

## Tilburg University

### Taxation and the External Wealth of Nations

Huizinga, Harry; Todtenhaupt, Maximilian; Voget, Johannes; Wagner, W.B.

*Publication date:*  
2019

*Document Version*  
Early version, also known as pre-print

[Link to publication in Tilburg University Research Portal](#)

*Citation for published version (APA):*

Huizinga, H., Todtenhaupt, M., Voget, J., & Wagner, W. B. (2019). *Taxation and the External Wealth of Nations: Evidence from Bilateral Portfolio Holdings*. (CentER Discussion Paper; Vol. 2019-029). CentER, Center for Economic Research.

#### **General rights**

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

#### **Take down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



No. 2019-029

**TAXATION AND THE EXTERNAL WEALTH OF NATIONS:  
EVIDENCE FROM BILATERAL PORTFOLIO HOLDINGS**

By

Harry Huizinga, Maximilian Todtenhaupt,  
Johannes Voget, Wolf Wagner

28 October 2019

ISSN 0924-7815  
ISSN 2213-9532

# Taxation and the External Wealth of Nations: Evidence from Bilateral Portfolio Holdings<sup>1</sup>

Harry Huizinga<sup>2</sup>  
Tilburg University and CEPR

Maximilian Todtenhaupt  
Norwegian School of Economics (NHH) and University of Munich

Johannes Voget  
University of Mannheim and ZEW

Wolf Wagner  
Erasmus University Rotterdam and CEPR

October 2019

**Abstract:** This paper examines the impact of capital income taxation on the composition of foreign portfolio investment. Studying bilateral portfolio positions among a sample of 37 countries over the period 2001-2015, we find that capital gains and dividend taxation reduce the share of equities in foreign investments, while interest taxation increases this share. The results suggest that domestic capital income taxation affects the worldwide asset allocation of domestic investors. The estimated tax sensitivities imply a significant increase in country's external wealth following a tax policy change that stimulates investors to hold higher-yielding equity investments.

**Keywords:** Asset allocation; Capital income taxation; Foreign portfolio investment

**JEL classification:** G11, H24

---

<sup>1</sup> We thank Martin Jacob for exchanging data on nonresident dividend and interest withholding tax rates. We gratefully acknowledge helpful comments from Tobias Bornemann, Ruud De Mooji, Dhammika Dharmapala, Philipp Krug, Kevin Markle, Peter Merrill, and seminar participants at the University of Mannheim, the 9th Conference on Current Research in Taxation in Barcelona, the 21st ZEW Summer Workshop, 75th IIPF Annual Congress in Glasgow, the 2019 Skatteforum in Oslo, and the 2018 NTA Annual Conference in New Orleans.

<sup>2</sup> Corresponding author. Email: [huizinga@uvt.nl](mailto:huizinga@uvt.nl); phone: +31-134662623; fax: +31-134663042; address: Tilburg University, School of Economics and Management, PO Box 90153, 5000 LE Tilburg, Netherlands.

## 1. Introduction

A nation's external wealth is not only determined by how much it saves or borrows vis-à-vis other countries over time, but also by how any savings are invested. Asset classes differ widely in their expected returns, with equity investment historically providing higher returns than debt investment. As return differences are compounded over time, the long run consequences of the composition of a country's external portfolio can be substantial. A point in case are the United States. Due to long-standing current account deficits, the United States are the world's largest debtor country.<sup>3</sup> However, U.S. net investment income from abroad has consistently been positive and large. As a result, U.S. net indebtedness has grown much less than was to be expected on the basis of its negative net foreign asset position (Boonstra, 2017). The relatively high U.S. net foreign investment income from abroad reflects that a larger share of its foreign assets are invested in equity compared to its foreign debts.

This paper explores the idea that taxation affects a nation's external wealth. Taxation of capital income, set by respective domestic governments, can affect the foreign asset allocation of investors. In many countries, taxes on debt and equity differ, with income from equity often being taxed more lightly than interest income. Such differential taxation makes investments in equity on an after-tax basis more attractive relative to debt. This may lead to a shift in foreign asset positions away from debt into equity, with positive long-term repercussions for domestic external wealth accumulation.

---

<sup>3</sup> Zucman (2013) argues that accounting for the unrecorded foreign assets of the U.S. would significantly reduce its recorded net debt.

We examine this question by studying how domestic capital income taxation affects the asset allocation of countries' foreign portfolio investments.<sup>4</sup> We use data on cross-border portfolio investments from the Coordinated Portfolio Investment Survey (CPIS) conducted by the International Monetary Fund for a sample of 37 developed countries over the period from 2001 to 2015. We base our analysis on bilateral data, which enables us to control for a wide array of factors that may affect foreign positions at the bilateral level,

In our main regressions, we relate the proportion of equity investments in overall foreign positions to relevant domestic tax rates. We find that the taxation of dividends and capital gains each significantly reduce the equity share in overall investments, while the taxation of interest income increases the equity share. These results are consistent with the expectation that investors consider the differing tax implications of investments when deciding on their foreign portfolio allocations, that is, after-tax returns matter for portfolio choices.<sup>5</sup> To provide an idea of the economic relevance of the estimated effects, a one-standard deviation variation in any of the three tax rates changes the equity share in the range of 1.7 to 2.6 percentage points.<sup>6</sup> While appearing modest at first sight, the consequences for wealth accumulation are material. We calculate the wealth reduction arising from a one-standard deviation increase in the relative taxation of equity (defined as the difference

---

<sup>4</sup> Portfolio investment typically constitutes a large part of a country's overall foreign investment. For example, portfolio investment as a fraction of GDP is about 48% in the U.S., while the corresponding number for FDI is 27%.

<sup>5</sup> A priori it is not clear that higher taxation of equity (or lower taxation of debt) necessarily translates into a lower demand for equity. This may be because of the de-risking effect of proportional taxation (as first pointed out by Domar and Musgrave (1944)) or because of portfolio rebalancing. Taxation also affects portfolio allocation through the wealth effect. For example, higher *relative* taxation of equity arising from lower taxation of debt may increase equity allocations by increasing wealth and reducing risk-aversion.

<sup>6</sup> As the estimates are obtained based on the total foreign positions of the country (thus including tax-exempt institutions), they are already net of potential clientele effects where taxable investors sell to tax-exempt ones.

between the average taxation of equity returns and the taxation of interest income) to be around \$38,000 for an initial lump-sum retirement investment of \$100,000 with an investment horizon of 36 years.<sup>7</sup>

The question of how domestic taxation affects portfolio positions is made difficult by identification issues. Tax changes will trigger changes in the prices of assets and affect their supply, making it difficult to interpret estimated tax elasticities as reflecting asset demand.<sup>8</sup> In addition, governments may vary tax rates across the business cycle, which tends to bring about variation in the macro-level equity share. Our empirical setup limits identification concerns. First, we consider foreign portfolios that are less likely to covary with domestic conditions that affect tax rates, and we can control for changes in global conditions through fixed effects. Second, domestic investors constitute only a small part of the investor base in each foreign country; we can hence take foreign asset supply and prices as given, allowing us to isolate demand. Third, our bilateral structure allows us to control for a variety of fixed effects, including any supply side shock by accounting for year fixed effects per investment destination country, and bilateral fixed effects. Fourth, we can exploit bilateral heterogeneities in tax sensitivities for different issuer countries for investors of a given holder country. For example, higher familiarity of investors of the holder country with a specific issuer country means that these investors develop preferences for (or, alternatively, against) investing in this country, making investment decisions stickier and less responsive to

---

<sup>7</sup> Note that higher wealth accumulation does not necessarily equate to welfare gains to the extent that the higher return on equity is a compensation for risk.

<sup>8</sup> There is a considerable literature documenting that capital income taxes are capitalized in equity prices. Sialm (2009), for instance, provides evidence that U.S. share prices reflect U.S. capital gains and dividend taxation, while Huizinga et al. (2018) find that equity valuations in M&A transactions reflect capital gains taxes internationally.

taxation.<sup>9</sup> Following a (potentially endogenous) variation in domestic tax rates, the foreign equity share vis-à-vis issuer countries with higher bilateral tax sensitivities should thus react more than the one vis-à-vis countries with lower bilateral tax sensitivity. Consistent with this, we find that the equity share is significantly less responsive to tax changes in the case of issuer countries that are more familiar to investors of the holder country, as proxied for example by the distance between the two countries.<sup>10</sup> In this setting, we can control for time fixed effects of the holder country, thus fully absorbing changes in the tax rate itself.

Our results on the sensitivity of the equity share to taxation raise the question of what drives the adjustments in the equity share. Is it a pure substitution effect where following higher taxation of one asset class investors shift into the other asset class, leaving total foreign positions unchanged? Or does higher taxation of one asset class predominantly lead to a reduction in this asset class, and hence reduces overall foreign asset holdings? Which of the two polar cases better approximates reality tells us about the substitutability of foreign and domestic assets, beyond the allocation between equity and debt. To investigate, we consider the constituent parts of the equity share, i.e. the amount of foreign equity and the amount of foreign debt, and study how they are affected by taxation. We find that the results vary with the specific tax considered; however, for changes in the relative taxation of equity the effects on the equity and debt positions approximately cancel out, pointing towards a pure substitution within foreign portfolios. Put in another way, taxation of capital income does not

---

<sup>9</sup> There is compelling evidence that households prefer investing in familiar assets, ignoring the principles of portfolio theory in doing so (e.g., Huberman (2001), Massa and Simonov (2006), Cao et al. (2011)).

<sup>10</sup> In previous research, Gelos and Wei (2005) found that equity funds have a greater propensity to exit non-transparent countries during crises. Similarly, Galstyan and Lane (2013) found that during the financial crisis bilateral portfolio positions were more stable vis-à-vis those destinations that were closer to home, with the volume of bilateral trade and common language ties also being important.

necessarily affect total foreign portfolio investment, and hence may not distort the total foreign allocation of investor portfolios.

Our paper connects two strands of literature. The first strand has examined the determinants of international capital flows, and more closely related to our setting, the resulting external asset positions of countries. In a series of papers, Lane and Milesi-Ferretti (2001, 2007, 2008, 2018) have compiled information on, and analyzed, the asset positions of a large number of developing and developed countries. Lane and Milesi-Ferretti (2001), in particular, show that the ratios of Foreign Direct Investment (FDI) and portfolio equity to Gross Domestic Product (GDP) are positively related to the openness of a country and to country size.<sup>11</sup> Focusing on dividend taxes, Amiram and Frank (2016) find that inward foreign portfolio investment in equity substitutes for domestic investors as domestic dividend taxes increase. Desai and Dharmapala (2011) show that U.S. portfolio investment in foreign equity increases more strongly in countries with a tax treaty than in countries without a treaty reflecting that investments in the latter group do not benefit from the dividend tax cut in the Jobs and Growth Tax Relief Reconciliation Act of 2003. Personal income taxes (and, particularly, bilateral withholding taxes) have also been used to explain the home bias in portfolio investment, with mixed results (Chan et al. (2005) and Bekaert and Wang (2009)). Relying on an extensive international panel data set of taxes on dividends as well as on capital gains and interest allows us to extend this literature by considering the choice between fixed

---

<sup>11</sup> While we focus on the asset side, a significant part of the literature has also analyzed the liability side of national balance sheets, arguing that a higher reliance on debt finance may cause vulnerability while higher equity-based financing promotes international risk sharing (Rogoff, 1999; Lane and Milesi-Ferretti, 2001).

income and equity investments – in addition the bilateral focus permits controlling for a variety of confounding effects that facilitate identification.<sup>12</sup>

The second strand is on how taxation affects investor portfolios in a domestic setting. This literature has predominantly considered the cross-sectional aspect of taxation, i.e., it has studied how assets are allocated among heterogeneous agents that differ in terms of their tax status regarding different asset classes. Theory predicts that if all assets are riskless (or, more generally, if assets are complete substitutes in the absence of taxation), strict clienteles will emerge so that each set of investors invests in the asset classes that are taxed most favorably for them (Auerbach and King, 1983). When one allows for investor heterogeneity and differential taxation of ordinary income, a modified CAPM emerges in which investors combine the market portfolio with a portfolio consisting of assets for which the investor is taxed lightly relative to other investors (Auerbach and King, 1983).

Several empirical studies have confirmed the predictions of theory. Feldstein (1976) finds that equity – which in the U.S. is less heavily taxed than debt – is more predominantly held by high-income households that face higher marginal tax rates. King and Leape (1998) find that marginal tax rates affect the set of assets investors hold, but they find very little evidence that taxation also affects the fraction of household wealth held in the respective asset classes. Poterba and Samwick (2002) show that the likelihood of an investor holding tax-advantaged assets is positively related to its tax rate on ordinary income. Poterba and Samwick (2002) also find that the equity share increases in a household's income tax rate. A

---

<sup>12</sup> There is also an extensive literature on international portfolio choice (e.g., Adler and Dumas (1983), Bohn and Tesar (1996) and Das and Uppar (2004)). While this literature examines how investors allocate their wealth across countries (predominantly from the perspective of equity), the focus in our paper is on the equity share, that is, how the wealth allocation to a specific country is split into debt and equity.

potential problem with exploiting differences in (marginal) tax rates across households is that tax rates are likely to be correlated with other factors such as income. Exploiting within-household variation of taxation in Canada, Alan et al. (2010) find evidence that household portfolio shares vary with capital income taxation while controlling for household income.

Our study differs from prior papers in several dimensions. First, we focus on how taxation affects the foreign asset holdings of investors, whereas the literature has focused on the domestic holdings of investors.<sup>13</sup> Second, we exploit variation in tax rates over time and across countries, rather than within-country variation in tax rates. Third, we study the effect of taxation on the entire portfolio of a country, which includes also tax-exempt entities (such as pension funds) and thus takes into account clientele effects.<sup>14</sup> The latter two aspects of our study enable us to study how a change in the relative taxation of equity affects the total external wealth of a country.

The remainder of the paper is organized as follows. Section 2 explains our empirical approach. Section 3 describes the data. Section 4 contains the empirical results. The final section offers conclusions.

## **2. Empirical approach**

---

<sup>13</sup> We expect the tax sensitivities of foreign holdings to differ from the domestic ones for two reasons. First, foreign assets are in fairly elastic supply for a (small) country, while domestic assets (at least in the short-term) are in fixed supply. This should lead to higher sensitivities of foreign holdings to taxation. Second, foreign investment is subject to higher frictions (e.g., investors incur higher transaction and informational costs), which suggests lower tax sensitivities.

<sup>14</sup> In particular, our estimation considers total ownership, consisting of direct household stock ownership and indirect ownership through financial institutions including pension funds. This is important since Rydqvist, Spizman and Strebulaev (2014) have shown that tax policies can lead to a shift to indirect stock ownership.

The purpose of this study is to investigate how shareholder taxation affects the allocation of foreign portfolios holdings between debt and equity. Our main variable of interest is the share of equity investments in total portfolio investments, but we also examine investments in debt and equity separately. Specifically, let  $Share_{ijt}$  be the share of equity investments in total portfolio investments in country  $i$  owned by investors resident in country  $j$  with  $i \neq j$  at time  $t$ . We relate the equity share,  $Share_{ijt}$ , to the taxation of the returns to debt and equity investments that apply to a private investor given that institutional investors such as pension funds tend to be tax exempt. Generally, the applicable shareholder taxation consists of residence-based income taxation in the investor's country  $j$  as well as of the nonresident withholding taxation of dividends and interest in the foreign-source country  $i$ . In the empirical work, we first consider residence-based taxation. Subsequently, we consider residence-based taxation and foreign-source withholding taxation jointly.

Our main analysis relates the foreign portfolio equity share,  $Share_{ijt}$ , to shareholder-country tax rates as follows:

$$Share_{ijt} = \gamma Tax_{jt} + \beta X_{jt} + \phi_{ij} + \phi_{it} + \epsilon_{ijt} \quad (1)$$

in which  $Tax_{jt}$  is a residence-based capital income tax rate. Alternatively, the tax rate  $Tax_{jt}$  is the capital gains tax rate,  $Tax_{jt}^{cg}$ , the tax rate on dividend income,  $Tax_{jt}^{div}$ , or the interest income tax rate,  $Tax_{jt}^{int}$ . We expect the equity share to be negatively related to the capital gains and dividend tax rate, and positively to the interest tax rate. Further,  $X_{jt}$  it is a vector of controls at the level of the investor country that could affect the foreign portfolio equity share including several macroeconomic and institutional variables. In specification (1), we include bilateral fixed effects  $\phi_{ij}$  that capture (time-invariant) bilateral determinants of

cross-border portfolio investments such as the correlation of stock market returns (which determine diversification benefits) and potential frictions that may limit cross-border portfolio investments. In addition,  $\phi_{it}$  are time-variant foreign-source country fixed effects that among other things could reflect variation in the supply of foreign assets as well as the corresponding expected pre-tax returns on these assets. This absorbs any global or local confounding effect from the supply side that alternative approaches to identification could suffer from.

In our analysis, we take the outstanding amounts and characteristics<sup>15</sup> of investable assets around the world as exogenously given, as cross-border portfolio investment from a particular investor country is small relative to worldwide asset demand and supply. For this reason, the estimated sensitivity of the equity share to taxation, as reflected in the parameter  $\gamma$ , isolates the effect of taxation on asset allocation for given asset supplies (in other words, we estimate demand functions).

The sensitivity of cross-border portfolio investment potentially depends on how familiar prospective investors are with a particular foreign country. In particular, familiarity is expected to reduce the impact of taxation as it will tend to create (tax-unrelated) preferences for (or against) an asset. To test this, we estimate the following model

$$Share_{ijt} = \gamma_1 Tax_{jt} + \gamma_2 Tax_{jt} \times Z_{ijt} + \gamma_3 Z_{ijt} + \beta X_{jt} + \phi_{ij} + \phi_{it} + \epsilon_{ijt} \quad (2)$$

in which  $Z_{ijt}$  is an index of the intensity of bilateral contact between countries  $i$  and  $j$ .

Alternatively, we represent bilateral contact by bilateral tourists visits,  $Visits_{ijt}$ , and the log

---

<sup>15</sup> The characteristics of assets (such as, for example, dividend payouts) are potentially endogenous. For example, Jacob and Jacob (2013) have shown that dividend and capital gains taxes affect firms' choices between dividend payments and share repurchases.

of the distance between the two countries,  $Distance_{ij}$ . We also consider audit quality in the issuer country,  $Audit\ quality_{it}$ , as a proxy for familiarity as establishing familiarity requires availability of reliable information. For the various tax rates, we expect to find estimates of  $\gamma_1$  and  $\gamma_2$  of opposing signs consistent with the notion that investor familiarity with a foreign country reduces the sensitivity of portfolio investment in this country with respect to taxation.

### **3. Data**

We obtain data on cross-border portfolio investments from the Coordinated Portfolio Investment Survey (CPIS) conducted by the International Monetary Fund (IMF). This survey collects annual data on holdings of portfolio investment securities including equity and investment fund shares, long-term debt instruments, and short-term debt instruments from participating countries. These data are collected from the asset owning country rather than from the security issuing country. Countries generally report their foreign portfolio holdings for a range of domestic sectors including households and the financial sector. We consider aggregate foreign portfolio investment at the level of the investor country (excluding the central bank) to take account of indirect ownership of households through intermediaries. Considering aggregate portfolios (which include tax-exempt institutions) also means that our estimates are net of potential clientele effect that may arise because following an increase in a tax an asset is sold to more lightly taxed agents. Another advantage of this approach is that reporting at the aggregate level is much more complete. Consistent with Amiram and Frank

(2015), we exclude investor countries with inconsistent reporting during the sample period (Mexico and Luxembourg). The sample period is 2001-2015.<sup>16</sup>

Table 1 reports the volumes of average foreign portfolio investments in equity and debt by investor country in the sample. The U.S. is the largest foreign portfolio investor, with foreign equity holdings of \$4.1 trillion and foreign debt holdings of \$1.8 trillion. The table also reports the average equity share of bilateral portfolio investment stocks by investor country. Canada, Iceland, and Chile report the highest equity shares of 80.6%, 76.0%, and 75.6%, respectively. The U.S. also has a relatively high equity share of 69.1%. In contrast, Malta, Slovakia and Bulgaria have rather low average equity shares of 8.7%, 13.4%, and 13.5%, respectively. These data along with consistently higher returns on equity investments than on debt investments imply that countries greatly differ in the returns that they achieve on their foreign portfolio investments. For example, assuming returns on equity and debt of 9.6% and 3.7% (which are average long-term, world-wide returns; see Dimson, Marsh and Staunton (2018)) we obtain a portfolio return of 8.5% for Canada, and 4.2% for Malta.

Figure 1 plots foreign portfolio investments in equity, foreign portfolio investments in debt, and FDI as shares of GDP in 2012 for the countries in our sample. For most countries, total foreign portfolio investment, i.e. the sum of portfolio investments in equity and debt, is shown to exceed foreign direct investment, which underscores the importance of foreign portfolio investments. In the U.S., for instance, outward foreign portfolio investment amounted to 48.1% percent of GDP in 2012, while outward FDI was equal to 27.2%. As expected, tax haven countries (notably Ireland and Luxembourg) are found to have high

---

<sup>16</sup> We drop observations with negative values for bilateral portfolio holdings arising from short positions.

levels of foreign investment. For tax haven countries, the identities of immediate and ultimate owners regularly differ (see, for example, Hanlon, Maydew and Thornock (2015)). Therefore, we exclude tax havens in a robustness test.

In the empirical work, we relate the bilateral equity investment share, *Share*, as well as the logarithms of the underlying equity and debt investment amounts, denoted *Equity* and *Debt*, to tax variables and other determinants over the 2001-2015 period.<sup>17</sup> As seen in Table 2, the average bilateral equity share in our sample is 41.8%. Figure 2 depicts the average equity share over time, showing that it increased in the years prior to the global financial crisis, but decreased thereafter.

The returns to equity come in the form of capital gains and dividend income that are subject to tax rates  $Tax_{jt}^{cg}$  and  $Tax_{jt}^{div}$  in the investor's country  $j$ , respectively. In this study, we consider personal capital gains and dividend taxes applicable to nonsubstantial, long-term stock investments. In line with prior research, we take the perspective of wealthy individuals and thus consider top statutory rates. The average capital gains and dividend tax rates in the sample are 14.7% and 27.2%, respectively. The return to debt accrues in the form of interest which is subject to an interest income tax,  $Tax_{jt}^{int}$ . The average interest income tax is 26.8%. Figure 3a-c depict the development of the three tax rates over time, showing a downward trend in all three tax rates in the first half over our sample, followed by an upward trend in the second half. To measure the relative taxation of the returns to equity and debt, we define the tax rate difference variable  $\Delta Tax_{jt}$  as the (simple) average of the capital gains and

---

<sup>17</sup> See Table A1 in the appendix for variable definitions and data sources.

dividend tax rates<sup>18</sup> minus the interest tax rate, i.e.  $\Delta Tax_{jt} = \frac{1}{2}Tax_{jt}^{cg} + \frac{1}{2}Tax_{jt}^{div} - Tax_{jt}^{int}$ .

The average tax rate difference variable is -5.9%, which implies that on average the return to equity is taxed less heavily than interest income. There is significant variation in the (average) tax rate difference over time (Figure 3d), ranging from -9.6% in 2005 to -3.9% in 2011. Compared to the international average of -5.9%, the average tax rate difference for the U.S. during our sample period was much more negative (-23.5%), possibly contributing to the high equity share in U.S. foreign investment mentioned earlier.

Figure 4 provides some initial evidence on the relations between the equity share and investor-country capital income tax rates. Specifically, Figure 4a-d display the relations between the equity share and the four respective tax rates, as provided by simple regressions that include bilateral fixed effects and a set of year-fixed effects per issuer-country. The figures indicate that the equity share varies negatively with the capital gains and dividend tax rates and also with the differential equity-debt tax rate, but positively with the interest income tax rate.

In addition to investor-country capital income taxation, the returns on bilateral portfolio investments can be subject to taxation in the foreign-source country in the form of nonresident dividend and interest withholding taxes denoted  $Withholding\ tax_{ijt}^{div}$  and  $Withholding\ tax_{ijt}^{int}$ , respectively. These nonresident withholding tax rates are generally creditable against personal income taxation in the residence country up to the level of the corresponding dividend and interest income tax rates. This implies that nonresident dividend and interest withholding taxes only add to the effective taxation of cross-border dividend and

---

<sup>18</sup> During our sample period the equity returns arising from dividends and capital gains were roughly equal.

interest income streams to the extent that this foreign-source taxation exceeds the pertinent taxation in the residence country. The effective, combined international tax rate on, say, dividend income, then is the maximum of the dividend income tax rate in the residence country and the nonresident interest income tax rate in the foreign-source country. Generally, the effective tax rates on cross border dividend and interest income from country  $i$  to country  $j$  can be written as follows

$$Effective\ tax_{ijt}^s = \max(Withholding\ tax_{ijt}^s, Tax_{it}^s), \quad s = div, int \quad (3)$$

The average effective dividend and interest income taxes,  $Effective\ tax_{ijt}^{div}$  and  $Effective\ tax_{ijt}^{int}$ , are 29.2% and 28.2%, respectively. The relative effective taxation of the returns to equity,  $\Delta Effective\ tax_{ijt}$ , is computed as  $\frac{1}{2}Tax_{it}^{cg} + \frac{1}{2}Effective\ tax_{ijt}^{div} - Effective\ tax_{ijt}^{int}$  and has a mean of -6.2%.

In some specifications, we relate the foreign equity share to tax yields, which are computed as tax rates times estimates of the expected returns to which the tax rates apply. Tax yields provide a better proxy of the effective tax burden when returns differ significantly across asset classes. For capital gains and dividends, we use historical returns to proxy return expectations. In particular, the capital gains tax yield,  $Yield_{ijt}^{cg}$ , is defined as the capital gains tax rate  $Tax_{jt}^{cg}$  times the annualized capital gains return  $R_{it}^{cg}$ , i.e.  $Yield_{ijt}^{cg} = Tax_{jt}^{cg} \times R_{it}^{cg}$ . Similarly, the dividend tax yield,  $Yield_{ijt}^{div}$ , is computed as  $Tax_{jt}^{div} \times R_{it}^{div}$  where  $R_{it}^{div}$  is the annualized dividend yield. We calculate the capital gains return  $R_{it}^{cg}$  and dividend yield  $R_{it}^{div}$  from respective realized returns during the prior ten-year period.<sup>19</sup> The (inflation-adjusted)

---

<sup>19</sup> The Online Appendix to this paper contains detailed information on the how these returns are calculated.

average values for the capital gains and the dividend tax yields,  $Yield_{ijt}^{cg}$  and  $Yield_{ijt}^{div}$ , are 0.6% and 0.7%, respectively. Analogously, we define the interest tax yield,  $Yield_{ijt}^{int}$ , as the product of the interest income tax rate,  $Tax_{jt}^{int}$ , and the interest income yield,  $R_{it}^{int}$ , which we approximate by the yield on 10-year government bonds reported by the IMF. The average (inflation-adjusted) interest tax yield,  $Yield_{ijt}^{int}$ , is 2.1%. The differential equity-debt tax yield,  $\Delta Yield_{ijt}$ , is defined as  $\frac{1}{2}Yield_{ijt}^{cg} + \frac{1}{2}Yield_{ijt}^{div} - Yield_{ijt}^{int}$ .

We define the dividend tax yield including the withholding tax,  $Effective\ yield_{ijt}^{div}$ , as  $Effective\ tax_{ijt}^{div} \times R_{it}^{div}$ . This variable has a mean of 0.7%. Similarly, the interest tax yield including the withholding tax,  $Effective\ yield_{ijt}^{int}$ , is computed as  $Effective\ tax_{ijt}^{int} \times R_{it}^{int}$  with a mean of 2.2%. The relative tax yield variable including withholding taxes,  $\Delta Effective\ yield_{ijt}$  is given by  $\frac{1}{2}Yield_{ijt}^{cg} + \frac{1}{2}Effective\ yield_{ijt}^{div} - Effective\ yield_{ijt}^{int}$ .

The empirical analysis includes several control variables at the level of the investor's country of residence. *GDP per capita* is the log of GDP per capita in constant US dollars. Residents of a country with a higher GDP per capita may have a higher risk tolerance, which could explain a higher foreign portfolio equity share. *Inflation* is the annual percentage change in the consumer price index with a mean of 2.0%. A higher rate of inflation makes domestic investments less attractive, leading to a substitution towards foreign investments, thus potentially affecting the equity share. *Stock market growth* is the percentage change in the investor-country stock market index with a mean of 8.3%. A higher stock market growth may make domestic equity investments more attractive, possibly leading to a lower foreign

portfolio equity share. *Interest rate* is the lending interest rate with a mean of 5.2 %. A higher domestic interest rate raises the attractiveness of domestic fixed income instruments, causing investors to hold more domestic debt. To counterbalance the increased debt allocation in their overall portfolio, investors may thus increase the equity share in their foreign portfolios. *Government efficiency* is an indicator of how effective the government is. A more effective domestic government could entail better enforcement of domestic residence-based taxation of foreign-source investment income. This could increase the relative taxation of foreign-source interest income, as de jure interest taxation is relatively high (as seen by the negative mean value of the differential equity-debt tax variable,  $\Delta Tax_{it}$ ). Therefore, greater government enforcement could lead to a higher foreign equity share. *Government efficiency* is measured on a scale from -2.5 to 2.5, and it has a mean of 1.5. *Elderly share* is the percentage of the total population that is older than 65 with a mean of 15.9. Older people could want to reduce the riskiness of their (foreign) portfolio holdings, and thus reduce their foreign equity share. *Corporate tax* is the corporate income tax rate. A higher residence-country corporate income tax rate lowers the after-tax share of payouts that an investor receives from (domestic) equity as opposed to debt (as domestic firms are now taxed more heavily). Maintaining the equity-debt allocation would thus require portfolio rebalancing into equity, possibly resulting in a higher foreign portfolio equity share. The average corporate income tax rate is 27.5.

To test how investor familiarity with a foreign country affects the sensitivity of foreign portfolio investment to taxation, we use two proxies of cross-border investor familiarity. First, *Visits* is the share of bilateral visits between a pair of countries in the total visits by foreigners to the two countries, with a mean of 1.1%. Second, *Distance* is the (log

of) the geographical distance between the most populous cities of the two countries, with a mean of 8.32. We also consider *Audit quality*, defined as the strength of auditing and reporting standards (index ranging from 1, extremely weak, to 7, extremely strong), of the issuer country as an indirect indicator of how easy it is to become familiar with this country. The mean of the audit quality variable is 5.10.

#### **4. Empirical results**

In this section, we present evidence on the relations between the foreign equity share and the underlying equity and debt investments on the one hand, and capital income tax rates and yields on the other hand. Specifically, section 4.1 considers how the equity share varies with investor-country capital income tax rates and yields, and with effective capital income tax rates and yields incorporating nonresident withholding taxation. In section 4.2 we consider several robustness checks and extensions to the basic econometric model.

##### **4.1 Main results**

To start, Table 3 provides evidence on the relation between the equity share and personal income tax rates in the investor country. In regression 1, the capital gains tax rate is estimated with a negative coefficient of -0.212 that is significant at the 1% level. Thus, an increase in the capital gains tax rate by 1 percentage point is estimated to reduce the equity share by 0.212 percent. In regression 2, the dividend tax receives a negative coefficient of -0.102 that is significant at 1%, suggesting that a higher dividend tax reduces the equity share in international portfolio investment. In contrast, in regression 3 the coefficient for the interest income tax is positive at 0.103 and significant at 1%, implying that higher interest

income taxation encourages cross-border equity investment relative to fixed income assets. In regression 4, we jointly include the three tax rates, yielding results that are similar to regressions 1-3. Regression 5 includes the differential equity-debt tax rate, which obtains a negative coefficient of -0.178 that is significant at 1%. This result suggests that the foreign equity share declines with the taxation of the returns to equity relative to debt.

Next, we include a set of controls in regressions 1-5 of Table 3, and report the results as regressions 6-10. The tax rate variables in regressions 6-10 are estimated with very similar coefficients. In particular, in regression 9, the capital gains tax and dividend tax rate variables are estimated with negative and significant coefficients, while the interest tax variable is estimated with a positive and significant coefficient. In these regressions, *GDP per capita* enters with positive and significant coefficients, as the residents of wealthier countries may prefer to hold relatively more equity. The estimated coefficients for *Stock market growth* are negative and significant, consistent with the notion that higher domestic stock market returns lead investors to hold less foreign equity. *Interest rate* is estimated with positive and significant coefficients, as higher domestic interest rates could make investors increase the foreign equity share in order to counterbalance higher allocations to (domestic) debt. The equity share is positively and significantly related to *Government efficiency*. This could reflect that more efficient governments are better able to enforce the domestic taxation of foreign-source investment income, which could increase the taxation of foreign debt instruments relative to foreign equity. *Elderly share* receives a positive coefficient that is significant at 10% in regressions 9-10, and it is insignificant in regressions 6-8.

The results of Table 3 imply that personal income taxation in the investor country has an economically significant effect on the foreign portfolio equity share. In particular, the

estimated coefficient of -0.126 for the capital gains tax variable in regression 9 implies that a one standard deviation increase in this tax reduces the equity share by 1.7, equivalent to 4.4% of its standard deviation. Further, the estimated coefficient of -0.141 for the dividend tax variable implies that a one standard deviation increase in the dividend tax reduces the equity percentage by 2.0 percentage points, equivalent to 5.2% of its standard deviation. Finally, the coefficient estimate of 0.165 for the interest tax variable implies that a one standard deviation increase in the interest tax increases the equity share by 2.6 or 6.6% of its standard deviation.

Next, we examine the empirical relation between the equity share and capital income taxation using alternative measure of tax rates and tax burdens. To start, we re-estimate regression 9-10 of Table 3 after replacing the investor-country personal income tax rates by the effective tax rates that include foreign-source country nonresident withholding taxation. The results are presented as regressions 1-2 of Table 4 and are very similar. Next, we use tax yield measures rather than tax rate variables to represent the tax burden on foreign portfolio investment. Specifically, regressions 3-4 in Table 4 include tax yield measures that reflect only investor-country personal income taxation, yielding very similar results. The advantage of using tax yields is that it makes the coefficients on different tax rates comparable. In particular, we can see that the coefficient on the dividend tax is more than three times as high (in absolute terms) than the coefficient on the capital gains tax. This lower elasticity with respect to capital gains taxation is consistent with the fact that capital gains taxation is considered less burdensome as it is only triggered upon realization of capital gains and gains may be offset with losses in other parts of the portfolio. In particular, Huizinga et al. (2018) estimate the effective capital gains tax rate to be only about 40% of the statutory one.

Regressions 5 and 6 feature tax yield measures that reflect both investor-country personal income taxation and issuer-country nonresident withholding taxation, again giving very similar results. Thus, the results from Table 3 that the equity share negatively reflects equity taxation and positively interest taxation are robust to including nonresident withholding taxation and replacing tax rates by tax yields.

The tax yield regressions potentially imply that the magnitudes of pre-tax equity returns in a country not only affect the equity share of investments in that country, but also the share of equity investments in that country relative to total foreign equity investments. A higher pre-tax dividend return in a country, for instance, increases  $Yield^{div}$  and from regression 3 reduces the equity share for that country. This effect by itself suggests a lower share of that country's equity in total foreign equity investment.

To provide some insight into the implications of taxation for international stock (market) allocations, we consider variation in the price-earnings (PE) ratios across stock markets in different issuer countries. Stock markets with high PE ratios are expected to provide investments with high capital gains yields relative to dividend yields, as a high PE ratio suggests a low current dividend yield. Taxation of capital gains should thus be more burdensome in such markets (and, conversely, taxation of dividends less). To test this, regression 7 relates the equity share to interactions between the PE ratio and effective tax rates. The interaction effect of the PE ratio with the capital gains tax obtains a negative coefficient of -0.005, significant at the 10% level. This confirms expectations that capital gains taxation should matter more for an asset where a higher share of returns comes in the form of price appreciation (as opposed to dividends). The interaction effect of the effective tax on dividends and the PE ratio, however, is insignificant (the coefficient though is positive,

consistent with priors). Finally, the interaction effect with the tax rate on interest is insignificant as well, which is according to expectations, as the division of equity returns (between capital gains and dividends) should not affect the returns on debt. The negative estimated coefficient for the interaction of the PE ratio with the capital gains tax suggests that investors, who are faced with a higher capital gains tax, will reduce the equity-to-debt ratio of their investments in countries with high-PE stock markets, possibly leading to a lower share of their overall foreign equity investments allocated to these markets.

To conclude this section, we examine how a change in the relative taxation of equity affects the external wealth of domestic investors. The idea is that if a higher taxation of equity leads to lower holdings of equity, and equity provides higher returns, this ultimately results in lower expected wealth.

We consider a domestic investor who at the age of 30 makes a lump-sum investment of \$100,000 into foreign assets that he plans to use for his retirement 36 years later. We analyze how the investor's final wealth will be affected by a change in the relative taxation of equity. We assume that the investor rebalances his portfolio every period to keep the equity share constant and we focus on pre-tax wealth.<sup>20</sup> Using the long-run (world) returns on equity of 9.6% and on (fixed-income) bills of 3.7% (source: Dimson, Marsh and Staunton, 2018), we obtain a portfolio return of 6.18% for the mean equity share of 41.80% in the sample. This translates into a final wealth of \$ 861,997. Now we consider a one-standard deviation increase in the differential equity-debt tax rate,  $\Delta Tax$ . Given the point estimate of -0.190 on the tax difference in Column 10 of Table 3, a one-standard deviation increase in the differential

---

<sup>20</sup> This isolates the effect coming through the change in the equity share. Pre-tax and post-tax wealth will coincide if the government returns the tax revenue to the domestic investor by means of a lump sum.

equity-debt tax reduces the mean equity share to 39.53% ( $= 41.80\% - 0.190 \times 11.80$ ), resulting in a new, lower blended portfolio return of 6.03%. The resulting wealth is now \$ 823,678, \$38,319 lower than before. Relative taxation of equity versus debt has thus considerable implications for wealth (wealth accumulation over generations would imply an even larger tax impact than suggested by our example).<sup>21</sup>

## 4.2 Extensions and robustness

Table 5 presents the results of several robustness checks related to the benchmark regressions of Table 3. To start, columns 1 and 2 in Panel A present the results of regressions 9-10 of Table 3 where we exclude the financial crisis years 2008-2009, as equity returns during these years were extremely negative. The results are very similar. For instance, the coefficient on the tax difference is -0.207 in regression 2 of Table 5 compared with -0.190 in regression 10 in Table 3.

Next, we estimate the two benchmark regressions excluding cases where either the investor country or the issuer country is a tax haven, using the list of tax havens provided in Hines and Rice (1994). In tax havens, the identities of immediate and ultimate owners frequently differ, which implies that the tax rates that apply to the immediate foreign owner as included in our analysis could be inappropriate. The results are presented as regressions 3 and 4. In regression 4, the coefficient for the tax difference variable is estimated to be -0.188

---

<sup>21</sup> Note that in terms of the *net investment income* of a country (i.e., the difference between capital income earned abroad and paid to foreigners), we are likely to underestimate the impact of tax changes. This is because following an increase in the relative taxation of equity, foreigners will hold a higher proportion of domestic equity since domestic investors have incentives to reduce their overall equity allocations (see, Amiram and Frank (2016)).

and thus is very similar to the full sample. This result provides some comfort that our previous results are not driven by the presence of tax havens.

Investors from an individual country generally own only a limited fraction of the assets of another country. This implies that we can reasonably assume that the asset supply and thus the pre-tax asset returns in an issuer country are exogenous to personal income taxation in a particular holder country. However, personal income taxation in a holder country could affect the asset supply and hence pre-tax returns in the holder country itself, which in turn could affect the foreign equity share. Such a potentially confounding effect is less pronounced when holder country investors own a smaller share of the assets of their own country. We thus restrict the sample to holder countries where the foreign ownership is large. Specifically, in regressions 5 and 6 we only include (holder) countries where the share of foreign equity (computed as total foreign ownership relative to the valuation of the domestic stock market) exceeds the 25% quantile. In regression 5, the effect of the dividend tax rates is no longer significant, while the capital gains tax rate and interest income tax rate variables remain significant with coefficient estimates of -0.179 and 0.208, respectively. In regression 6,  $\Delta Tax$  obtains a coefficient of -0.230, significant at the 1% level. It is interesting to note that (among the significant variables), the estimated tax coefficients are all larger (in absolute terms) than the corresponding ones in the benchmark regressions. Thus, any reaction coming through domestic supply seems to mitigate the tax effects.

Tax policy potentially is endogenous to the foreign portfolio allocation decisions of domestic investors (as discussed previously, endogeneity to domestic or global factors is less of a concern in our empirical setup). For instance, policy makers could lower the taxation of equity returns following a reduction in the foreign equity share if they want to counteract the

resulting negative effect on foreign wealth accumulation. To reduce this potential for endogeneity, we rerun our benchmark regressions where we use lagged values of these tax rate variables as instruments for these tax variables, with the results presented in columns 7 and 8. In regression 7, the dividend tax rate is only significant at 10%, while otherwise results are similar to the benchmark estimates.

Another potential issue is that in some countries a large share of assets are held by pension funds, which are typically tax-exempt. In the first two columns of Panel B of Table 5 we exclude holder countries with a share of pension funds in total foreign portfolio investment above 25%.<sup>22</sup> This reduces the sample to 2806 country pairs (compared to 3452 in the full sample). The results are similar to the baseline model. In particular, in column 2 the tax difference variable obtains a coefficient of -0.158, significant at the 1% level.

In regressions 3 and 4, we additionally correct for institutional ownership in the equity share. Specifically, we exclude insurance companies, pension funds and other financial corporations when calculating the equity share. The results are again similar to the baseline regression. The coefficient for the tax difference in regression 4 obtains a coefficient of -0.255, significant at the 1% level. This coefficient is now larger than the corresponding coefficient in the benchmark regression (-0.190), possibly reflecting that pension funds are often tax exempt, and thus their inclusion should lower tax sensitivities.

In Table 6, we consider an extension to the baseline results by examining how “familiarity” affects tax sensitivities. Familiarity with certain assets (or the country issuing

---

<sup>22</sup> The Online Appendix to this paper provides information on the importance of pension funds for the countries in our dataset and indicates how the equity share is affected by the presence of pension funds.

them) could mean that investors become reluctant to change portfolios involving these assets. Their portfolio allocations thus are expected to become less sensitive to other factors such as tax rates.<sup>23</sup> To test this, the regressions include interactions terms of a familiarity variable (bilateral visits, distance, or audit quality) with tax rates. These regressions include time-varying holder-country fixed-effects that fully absorb the tax rates, in addition to bilateral country and issuer country-time fixed effects. In this setting, identification comes entirely from differences in bilateral tax sensitivities between the holder-country and different issuer-countries as affected by familiarity, and the remaining potential for endogeneity is arguably very limited.

Regressions 1 and 2 include interactions of the visits variable with tax rates. In regression 1 the interaction term of *Visits* with the dividend tax rate is positive and significant at 10%, consistent with a lower dividend tax sensitivity in case of numerous bilateral visits. In regressions 3 and 4, we consider the (log) distance between the holder and issuer countries as an (inverse) proxy of familiarity. In regression 3 the interaction effect with the dividend tax variable is negative and significant, and in regression 4, the interaction with the tax difference is also negative and significant. These effects suggest that less familiarity as proxied by greater distance increases tax sensitivities. In regressions 5 and 6, we consider audit quality in the issuer country. Higher audit quality means a greater availability of information to investors, making it easier for them to familiarize themselves with assets of the issuer country. In regression 5, the interaction effect with the dividend tax is positive and

---

<sup>23</sup> The argument can also be understood from the perspective of investor clienteles. Familiarity will tend to attract investors with behavioral biases to hold familiar assets, thus reducing the overall sensitivity of the investor base to rational factors such as tax rates.

significant, while the interaction effect with the interest rate tax is negative and significant. In regression 6, the interaction effect with the tax difference is positive and significant. Thus, familiarity as proxied by audit quality reduces tax sensitivities, consistent with earlier results.

In Table 7, we split the equity share into its two components, equity and debt. This is interesting for two reasons. First, it can inform us about which part of the foreign investment is more sensitive to a certain tax change. Second, it tells us about how a change in the equity share is brought about. In principle, we can think of two polar cases. An increase in the tax on equity, for example, could lead to a reduction in foreign equity while leaving foreign debt unaffected, thus lowering foreign investment (“retrenchment case”). Alternatively, the money freed by selling foreign equity could be used to buy foreign debt, leaving total foreign investment unaffected (“substitution case”). Which of these polar cases is closer to reality will depend on how good of a substitute domestic and foreign assets are, relative to substitution between debt and equity.

Regressions 1 to 5 report the results of estimating regressions 6-10 of Table 3 using the log of foreign equity holdings, *Equity*, as dependent variable, while in Regressions 6 to 10 the dependent variable is the log of debt, *Debt*. The capital gains tax rate in regression 1 of *Equity* obtains a coefficient of -0.020 (significant at the 1% level), while the coefficient in Regression 6 of *Debt* is insignificant and is estimated to be 0.000. In the case of capital gains taxation, the adjustment in response to changes thus exclusively takes place through equity (“retrenchment”). As for the dividend tax, the respective coefficients for equity and debt are 0.003 (insignificant) and 0.009 (significant at the 1% level). In this case, a larger part of the adjustment takes place through debt levels (as  $0.009 > 0.003$ ). The respective coefficients for the interest tax are 0.004 (insignificant) and -0.005 (significant at the 5% level), suggesting

that the majority of the adjustment takes place through debt. Regressions 4 and 9 report the results for all tax terms combined, with result similar to the regressions in which tax terms are considered in isolation. In regressions 5 and 10, we consider the tax difference. For the case of the equity amount, the coefficient is  $-0.009$ , whereas for the debt amount the coefficient is  $0.007$  (both significant at the 1% level). It is interesting to note that the coefficients are of almost equal magnitude (in absolute terms). Given that the sample means of debt and equity are also similar, this implies that changes in the tax difference lead to nearly offsetting changes in equity and debt positions, suggesting that the total level of foreign investment (equity plus debt) could be largely unaffected (“substitution”). This points to domestic and foreign investment as being fairly imperfect substitutes as investors aim to hold constant their total foreign asset positions following a change in taxation.

## **5. Conclusion**

In this paper, we have examined how capital income taxation affects the composition of a country's external asset portfolio. For this purpose, we have analyzed bilateral portfolio positions for a large sample of 37 developed and developing countries over the period from 2001 to 2015.

We find that investor-country capital gains taxation and dividend taxation reduce the equity share in foreign portfolio investments, while interest income taxation increases this share, consistent with theoretical priors. These results are robust to including foreign-source nonresident withholding taxes into the analysis, and to considering tax yields as measured by the capital income tax burden. Following changes in the relative taxation of equity versus debt, we find that the equity share adjusts primarily through a substitution effect between

equity and debt, with little impact on total foreign investment. The estimated effects are economically meaningful, as a one-standard deviation variation in each of the three tax rates changes the equity share in the range of 1.7 to 2.6 percentage points.

Average returns on equity are higher than on debt. Thus, a reduction in the relative taxation of equity, that increases the foreign equity share, can generate a higher expected return on a country's foreign assets. Our analysis suggests that a reduction in the taxation of equity relative to debt by one standard deviation would increase the average country's foreign equity share by 2.2 percentage points. For a lump-sum investment of \$100,000 at age thirty, this would lead to an increase in wealth of \$38,000 upon retirement, which is a sizeable effect.

Our results have implications for tax policy. Specifically, our results suggest that by creating a more favorable relative taxation of equity, governments can ensure that a higher proportion of the world's high-yielding assets will be held by their residents. Since what matters here is the *relative* taxation of equity, such a tax policy change can be brought about in a manner that is revenue-neutral. Over time, as domestic wealth increases due to higher returns on international portfolios, tax revenue could even increase. Lowering the relative taxation of equity thus seems an attractive option for governments interested in increasing the long-term wealth of their nations.

## References

- Adler, M., Dumas, B. 1983, International portfolio choice and corporation finance: A Synthesis, *Journal of Finance* 38, 925-84.
- Alan, S., Atalay, K., Crossley, T., Sung-Hee, J., 2010. New evidence on taxes and portfolio choice, *Journal of Public Economics*, Volume 94, Issues 11--12, 813-823.
- Amiram, D., Frank, M., 2016. Foreign portfolio investment and shareholder dividend taxes. *Accounting Review* 91, 717 – 740.
- Auerbach, A., King, M., 1983. Taxation, portfolio choice, and debt--equity ratios: A general equilibrium model. *Quarterly Journal of Economics* 98, 587--609.
- Bekaert, G., Wang, X., 2009, Home bias revisited, Working paper, Columbia University.
- Bohn, H., Linda, T., 1996, U.S. equity investment in foreign markets: Portfolio rebalancing or return chasing?, *American Economic Review* 86, 77-81.
- Boonstra, W., 2017. The external debt of the US is no cause for concern, yet, *VoxEU Column*, 25 August 2017.
- Cao, H., Han, B., Hirshleifer, D., Zhang, H. 2011. Fear of the unknown: Familiarity and economic decisions. *Review of Finance* 15, 173–206.
- Chan, K., Covrig, V., Ng, L., 2005. What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocations worldwide, *Journal of Finance* 60, 1495-1534.
- Das, S., Uppal, R., 2004, Systemic risk and international portfolio choice, *Journal of Finance* 59, 2809-2834.
- Desai, M., Dharmapala, D., 2011. Dividend taxes and international portfolio choice. *Review of Economics and Statistics* 93, 266-284
- Dimson, E., Marsh, P., Staunton, M, 2018. Triumph of the optimists. Credit Suisse Global Investment Returns Yearbook 2018.
- Domar, E., Musgrave, R., 1944. Proportional income taxation and risk-taking, *Quarterly Journal of Economics* 58, 388-422.
- Feldstein, M., 1976. Personal taxation and portfolio composition: An econometric analysis. *Econometrica* 44, 631--649.
- Galstyan, V., Lane, P., 2013. Bilateral portfolio dynamics during the global financial crisis. *European Economic Review* 57, 63-74.

- Gelos, R., Wei, S., 2005. Transparency and international portfolio holdings. *Journal of Finance*, 60, 2987-3020.
- Hanlon, M., Maydew, E., Thornock, J., 2015. Taking the long way home: US tax evasion and offshore investments in US equity and debt markets. *Journal of Finance* 70, 257–287.
- Hines, J. R., Rice, E., 1994. Fiscal paradise: Foreign tax havens and American business. *Quarterly Journal of Economics* 109, 149–82.
- Huberman, G., 2001. Familiarity breeds investment, *Review of Financial Studies* 14, 659-680.
- Huizinga, H., Voget, J., Wagner, W., 2018. Capital gains taxation and the cost of capital: Evidence from unanticipated cross-border transfers of tax base. *Journal of Financial Economics* 129, 306-328.
- Jacob, M., Jacob M., 2013. Taxation, dividends, and share repurchases: Taking evidence global. *Journal of Financial and Quantitative Analysis* 48, 1241-1269.
- King, M., Leape, J., 1998. Wealth and portfolio composition: Theory and evidence. *Journal of Public Economics* 69, 155--193.
- Lane, P., Milesi-Ferretti, G., 2001. The external wealth of nations: Measures of foreign assets and liabilities for industrial and developing countries. *Journal of International Economics* 55, 263--294.
- Lane, P., Milesi-Ferretti, G., 2007. The external wealth of nations, Mark II. *Journal of International Economics* 73, 223--250.
- Lane, P., Milesi-Ferretie, G., 2008, The drivers of financial globalization, *American Economic Review* 98, 327-332.
- Lane, P., Milesi-Ferretti, G., 2018. The external wealth of nations revisited: International financial integration in the aftermath of the global financial crisis, *IMF Economic Review* 66, 189-222.
- Massa, M., Simonov, A. 2006. Hedging, familiarity and portfolio choice. *Review of Financial Studies* 19, 633–685.
- Mayer, T., Zignago, S., 2005. Notes on CEPII’s distances measures: The GeoDist database. Working Paper No. 2011-25.
- Poterba, J., Samwick, A., 2003. Taxation and household portfolio composition: US evidence from the 1980s and 1990s. *Journal of Public Economic* 87, 5--38.

Rogoff, K., 1999. Institutions for reducing global financial instability. *Journal of Economic Perspectives* 13, 21-42.

Rydqvist, K., Spizman, J., Strevulaev, I., 2014. Government policy and ownership of equity securities. *Journal of Financial Economics* 111, 70-85.

Sialm, C., 2009. Tax changes and asset pricing. *American Economic Review* 99, 1356-1383.

Zucman, G., 2013. The missing wealth of nations: Are Europe and the U.S. net debtors or net creditors? *Quarterly Journal of Economics* 128, 1321–1364

## Appendix

**Table A1: Variable definitions and data sources**

Variable	Definition	Source
$Share_{ijt}$	Share of equity holdings in total holdings in country $i$ of investors residing in country $j$ in year $t$ in percentage points	CPIS
$Tax_{it}^{cg}$	Tax rate on capital gains realized on equity holdings in country $i$ by residents of country $j$ in year $t$ in percentage points	IBFD, own computation
$Tax_{it}^{div}$	Tax rate on dividend income from equity holdings in country $i$ received by residents of country $j$ in year $t$ in percentage points	IBFD, own computation
$Tax_{it}^{int}$	Tax rate on interest income from debt holdings in country $i$ realized by residents of country $j$ in year $t$ in percentage points	IBFD, own computation
$\Delta Tax_{it}$	Difference between the equally weighted sum of the equity tax rates, $Tax_{it}^{cg}$ and $Tax_{it}^{div}$ , and the interest tax rate, $Tax_{it}^{int}$	IBFD, own computation
$Effective\ tax_{ijt}^{div}$	Tax rate on dividend income received from equity holdings in country $i$ by residents of country $j$ in year $t$ taking into account withholding taxes in country $i$ in percentage points	IBFD, own computation.
$Effective\ tax_{ijt}^{int}$	Tax rate on interest income from debt holdings in country $i$ realized by residents of country $j$ in year $t$ taking into account withholding taxes in country $i$ in percentage points	IBFD, own computation
$Yield_{ijt}^{cg}$	Amount in US dollars paid in capital gains taxes per 100 US dollars of equity investment in country $i$ by residents of country $j$ based on inflation-adjusted annualized geometric 10-year average price returns	IBFD, own computation from MSCI indices
$Yield_{ijt}^{div}$	Amount in US dollars paid in dividend taxes per 100 US dollars of equity investment in country $i$ by residents of country $j$ based on inflation-adjusted annualized arithmetic 10-year average dividend returns	IBFD, own computation from MSCI indices
$Yield_{ijt}^{int}$	Amount in US dollars paid in interest taxes per 100 US dollars of debt investment in country $i$ by residents of country $j$ based on inflation-adjusted annualized 10-year average interest rates	IBFD, own computation from MSCI indices.
$\Delta Yield_{ijt}$	Difference between the equally weighted sum of the inflation-adjusted equity tax yields, $Yield_{ijt}^{div}$ and $Yield_{ijt}^{cg}$ , and the inflation-adjusted interest tax yield, $Yield_{ijt}^{int}$	IBFD, own computation from MSCI indices.
$Effective\ yield_{ijt}^{div}$	Amount in US dollars paid in dividend taxes per 100 US dollars of equity investment in country $i$ by residents of country $j$ based on inflation-adjusted annualized 10-year average dividend returns taking into account withholding taxes in country $i$	IBFD, own computation from MSCI indices.
$Effective\ yield_{ijt}^{int}$	Amount in US dollars paid in interest taxes per 100 US dollars of debt investment in country $i$ by residents of country $j$ based on inflation-adjusted annualized 10-year average interest rates taking into account withholding taxes in country $i$	IBFD, own computation from MSCI indices
$\Delta Effective\ yield_{ijt}$	Difference between the equally weighted sum of the inflation-adjusted equity tax yields, $Yield_{ijt}^{cg}$ and $Effective\ yield_{ijt}^{div}$ , and the inflation-adjusted interest tax yield including withholding taxation, $Effective\ yield_{ijt}^{int}$	IBFD, own computation from MSCI indices

<i>GDP per capita<sub>i</sub></i>	Logarithm of real GDP per capita in US dollars in 2005 prices in country <i>i</i>	WDI
<i>Inflation<sub>i</sub></i>	Annual percentage change in average consumer prices in country <i>i</i>	WDI
<i>Stock market growth<sub>i</sub></i>	Percentage change in the stock market index in US dollars from Standard & Poor's Global Equity Indices and Standard & Poor's Frontier Broad Market Indices in country <i>i</i> . Missing values have been interpolated using the average sample trend	
<i>Interest rate<sub>i</sub></i>	Lending interest rate in country <i>i</i> . Missing values are extrapolated using the trend in government bond yields and interest rates on deposits	IMF
<i>Government efficiency<sub>i</sub></i>	Index of government effectiveness ranging from -2.5 (very ineffective) to 2.5 (very effective) in country <i>i</i>	WGI
<i>Elderly share<sub>i</sub></i>	Percent of the total population that is older than 65 in country <i>i</i>	WDI
<i>Corporate tax<sub>i</sub></i>	Corporate income tax rate in percentage points in country <i>i</i>	IBFD
<i>PE</i>	Demeaned adjusted price-to-earnings ratio	Datastream
<i>Visits<sub>ijt</sub></i>	Demeaned percent of total foreign visits of residents of country <i>i</i> and country <i>j</i> in year <i>t</i> with one of the two countries as the destination	UNWTO
<i>Distance<sub>ij</sub></i>	Demeaned logarithm of the distance between the two most populous cities in countries <i>i</i> and <i>j</i>	Mayer and Zignago (2005)
<i>Audit quality<sub>it</sub></i>	Strength of auditing and reporting standards ranging from 1 (extremely weak) to 7 (extremely strong)	World Economic Forum

---

**Table 1: Foreign holdings of equity and debt**

This table reports average annual foreign holdings by individual holder country. Equity and Debt are reported in billion \$US and Share is the share of equity in total foreign holdings.

	Equity	Debt	Share
Australia	195.573	107.066	67.762
Austria	72.304	220.433	24.570
Belgium	216.942	386.805	35.879
Bulgaria	0.457	2.232	13.502
Canada	528.439	136.246	80.605
Chile	54.775	18.101	75.560
Cyprus	3.171	19.478	18.652
Czech Republic	8.407	12.377	38.547
Denmark	119.979	135.844	46.031
Estonia	1.664	2.509	34.054
Finland	93.218	120.804	41.143
France	541.468	1551.075	25.909
Germany	670.317	1318.605	34.810
Greece	9.531	69.87	14.170
Iceland	6.439	2.679	75.952
Ireland	478.906	1004.815	31.415
Israel	24.37	18.806	46.636
Italy	442.342	488.349	46.886
Japan	580.305	1904.857	22.233
Latvia	0.945	2.943	34.086
Lithuania	1.921	2.232	46.718
Malta	0.817	10.032	8.676
Netherlands	520.773	622.543	45.287
New Zealand	17.292	5.624	71.860
Norway	291.751	264.649	48.071
Poland	5.503	4.325	43.487
Portugal	28.373	109.992	19.973
Romania	0.604	0.761	43.937
Slovak Republic	1.143	12.174	13.408
Slovenia	3.164	10.765	22.654
South Korea	99.446	43.704	69.615
Spain	118.599	304.845	28.181
Sweden	258.554	117.994	67.985
Switzerland	389.791	462.479	45.720
Turkey	0.215	1.271	15.212
United Kingdom	876.017	1275.83	39.764
United States	4081.336	1775.916	69.075

**Table 2: Summary statistics**

This table provides summary statistics. *Share* is the share of equity in total holdings bilaterally in percentage points. *Equity* is the log of equity holdings on a bilateral basis. *Debt* is the log of debt holdings on a bilateral basis.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ .  $Effective\ tax^{div}$  is tax rate on dividends taking into account withholding taxation bilaterally in percentage points.  $Effective\ tax^{int}$  is the tax rate on interest income taking into account withholding taxation bilaterally in percentage points.  $\Delta Effective\ tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Effective\ tax^{div}$ , and the interest income tax rate,  $Effective\ tax^{int}$ , bilaterally in percentage points.  $Yield^{cg}$  is the amount in US dollars paid in capital gains taxes per 100 US dollars of equity investment based on inflation-adjusted annualized geometric 10-year average price returns bilaterally.  $Yield^{div}$  is the amount in US dollars paid in dividend taxes per 100 US dollars of equity investment based on inflation-adjusted annualized arithmetic 10-year average dividend returns bilaterally.  $Yield^{int}$  is the amount in US dollars paid in interest taxes per 100 US dollars of debt investment based on inflation-adjusted annualized arithmetic 10-year average interest rates bilaterally.  $\Delta Yield$  is the difference between the equally weighted sum of the inflation-adjusted capital gains and dividends tax yields,  $Yield^{cg}$  and  $Yield^{div}$ , and the interest income tax yield,  $Yield^{int}$ .  $Effective\ yield^{div}$  is the amount in US dollars paid in dividend taxes including withholding taxes per 100 US dollars of equity investment based on inflation-adjusted annualized arithmetic 10-year average dividend returns bilaterally.  $Effective\ yield^{int}$  is the amount in US dollars paid in interest taxes including withholding taxes per 100 US dollars of debt investment based on inflation-adjusted annualized 10-year average interest rates bilaterally.  $\Delta Effective\ yield$  is the difference between the equally weighted sum of the inflation-adjusted capital gains and dividends tax yields,  $Yield^{cg}$  and  $Effective\ yield^{div}$ , and the interest income tax yield,  $Effective\ yield^{int}$ . *GDP per capita* is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country. *Inflation* is the annual percentage change in average consumer prices in the holder country. *Stock market growth* is the percentage change in the stock market index in US dollars in the holder country. *Government efficiency* is an index of government effectiveness in the holder country. *Elderly share* is the percent of the total population that is older than 65 in the holder country. *Corporate tax* is the corporate income tax rate in percentage points in the holder country. *PE* is the demeaned adjusted price-to-earnings ratio. *Visits* is the demeaned percent of total foreign visits between holder and issuer countries with of the two countries as the destination. *Ownership* is the FPI of two countries in each other's stock markets scaled by the sum of total stock market capitalization in both countries. *Distance* is the demeaned logarithm of the distance between the two most populous cities of holder and issuer country. *Audit quality* is the demeaned measure of audit quality strength.

	N	Mean	SD	Min	p5	p50	p95	Max
<i>Share</i>	34,942	41.796	38.832	0.000	0.000	30.492	100.000	100.000
<i>Equity</i>	29,434	5.448	31.476	0.000	0.000	0.058	20.285	978.137
<i>Debt</i>	31,565	5.924	29.951	0.000	0.001	0.091	24.282	977.169
<i>Log Equity</i>	29,434	17.722	3.917	-5.105	11.050	17.872	23.733	27.609
<i>Log Debt</i>	31,565	18.420	3.280	-2.619	13.189	18.326	23.913	27.608
$Tax^{cg}$	34,942	14.661	13.527	0.000	0.000	15.000	42.000	60.500
$Tax^{div}$	34,942	27.193	14.466	0.000	0.000	25.292	50.000	60.534
$Tax^{int}$	34,942	26.793	15.589	0.000	0.000	25.000	51.170	62.001
$\Delta Tax$	34,942	-5.866	11.799	-38.378	-25.223	-2.500	11.000	19.000
$Effective\ tax^{div}$	32,655	29.229	12.568	0.000	10.000	26.380	50.000	60.534
$Effective\ tax^{int}$	32,655	28.204	14.762	0.000	0.000	26.375	51.433	62.001
$\Delta Effective\ tax$	32,655	-6.231	11.881	-38.378	-25.223	-2.500	11.000	34.000
$Yield^{cg}$	16,519	0.556	1.064	0.000	0.000	0.000	2.721	13.159
$Yield^{div}$	16,519	0.684	0.437	0.000	0.000	0.635	1.475	3.093
$Yield^{int}$	16,519	2.106	2.860	0.000	0.000	1.352	6.297	44.073
$\Delta Yield$	16,519	-0.502	2.085	-27.829	-3.356	-0.126	1.511	8.933
$Effective\ yield^{div}$	16,490	0.725	0.404	0.000	0.233	0.653	1.475	3.093
$Effective\ yield^{int}$	16,490	2.213	2.910	0.000	0.100	1.419	6.696	44.073

	N	Mean	SD	Min	p5	p50	p95	Max
<i>ΔEffective yield</i>	16,490	-0.528	2.146	-27.829	-3.523	-0.162	1.556	8.933
<i>GDP per capita</i>	33,514	10.492	0.546	8.340	9.391	10.663	11.226	11.425
<i>Inflation</i>	33,514	2.016	2.172	-4.480	-0.481	1.956	4.492	54.400
<i>Stock market growth</i>	33,514	8.309	35.482	-192.337	-49.040	8.994	57.533	207.186
<i>Interest rate</i>	33,514	5.163	3.803	0.370	1.143	4.458	10.258	74.699
<i>Government efficiency</i>	33,514	1.451	0.511	-0.057	0.381	1.571	2.097	2.354
<i>Elderly share</i>	33,514	15.949	3.406	6.227	9.929	16.598	20.807	26.015
<i>Corporate tax</i>	33,514	27.521	8.091	10.000	12.500	27.500	39.500	42.100
<i>PE (demeaned)</i>	20,382	-0.000	6.378	-14.233	-8.233	-0.833	10.367	50.567
<i>Visits (demeaned)</i>	28,914	0.000	3.575	-1.146	-1.143	-0.976	3.596	52.416
<i>Visits</i>	28,914	0.011	0.036	0.000	0.000	0.002	0.047	0.536
<i>Distance (demeaned)</i>	32,860	0.000	1.018	-4.232	-1.838	0.344	1.248	1.565
<i>Distance</i>	32,860	8.320	1.018	4.088	6.482	8.664	9.568	9.885
<i>Audit quality (demeaned)</i>	30,020	0.000	0.811	-2.894	-1.333	-0.014	1.173	1.629
<i>Audit quality</i>	30,020	5.098	0.811	2.204	3.765	5.083	6.270	6.727

**Table 3: The equity share and capital income taxation**

The dependent variable is *Share* which is the share of equity in total holdings bilaterally in percentage points.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ .  $GDP\ per\ capita$  is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country.  $Inflation$  is the annual percentage change in average consumer prices in the holder country.  $Stock\ market\ growth$  is the percentage change in the stock market index in US dollars in the holder country.  $Government\ efficiency$  is an index of government effectiveness in the holder country.  $Elderly\ share$  is the percent of the total population that is older than 65 in the holder country.  $Corporate\ tax$  is the corporate income tax rate in percentage points in the holder country. Bilateral country and issuer country fixed effects are included. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$Tax^{cg}$	-0.212*** (0.035)			-0.196*** (0.036)		-0.139*** (0.035)			-0.126*** (0.036)	
$Tax^{div}$		-0.102*** (0.035)		-0.104*** (0.037)			-0.098*** (0.035)		-0.141*** (0.038)	
$Tax^{int}$			0.103*** (0.033)	0.118*** (0.034)				0.130*** (0.034)	0.165*** (0.037)	
$\Delta Tax$					-0.178*** (0.028)					-0.190*** (0.030)
$GDP\ per\ capita$						22.851*** (5.092)	24.924*** (5.059)	27.425*** (5.147)	26.169*** (5.162)	27.130*** (5.081)
$Inflation$						-0.070 (0.133)	-0.075 (0.131)	-0.077 (0.137)	0.049 (0.132)	0.025 (0.135)
$Stock\ market\ growth$						-0.032*** (0.008)	-0.032*** (0.008)	-0.031*** (0.008)	-0.030*** (0.008)	-0.030*** (0.008)
$Interest\ rate$						0.386*** (0.090)	0.393*** (0.090)	0.389*** (0.090)	0.283*** (0.090)	0.302*** (0.090)
$Government\ efficiency$						7.039*** (1.361)	7.328*** (1.367)	6.634*** (1.385)	6.622*** (1.373)	6.465*** (1.376)
$Elderly\ share$						0.552 (0.439)	0.590 (0.445)	0.585 (0.444)	0.770* (0.447)	0.736* (0.444)
$Corporate\ tax$						0.097 (0.084)	0.116 (0.084)	0.032 (0.085)	-0.028 (0.086)	-0.037 (0.086)
Observations	34,942	34,942	34,942	34,942	34,942	33,514	33,514	33,514	33,514	33,514
Pairs	3,633	3,633	3,633	3,633	3,633	3,452	3,452	3,452	3,452	3,452
Adj. $R^2$	0.731	0.731	0.731	0.732	0.731	0.733	0.733	0.733	0.734	0.734

**Table 4: The equity share and alternative tax rate and tax burden measures**

The dependent variable is *Share* which is the share of equity in total holdings bilaterally in percentage points.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Effective\ tax^{div}$  is tax rate on dividends taking into account withholding taxation bilaterally in percentage points.  $Effective\ tax^{int}$  is the tax rate on interest income taking into account withholding taxation bilaterally in percentage points.  $\Delta Effective\ tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Effective\ tax^{div}$ , and the interest income tax rate,  $Effective\ tax^{int}$ , bilaterally in percentage points.  $Yield^{cg}$  is the amount in US dollars paid in capital gains taxes per 100 US dollars of equity investment based on inflation-adjusted annualized geometric 10-year average price returns bilaterally.  $Yield^{div}$  is the amount in US dollars paid in dividend taxes per 100 US dollars of equity investment based on inflation-adjusted annualized arithmetic 10-year average dividend returns bilaterally.  $Yield^{int}$  is the amount in US dollars paid in interest taxes per 100 US dollars of debt investment based on inflation-adjusted annualized 10-year average interest rates bilaterally.  $\Delta Yield$  is the difference between the equally weighted sum of the inflation-adjusted capital gains and dividends tax yields,  $Yield^{cg}$  and  $Yield^{div}$ , and the interest income tax yield,  $Yield^{int}$ .  $Effective\ yield^{div}$  is the amount in US dollars paid in dividend taxes including withholding taxes per 100 US dollars of equity investment based on inflation-adjusted annualized arithmetic 10-year average dividend returns bilaterally.  $Effective\ yield^{int}$  is the amount in US dollars paid in interest taxes including withholding taxes per 100 US dollars of debt investment based on inflation-adjusted annualized 10-year average interest rates bilaterally.  $\Delta Effective\ yield$  is the difference between the equally weighted sum of the inflation-adjusted capital gains and dividends tax yields,  $Yield^{cg}$  and  $Effective\ yield^{div}$ , and the interest income tax yield,  $Effective\ yield^{int}$ .  $PE$  is the demeaned adjusted price-to-earnings ratio.  $GDP\ per\ capita$  is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country.  $Inflation$  is the annual percentage change in average consumer prices in the holder country.  $Stock\ market\ growth$  is the percentage change in the stock market index in US dollars in the holder country.  $Government\ efficiency$  is an index of government effectiveness in the holder country.  $Elderly\ share$  is the percent of the total population that is older than 65 in the holder country.  $Corporate\ tax$  is the corporate income tax rate in percentage points in the holder country. Bilateral country and issuer country fixed effects are included. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

	Withholding taxes		Tax yields		Tax yields including withholding taxes		PE Ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Tax^{cg}$	-0.132*** (0.036)						-0.078 (0.057)
$Effective\ tax^{div}$	-0.131*** (0.040)						-0.193*** (0.069)
$Effective\ tax^{int}$	0.157*** (0.037)						0.102* (0.060)
$\Delta Effective\ tax$		-0.186*** (0.031)					
$Yield^{cg}$			-1.320*** (0.409)		-1.297*** (0.409)		
$Yield^{div}$			-4.870*** (1.608)				
$Yield^{int}$			1.051*** (0.250)				
$\Delta Yield$				-1.271*** (0.293)			
$Effective\ yield^{div}$					-4.727*** (1.760)		
$Effective\ yield^{int}$					1.290*** (0.286)		
$\Delta Effective\ yield$						-1.464*** (0.327)	
$Tax^{cg} \times PE$							-0.005* (0.003)
$Effective\ tax^{div} \times PE$							0.001 (0.003)
$Effective\ tax^{int} \times PE$							0.002 (0.003)
$GDP\ per\ capita$	28.536*** (5.179)	29.689*** (5.093)	27.026*** (6.191)	27.359*** (6.198)	27.957*** (6.183)	28.212*** (6.186)	27.695*** (5.763)
$Inflation$	-0.016	-0.043	-0.091	-0.183	-0.104	-0.190	0.045

	(0.130)	(0.133)	(0.141)	(0.145)	(0.140)	(0.145)	(0.133)
<i>Stock market growth</i>	-0.034***	-0.034***	-0.029***	-0.030***	-0.029***	-0.030***	-0.032***
	(0.008)	(0.008)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
<i>Interest rate</i>	0.306***	0.324***	0.263**	0.312***	0.278***	0.325***	0.209**
	(0.090)	(0.090)	(0.105)	(0.106)	(0.105)	(0.106)	(0.096)
<i>Government efficiency</i>	6.783***	6.654***	7.805***	7.842***	7.825***	7.920***	7.713***
	(1.389)	(1.394)	(1.671)	(1.685)	(1.671)	(1.681)	(1.591)
<i>Elderly share</i>	0.747*	0.721	0.861	0.677	0.847	0.676	0.460
	(0.454)	(0.451)	(0.574)	(0.574)	(0.572)	(0.570)	(0.533)
<i>Corporate tax</i>	-0.013	-0.020	-0.048	-0.063	-0.054	-0.057	-0.106
	(0.087)	(0.087)	(0.104)	(0.104)	(0.104)	(0.104)	(0.098)
Observations	32,655	32,655	16,519	16,519	16,490	16,490	20,382
Pairs	3,377	3,377	1,493	1,493	1,490	1,490	1,797
Adj. $R^2$	0.734	0.734	0.740	0.740	0.740	0.740	0.730

**Table 5: The equity share and capital income taxation: robustness checks**

**Panel A**

The dependent variable is *Share* which is the share of equity in total holdings bilaterally in percentage points.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ .  $GDP\ per\ capita$  is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country.  $Inflation$  is the annual percentage change in average consumer prices in the holder country.  $Stock\ market\ growth$  is the percentage change in the stock market index in US dollars in the holder country.  $Government\ efficiency$  is an index of government effectiveness in the holder country.  $Elderly\ share$  is the percent of the total population that is older than 65 in the holder country.  $Corporate\ tax$  is the corporate income tax rate in percentage points in the holder country. Regressions 1 and 2 exclude observations for the years 2008–2009. Regressions 3 and 4 exclude observations where either the holder country or the issuer country is a tax haven. Regressions 5 and 6 exclude observations for holder countries where the share of foreign ownership of the domestic stock market is below the 25% quantile. Regressions 7 and 8 are second stage instrumental variables (IV) estimates where first lags of the tax rate variables are used to instrument for the tax rate variables. Bilateral country and issuer country fixed effects are included. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

	Exclude financial crisis		No tax havens		Large foreign ownership		IV (second stage)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$Tax^{cg}$	-0.133*** (0.038)		-0.085** (0.040)		-0.179*** (0.039)		-0.095** (0.045)	
$Tax^{div}$	-0.185*** (0.041)		-0.225*** (0.043)		-0.027 (0.055)		-0.100* (0.060)	
$Tax^{int}$	0.177*** (0.039)		0.169*** (0.045)		0.208*** (0.040)		0.130*** (0.046)	
$\Delta Tax$		-0.207*** (0.033)		-0.188*** (0.035)		-0.230*** (0.034)		-0.146*** (0.037)
$GDP\ per\ capita$	27.403*** (5.321)	28.399*** (5.248)	43.958*** (5.917)	43.381*** (5.830)	48.694*** (7.461)	48.095*** (7.360)	24.646*** (5.464)	25.298*** (5.334)
$Inflation$	-0.074 (0.142)	-0.118 (0.145)	0.222 (0.156)	0.137 (0.161)	0.156 (0.170)	0.191 (0.171)	0.174 (0.140)	0.160 (0.142)
$Stock\ market\ growth$	-0.054*** (0.011)	-0.054*** (0.011)	0.006 (0.010)	0.003 (0.010)	-0.041*** (0.009)	-0.041*** (0.009)	-0.027*** (0.008)	-0.027*** (0.008)
$Interest\ rate$	0.171* (0.093)	0.204** (0.093)	0.295*** (0.103)	0.344*** (0.102)	0.683*** (0.136)	0.696*** (0.137)	0.418*** (0.095)	0.431*** (0.091)
$Government\ efficiency$	7.573*** (1.434)	7.377*** (1.438)	6.668*** (1.648)	6.441*** (1.646)	5.882*** (1.672)	5.831*** (1.669)	6.237*** (1.395)	6.091*** (1.381)
$Elderly\ share$	0.859* (0.449)	0.800* (0.448)	0.585 (0.494)	0.469 (0.485)	1.075* (0.637)	1.027 (0.644)	0.384 (0.473)	0.370 (0.467)
$Corporate\ tax$	-0.115 (0.092)	-0.127 (0.092)	-0.084 (0.104)	-0.076 (0.104)	0.030 (0.097)	0.004 (0.097)	0.056 (0.088)	0.050 (0.088)
Observations	28,890	28,890	22,303	22,303	24,473	24,473	31,738	31,738
Pairs	3,376	3,376	2,338	2,338	2,445	2,445	3,423	3,423
Adj. $R^2$	0.731	0.731	0.736	0.736	0.751	0.751	.	.

**Panel B**

The dependent variable is *Share* which is the share of equity in total holdings bilaterally in percentage points.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ . *GDP per capita* is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country. Inflation is the annual percentage change in average consumer prices in the holder country. Stock market growth is the percentage change in the stock market index in US dollars in the holder country. Government efficiency is an index of government effectiveness in the holder country. Elderly share is the percent of the total population that is older than 65 in the holder country. Corporate tax is the corporate income tax rate in percentage points in the holder country. Regressions 1 and 2 exclude investor countries where domestic pension funds hold more than 25% of FPI. Regressions 3 and 4 report results where the dependent variable has been adjusted for the involvement of pension funds by subtracting from the equity and debt holdings of each investor country the holdings reported for the sectors “Other Financial Corporations, Other” (2001-2012) and “Insurance Corporations and Pension Funds” (2013-2015). Bilateral country and issuer country fixed effects are included. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

	Excluding investors with large pension fund involvement in FPI		Adjusting equity share	
	(1)	(2)	(3)	(4)
$Tax^{cg}$	-0.101*** (0.036)		-0.178*** (0.037)	
$Tax^{div}$	-0.157*** (0.038)		-0.194*** (0.039)	
$Tax^{int}$	0.132*** (0.037)		0.214*** (0.037)	
$\Delta Tax$		-0.158*** (0.031)		-0.255*** (0.031)
<i>GDP per capita</i>	2.660 (5.915)	3.794 (5.884)	20.321*** (5.352)	21.884*** (5.260)
<i>Inflation</i>	0.063 (0.152)	-0.002 (0.156)	0.220* (0.133)	0.183 (0.137)
<i>Stock market growth</i>	-0.037*** (0.008)	-0.037*** (0.008)	-0.031*** (0.008)	-0.031*** (0.008)
<i>Interest rate</i>	0.029 (0.089)	0.072 (0.088)	0.077 (0.091)	0.106 (0.091)
<i>Government efficiency</i>	4.811*** (1.429)	4.558*** (1.432)	5.551*** (1.374)	5.325*** (1.381)
<i>Elderly share</i>	0.036 (0.442)	-0.038 (0.439)	1.565*** (0.446)	1.515*** (0.443)
<i>Corporate tax</i>	0.005 (0.087)	-0.001 (0.087)	-0.162* (0.090)	-0.177* (0.091)
Observations	27,406	27,406	33,014	33,014
Pairs	2,806	2,806	3,407	3,407
Adj. $R^2$	0.761	0.761	0.712	0.712

**Table 6: The equity share and capital income taxation: the role of familiarity**

The dependent variable is *Share* which is the share of equity in total holdings bilaterally in percentage points.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points. *Visits* is the demeaned percent of total foreign visits between holder and issuer countries with of the two countries as the destination. *Distance* is the demeaned logarithm of the distance between the two most populous cities in countries  $i$  and  $j$ . *Audit quality* is the demeaned measure of audit quality strength.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ . All regressions include bilateral country, holder country-time and issuer country-time fixed effects. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

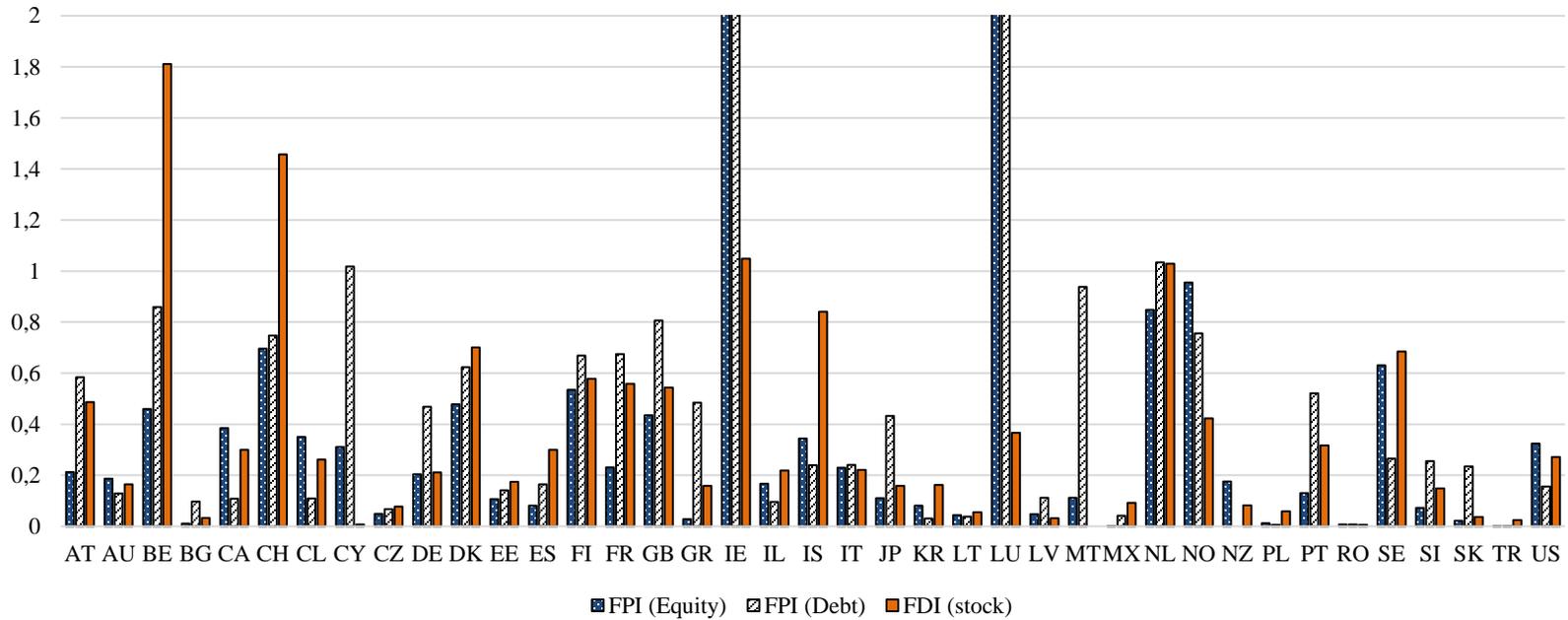
	Bilateral visits		Distance		Audit quality	
	(1)	(2)	(3)	(4)	(5)	(6)
$Tax^{cg} \times Visits$	0.001 (0.002)					
$Tax^{div} \times Visits$	0.002* (0.001)					
$Tax^{int} \times Visits$	-0.001 (0.001)					
$\Delta Tax \times Visits$		0.002 (0.001)				
$Tax^{cg} \times Distance$			-0.048 (0.030)			
$Tax^{div} \times Distance$			-0.089** (0.035)			
$Tax^{int} \times Distance$			0.020 (0.030)			
$\Delta Tax \times Distance$				-0.049** (0.023)		
$Tax^{cg} \times Audit\ quality$					-0.032 (0.038)	
$Tax^{div} \times Audit\ quality$					0.125*** (0.036)	
$Tax^{int} \times Audit\ quality$					-0.071** (0.033)	
$\Delta Tax \times Audit\ quality$						0.061** (0.031)
<i>Visits</i>	-0.062* (0.038)	-0.016 (0.019)				
Observations	31,022	31,022	32,860	32,860	30,020	30,020
Pairs	3,296	3,296	3,377	3,377	3,030	3,030
Adj. $R^2$	0.757	0.757	0.756	0.756	0.753	0.753

**Table 7: Foreign equity and debt investments and capital income taxation**

In regressions 1-5 the dependent variable is *Equity* which is the log of equity holdings on a bilateral basis. In regressions 6-10, the dependent variable is *Debt* which is the log of debt holdings on a bilateral basis.  $Tax^{cg}$  is the tax rate on capital gains in the holder country in percentage points.  $Tax^{div}$  is the tax rate on dividends in the holder country in year  $t$  in percentage points.  $Tax^{int}$  is the tax rate on interest income in the holder country in percentage points.  $\Delta Tax$  is the difference between the equally weighted sum of the capital gains and dividend tax rates,  $Tax^{cg}$  and  $Tax^{div}$ , and the interest income tax,  $Tax^{int}$ . *GDP per capita* is the logarithm of real GDP per capita in US dollars in 2005 prices in the holder country. *Inflation* is the annual percentage change in average consumer prices in the holder country. *Stock market growth* is the percentage change in the stock market index in US dollars in the holder country. *Government efficiency* is an index of government effectiveness in the holder country. *Elderly share* is the percent of the total population that is older than 65 in the holder country. *Corporate tax* is the corporate income tax rate in percentage points in the holder country. Bilateral country and issuer country fixed effects are included. Errors allow for clustering at the country pair level. \*\*\* denotes significance at 1%, \*\* denotes significance at 5%, and \* denotes significance at 10%.

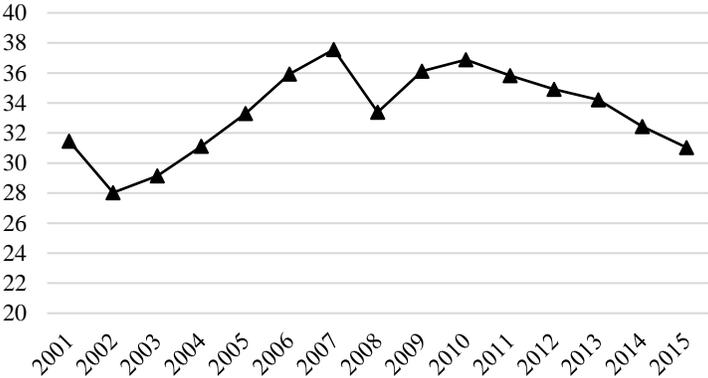
	(1)	(2)	Equity (3)	(4)	(5)	(6)	(7)	Debt (8)	(9)	(10)
$Tax^{cg}$	-0.020*** (0.002)			-0.020*** (0.002)		0.000 (0.002)			-0.001 (0.002)	
$Tax^{div}$		0.003 (0.002)		0.004* (0.002)			0.009*** (0.002)		0.012*** (0.002)	
$Tax^{int}$			0.004 (0.002)	0.003 (0.003)				-0.005** (0.002)	-0.008*** (0.002)	
$\Delta Tax$					-0.009*** (0.002)					0.007*** (0.002)
<i>GDP per capita</i>	5.780*** (0.339)	6.102*** (0.349)	6.166*** (0.357)	5.831*** (0.347)	6.192*** (0.349)	3.255*** (0.320)	3.252*** (0.318)	3.160*** (0.323)	3.084*** (0.325)	3.174*** (0.321)
<i>Inflation</i>	0.009 (0.008)	0.002 (0.008)	0.005 (0.008)	0.007 (0.008)	0.010 (0.008)	-0.008 (0.007)	-0.013* (0.007)	-0.009 (0.007)	-0.017** (0.007)	-0.013* (0.007)
<i>Stock market growth</i>	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.002*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
<i>Interest rate</i>	0.038*** (0.006)	0.044*** (0.006)	0.041*** (0.006)	0.039*** (0.006)	0.037*** (0.006)	0.011** (0.005)	0.014*** (0.005)	0.013*** (0.005)	0.018*** (0.005)	0.016*** (0.005)
<i>Government efficiency</i>	0.372*** (0.088)	0.380*** (0.090)	0.371*** (0.092)	0.353*** (0.090)	0.354*** (0.091)	0.177** (0.081)	0.165** (0.081)	0.194** (0.082)	0.187** (0.082)	0.201** (0.082)
<i>Elderly share</i>	-0.063** (0.028)	-0.076*** (0.029)	-0.071** (0.029)	-0.066** (0.029)	-0.063** (0.029)	-0.046* (0.024)	-0.055** (0.024)	-0.047* (0.024)	-0.060** (0.025)	-0.054** (0.025)
<i>Corporate tax</i>	0.031*** (0.005)	0.034*** (0.005)	0.031*** (0.006)	0.029*** (0.006)	0.027*** (0.006)	0.027*** (0.005)	0.028*** (0.005)	0.031*** (0.005)	0.034*** (0.005)	0.033*** (0.005)
Observations	29,434	29,434	29,434	29,434	29,434	31,565	31,565	31,565	31,565	31,565
Pairs	2,988	2,988	2,988	2,988	2,988	3,202	3,202	3,202	3,202	3,202
Adj. $R^2$	0.912	0.912	0.912	0.912	0.912	0.889	0.889	0.889	0.890	0.889

**Figure 1: Foreign portfolio and direct investment as a share of GDP in 2012**



The figure displays foreign portfolio investment(FPI) in equity and and debt, and foreign direct investment (FDI) as share of GDP (in current USD). Ireland: FPI (equity) is 2.86 and FPI (debt) is 5.65. Luxembourg: FPI (equity) is 22.6 and FPI (debt) is 33.25.

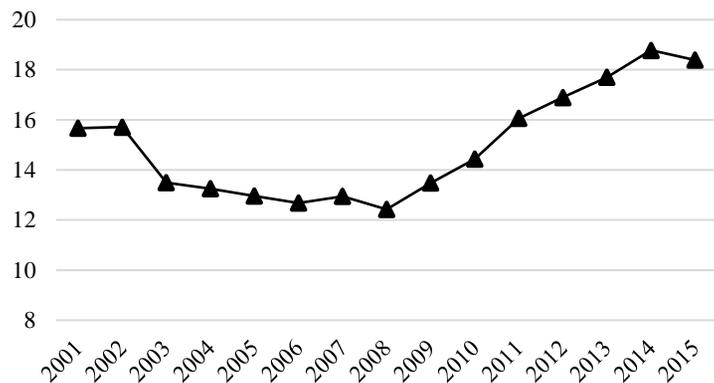
**Figure 2: The equity share during the sample period**



The figure displays the average equity share during the sample period.

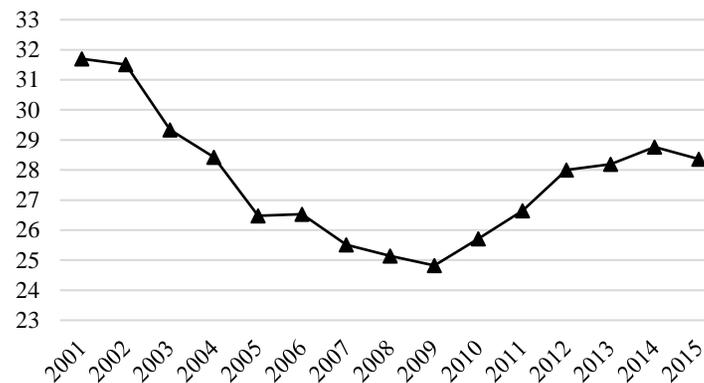
**Figure 3: The tax rates during the sample period**

A: Capital gains tax rate



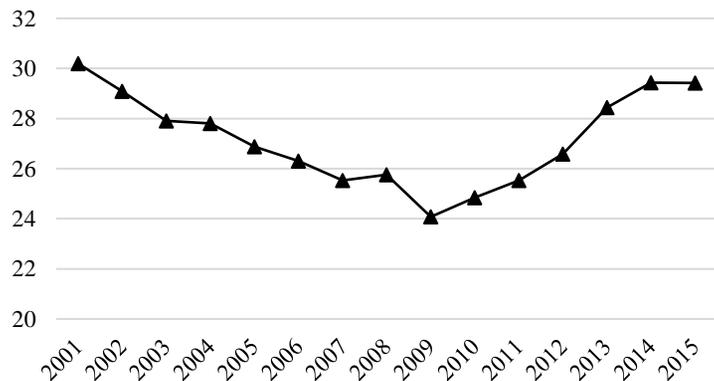
The figure displays the average capital gains tax rate during the sample period.

B: Dividend tax rate



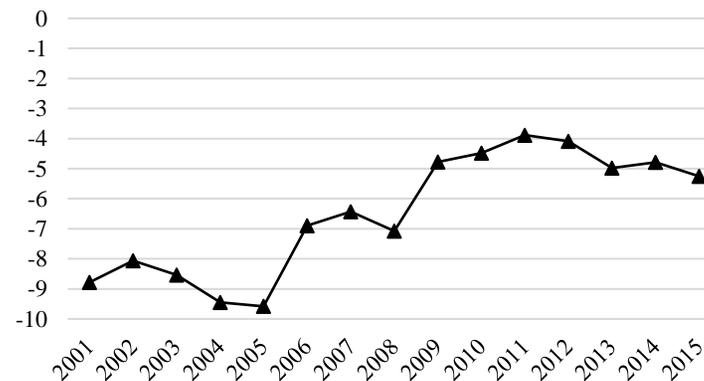
The figure displays the average dividend tax rate during the sample period.

C: Interest tax rate



The figure displays the interest tax rate during the sample period.

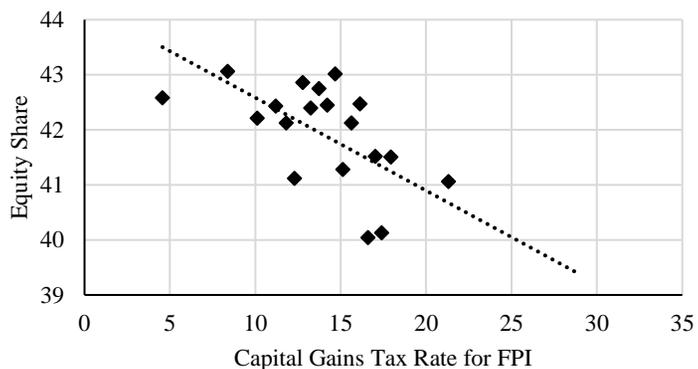
D: Tax rate difference



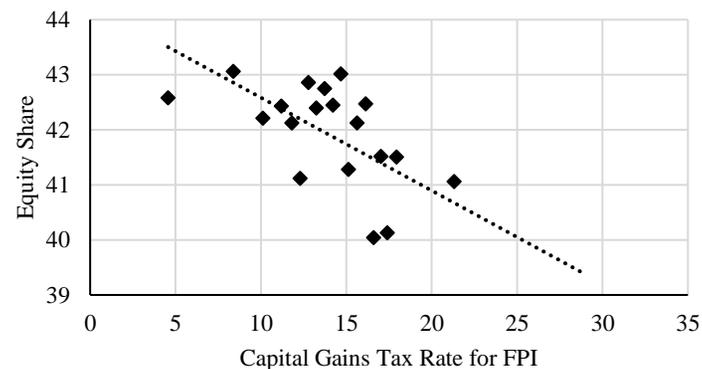
The figure displays the tax difference during the sample period.

**Figure 4: The tax rates during the sample period**

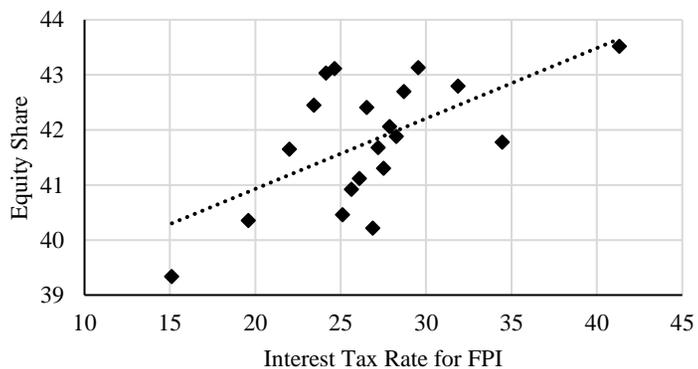
A: Capital gains tax rate



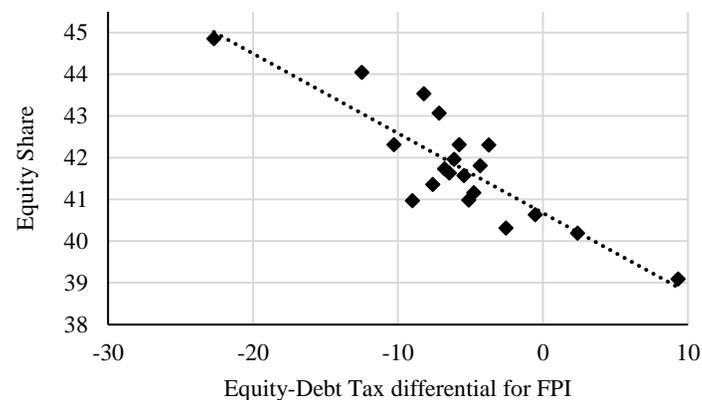
B: Dividend tax rate



C: Interest tax rate



D: Tax rate difference



The figure displays a binned scatterplot and the regression line of a regression of the equity share on various tax policy measures and on bilateral country and issuer country  $\times$  time fixed effects. In Figure 4a, the variable of interest is the capital gains tax rate, while it is the dividend tax rate in Figure 4b, the interest tax rate in Figure 4c and the equity-debt tax difference in Figure 4c. The binned scatterplot is generated by binning observations into 20 equal-sized groups according to values of the capital gains tax rate. The scatterplot indicates the mean of the capital gains rate and the equity share within each bin and is thereby informative about patterns of residuals across the bins.

# Online Appendix for Taxation and the External Wealth of Nations: Evidence from Bilateral Portfolio Holdings

Harry Huizinga, Maximilian Todtenhaupt, Johannes Voget and Wolf Wagner

## OA.1 Computing returns on investment

To compute the annualized capital gains and dividend return in the capital market of a country  $i$  in year  $t$ ,  $R_{it}^{cg}$  and  $R_{it}^{div}$ , we use the monthly gross stock return index,  $RI_{i,m}$ , and the corresponding price index,  $PI_{i,m}$ , for that country which are based on the MSCI country indexes. The monthly capital gains rate is computed as  $CG_{i,m} = \frac{PI_{i,m} - PI_{i,m-1}}{PI_{i,m-1}}$ , and the monthly dividend return is given by  $D_{i,m} = RI_{i,m} - CG_{i,m}$ . We then compute the 10-year dividend return by adding up the monthly dividend returns of the last 10 year:  $D_{it}^{10y} = \sum_{z=t-10}^t \sum_{m=1}^{12} D_{i,z,m}$ . The 10-year capital gain rate is obtained by computing the 10-year gain in December:  $CG_{it}^{10y} = \frac{PI_{i,12,t} - PI_{i,12,t-10}}{PI_{i,12,t-10}}$ . These figures are then annualized and adjusted for inflation using the inflation rate of consumer prices to arrive at  $R_{it}^{cg}$  and  $R_{it}^{div}$ , respectively. The return on interest income,  $R_{it}^{int}$ , in the capital market of a country  $i$  in year  $t$  is approximated by the real interest rate on 10-year government bonds reported by the IMF and the Organization for Economic Cooperation and Development (OECD) (with inflation adjustment using the consumer price deflator). Table OA.1 reports the average annualized dividend and capital gains returns as well as the returns on debt investment for each country in the estimation sample.

**Table OA.1: Equity returns and interest rates in issuer countries**

This table reports the annualized 10-year capital gains, dividend and interest returns in issuer countries during the sample period. The returns are expressed in US dollars and in percent using the issuer country consumer price deflator. *Source:* MSCI Country Indexes, World Development Indicators, own computation.

	Capital gains return	Dividend return	Interest rate
Argentina	6.685	2.118	-0.778
Australia	2.272	3.389	3.806
Austria	0.294	2.069	1.482
Bahrain	-24.219	4.225	16.031
Belgium	-0.676	3.016	5.205
Brazil	5.104	3.455	34.577
Bulgaria	-17.519	1.723	5.130
Canada	4.524	1.932	1.925
Chile	4.292	2.440	3.059
China	0.829	2.336	1.933
Colombia	12.402	3.233	8.071
Croatia	-1.787	3.810	8.504
Czech Republic	6.832	3.507	4.008
Denmark	6.889	1.610	1.236
Egypt	11.880	3.363	1.032
Estonia	-2.858	2.594	
Finland	4.403	2.574	1.236
France	1.789	2.252	4.775
Germany	1.981	2.182	5.008
Greece	-7.599	2.579	11.815
Hong Kong	2.911	2.892	4.952
Hungary	2.167	1.823	4.498
India	6.181	1.549	4.790
Indonesia	4.388	2.526	4.724
Ireland	-5.278	2.216	2.215
Israel	2.086	1.990	3.158
Italy	-1.622	2.986	3.480
Japan	-1.244	1.201	2.272
Jordan	-1.375	2.369	3.607
Kazakhstan	-13.537	3.880	.
Kenya	1.906	3.463	8.276
Kuwait	-11.120	3.559	40.860
Lebanon	.	.	4.154
Luxembourg	6.122	.	4.298
Malaysia	2.091	2.325	2.510
Mauritius	9.007	3.293	6.480
Mexico	7.703	1.762	1.642
Morocco	3.879	3.191	10.620
Netherlands	0.472	2.754	1.016
New Zealand	-2.165	4.366	2.982
Nigeria	-2.819	3.170	10.775
Norway	4.003	2.815	0.651
Oman	-7.400	3.683	29.253
Pakistan	0.269	5.422	3.121
Philippines	-1.527	1.970	4.273
Poland	0.431	2.375	3.599
Portugal	-2.311	2.922	6.169
Qatar	-6.198	3.583	35.458
Romania	-3.103	2.428	4.076
Russia	-2.325	1.753	-0.619
Singapore	1.267	2.426	4.217
Slovenia	-2.237	1.940	4.245
South Korea	5.935	1.595	3.517

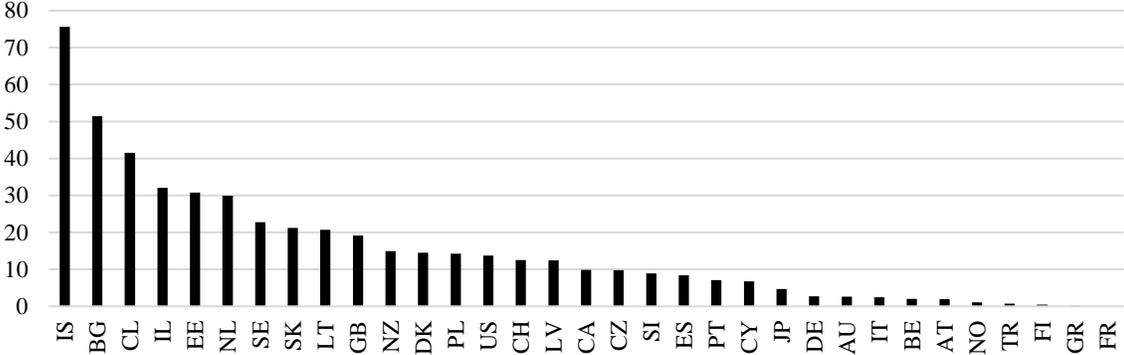
	Capital gains return	Dividend return	Interest rate
Spain	2.500	3.044	1.797
Sri Lanka	1.905	2.710	2.784
Sweden	5.801	2.372	1.489
Switzerland	3.446	1.814	2.463
Taiwan	-0.081	2.226	.
Thailand	0.147	2.662	2.709
Tunisia	3.851	2.458	.
Turkey	0.441	2.255	9.901
United Kingdom	0.300	2.903	0.619
United States	2.121	1.720	2.607
Sample mean	2.280	1.798	2.689

## OA.2 The share of FPI by pension funds in total FPI

To assess the importance of pension funds registered in a particular investor country for the FPI of that country, we gather information on the FPI of pension funds and relate it to the overall FPI of the country. The latter is obtained from the CPIS database provided by the IMF. For a few countries, the FPI of pension funds is directly available from the OECD Institutional Investor Statistics (NZ, CH, CA). For the remaining countries, we proceed as follows. First, we extract the total amount of FPI reported by the sector “Insurance corporations and pension funds (IPF)” for each individual investor country from the CPIS database. We then obtain information of the relative size of financial assets managed by insurance corporations and pension funds in each country from the OECD Institutional Investor Statistics (for IS, CL, SE, GB, DK, PL, US, CZ, PT, JP, DE, AU, NO, TR, GR), the ECB (for EE, NL, SK, LT, LV, SI, ES, CY, IT, BE, AT, FI) and national central banks (for BG). We assign a share of the IPF sector’s total FPI to pension funds that is equal to the share of financial assets managed by pension funds in total financial assets managed by the IPF sector in that country. With one exception due to data availability, all data is obtained for

2015.<sup>24</sup> In France, very few autonomous pension funds exist so their share in FPI is set to zero. This is consistent with reporting for France in the OECD Institutional Investor Statistics. Figure OA.1 displays the data on the share of pension funds in overall national FPI.

**Figure OA.1: FPI of pension funds as a share of total foreign portfolio investment (%)**



The figure displays the approximated percentage of foreign portfolio investment that is managed by pension funds in individual countries. The data refers to 2015, with the exception of Australia, where underlying data for FPI of pension funds is obtained for 2012. *Source:* IMF Coordinated Portfolio Investment Survey (CPIS), OECD Institutional Investor Statistics, European Central Bank (ECB), national central banks, own computations.

<sup>24</sup> The amount of assets under management of insurance corporations and pension funds, respectively, for Australia is obtained for 2012.