

Does Fair Value Taxation Affect Banks' Investment Portfolios and Risk Taking?

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ABSTRACT: We analyze the implications of including fair value changes in taxable income on banks' asset allocation and risk taking. Exploiting variation in fair value tax regimes and tax rates across 27 countries from 2010 to 2018, we find that fair value taxation is associated with banks' investment portfolio choices and risk taking. On average, banks hold fewer fair-value taxed securities when fair value taxes increase. This effect is pronounced for savings and cooperative banks. Further, the effect is pronounced for banks that report under local GAAP for tax purposes. Our results also suggest that banks instead invest more in securities that are not taxed at fair value. Lastly, we provide evidence that the risk taking of savings and cooperative banks is positively associated with the tax rate when subject to fair value taxes. In addition, banks that report under local GAAP increase risk taking when subject to fair value taxes.

Data Availability: Data are available from the sources cited in the text.

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I. INTRODUCTION

In this paper, we analyze the implications of using fair value accounting to define taxable income. Although the inclusion of fair values in book income provides value-relevant information to users of financial statements (Barth, Beaver, and Landsman 2001; Song, Thomas, and Yi 2010), taxable income typically relies on reliable and verifiable measurements such as historical cost and lower of cost or market (Blaufus and Jacob 2018). Taxable income therefore usually excludes unrealized gains and (partly) unrealized losses resulting in costly book-tax differences. To eliminate these costly book-tax differences, several countries, such as Germany or Hong Kong,¹ have adopted fair value tax regimes for financial institutions including any fair value changes of held-for-trading (HFT) assets in both taxable and book income. Fair value tax regimes, however, can have significant effects on banks' liquidity when unrealized gains are fully subjected to tax and unrealized losses are fully tax deductible. In this study, we investigate whether the inclusion of unrealized gains and losses in taxable income (fair value taxation) is associated with banks' investment portfolios and risk taking.

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¹ For example, Germany and Hong Kong introduced fair value tax regimes as of 2009 and 2018, respectively, to reduce banks' compliance costs (Deutscher Bundestag 2008; EY 2018).

Understanding whether fair value taxes affect banks' positions in fair value assets and their risk taking is critical because banks hold significant amounts of fair value assets,² which may introduce procyclicality in banks' balance sheets (European Central Bank 2004; International Monetary Fund 2008; Laux and Leuz 2010; Xie 2016). Fair value taxes can therefore elicit economically meaningful effects. The effects of fair value taxes are also of wider interest outside the financial industry. Some countries (e.g., Cyprus or Slovenia) already define taxable income based on IFRS and tax unrealized gains and losses of nonfinancial firms. This approach is also debated by the OECD within its proposal for a global corporate income tax reform and minimum taxation, which is currently implemented by the European Union (EU). Accordingly, minimum taxation (Pillar II) can either fully include or fully exclude unrealized gains and losses from fair values via profit or loss (OECD 2021, paragraph 3.5.2.).

The theoretical effect of fair value taxes on banks' investment portfolios is ambiguous. Although fair value tax regimes can reduce compliance costs via higher book-tax conformity, the inclusion of unrealized gains and losses can also have significant economic implications. Taxing the unrealized gains of an asset increases cash tax payments without corresponding cash inflows from selling the asset, resulting in a net cash outflow and reduced liquidity. Since liquidity is a key concern for banks, fair value taxes can impose economic costs on them. At the other end of the spectrum, full inclusion of unrealized losses in taxable income can result in a reduction of cash tax payments and a net cash inflow.³ This provides banks with incentives to hold value-decreasing securities under fair value taxation relative to when the deduction of temporary unrealized losses is prohibited or restricted. Hence, banks reduce their holdings in HFT securities taxed at fair value if they perceive fair value taxes as net costly. If, however, the benefits of fair value taxes outweigh their economic costs, banks have incentives to increase positions in HFT securities taxed at fair value.

We exploit cross-country variation in fair value tax regimes and intertemporal variation in bank tax rates to analyze the effects of fair value taxes on banks' investment portfolios and risk taking, using a sample of 27 countries from 2010 to 2018. We therefore compare the sensitivity of banks' HFT securities and risk taking to the bank tax rate in countries with and without a fair value tax regime. We label countries as fair value tax regime adopters when they include both unrealized gains *and* unrealized losses of HFT securities in taxable income.

Our results suggest that banks' investment portfolios are sensitive to fair value taxes. First, HFT securities of banks subject to fair value taxes decrease by about 1.9 percentage points of total assets for a one-standard-deviation increase in the tax rate relative to banks not subject to fair value taxes. Correspondingly, securities not subject to fair value taxation increase by about 2.2 percentage points of total assets for a one-standard-deviation increase in the tax rate. Our results are robust to excluding each country individually from our sample and to limiting the sample to banks located in EU countries that are subject to a harmonized regulatory environment. Taken together, our results point to a potential substitution away from securities taxed at fair value toward other securities suggesting that banks in our sample perceive fair value taxes as costly and choose alternative investments to manage their interest rate and liquidity risks.⁴

Our results are more pronounced for three types of banks. First, savings and cooperative banks, as opposed to commercial and investment banks, are more sensitive to fair value taxation. This result suggests heterogeneity among banks' business models (Merz and Overesch 2016) as savings and cooperative banks are traditionally smaller banks with higher liquidity needs compared to commercial or investment banks (Bülbül, Schmidt, and Schüwer 2013; Kim and McKillop 2019). Second, the negative association between the level of HFT securities and fair value taxes is pronounced for banks that report under local GAAP for tax purposes as opposed to IFRS. IFRS provide some discretion to designate a financial asset as either HFT or available for sale at the time of acquisition (Agoglia, Douppnik, and Tsakumis 2011; Evans, Houston, Peters, and Pratt 2015). Accordingly, we find in additional tests that the negative association between fair value taxes and HFT securities of banks that base taxable income on IFRS is most pronounced in level 1 fair values of securities, including stocks or bonds. Third, the results are pronounced for banks that are comparatively short in liquidity, suggesting that fair value taxes are relatively costly for banks with higher liquidity needs.

Next, we analyze the effect of fair value taxes on banks' risk taking. Fair value taxes can induce more risk taking in banks' investment portfolios on average. When unrealized gains and losses are included in taxable income, banks pay taxes on unrealized gains, but also receive full and immediate cash tax refunds on unrealized losses. Hence, fair value taxes reduce the after-tax returns on HFT securities while holding the asset. Domar and Musgrave (1944) show that

² For instance, per June 2022, 17 percent of banks' total assets were measured at fair value through profit and loss (European Banking Authority (EBA) 2022, 24). The 161 largest European bank groups, which cover about 80 percent of all European banks' total assets, hold about €4.5 trillion financial assets measured at fair value through profit and loss.

³ Losses not subject to the fair value tax regime can still be carried forward or backward depending on the country's tax loss offset regulations. We account for loss offset rules in our empirical analyses.

⁴ Although we are unable to entirely rule out that banks potentially reclassify investments from HFT to non-HFT securities, a reclassification of financial assets by banks in holding periods (in contrast to other nonregulated industries) is normally prohibited by regulatory restrictions, which provides some comfort that the effects are driven by banks' investment choices.

symmetric loss offsets provide incentives to increase portfolio risk because the government not only participates in the upward risk of the assets but also in the downside risk through tax loss offsets. Following prior empirical literature (Langenmayr and Lester 2018; Ljungqvist, Zhang, and Zuo 2017; Osswald and Sureth-Sloane 2020), we expect that the immediate and full tax loss offsets of fair value tax regimes provide banks with incentives to increase their risk-positions.

We find that banks' risk taking, measured as the three (five) year standard deviation of banks' pretax return on assets (ROA) and their pretax distance to insolvency, is positively associated with the tax rate when subject to fair value taxes. This effect can only be observed in savings and cooperative banks, which have lower risk tolerances than commercial and investment banks (Bülbül et al. 2013; Kim and McKillop 2019). Further, the effect is more pronounced for banks that report under local GAAP instead of IFRS. Our results provide some evidence that banks' risk taking is sensitive to including unrealized gains and losses in taxable income and is in line with prior evidence in nonfinancial settings, albeit subject to banks' business model.

We add to the scarce literature analyzing the potential consequences of including fair values in taxable income (Blaufus and Jacob 2018; Eberhartinger and Klostermann 2007). We show that the inclusion of unrealized gains and losses of securities in taxable income is associated with fewer investments in such assets, suggesting that, on average, banks perceive fair value taxes as costly despite the potential benefits of aligning book and tax income. Our results also suggest that especially smaller cooperative and savings banks perceive fair value taxes as costly in line with the idea that fair value taxes reduce compliance costs for larger investment and cooperative banks that focus on investment banking.

We also contribute to the growing literature analyzing the effect of corporate taxes on the risk taking of financial firms. Prior literature provides evidence that nonfinancial firms increase their risk taking when the government more directly participates in losses through longer periods of tax loss carryforwards and carrybackwards (Langenmayr and Lester 2018; Ljungqvist et al. 2017; Osswald and Sureth-Sloane 2020). However, prior literature explicitly eliminates financial firms from their samples because they are subject to different regulation than nonfinancial firms and their risk preferences depend on a broader set of determinants than those of nonfinancial firms, including liquidity, regulatory environment, or interest rates (e.g., Delis and Kouretas 2011; Laeven and Levine 2009; Wagner 2007). Our results suggest that fair value tax regimes affect banks' risk taking differently depending on their business model. Although risk taking of savings and cooperating banks that are subject to fair value taxes is positively associated with the tax rate, we do not find corresponding effects for commercial and investment banks. Therefore, our results paint a more nuanced picture of the differences in the effect of taxes across financial and nonfinancial firms (De Mooij and Keen 2016; Heckemeyer and De Mooij 2017). Collectively, our results suggest that a one-size-fits-all tax regime affects banks differently in a heterogeneous banking sector that features different business models in line with prior literature, which shows that banks' tax planning varies with their business model (Merz and Overesch 2016).

II. THEORETICAL BACKGROUND

Accounting for Banks' Financial Assets and Fair Value Taxation

For financial accounting purposes, financial assets are usually measured at fair value to provide users of financial statements with more forward-looking and decision-useful information (Fiechter and Novotny-Farkas 2017; Song et al. 2010). According to IAS 39, the applicable standard for banks reporting under IFRS in our sample, all equity and debt instruments except for held-to-maturity (HTM) debt instruments are measured at fair value. HFT securities are measured at fair value with unrealized gains and losses (fair value changes) going directly through profit or loss affecting net profit. Securities designated as available-for-sale (AFS) are also carried at fair value, but changes in fair values of AFS securities are going through other comprehensive income (OCI), and thus affect banks' equity. In contrast, HTM debt instruments are measured at amortized cost and net of impairment. These measurement principles did not significantly change with the introduction of IFRS 9 in 2018, the last year of our sample period.⁵

⁵ We therefore do not expect that the adoption of IFRS 9 affects our results. Our results are robust to excluding fiscal year 2018 from the sample (untabulated). IAS 39 distinguished between HFT and AFS securities. IFRS 9 classifies financial assets by business model and contractual cash flows. We expect no change in the accounting treatment of trading assets, because under the new IFRS 9, as well as under the prior IAS 39, fair value profits and losses of the trading portfolio directly affect book income. For AFS securities, however, banks expect a change in treatment, i.e., the profits and losses of a significant portion of these securities will directly affect book income instead of OCI under IFRS 9. This can result in an increase of a bank's trading portfolio. Alternatively, trading portfolios might remain unaffected if banks decide to sell the relevant AFS securities beforehand. Consequently, we expect our results for banks' trading portfolios to be unaffected or positively biased by the transition from IAS 39 to IFRS 9. Further, our argumentation is supported by descriptive evidence presented in Loew, Schmidt, and Thiel (2019). As our sample largely relates to the period in which IAS 39 was still applicable (2010–2017, only 2018 affected by IFRS 9), we are confident that our data and our results are not materially affected by the new accounting standard. Since HFT and AFS are adequate descriptions of their respective use, we use IAS 39 terminology in our study.

In contrast, for tax accounting purposes, financial assets are usually measured at lower-of-cost-or-market or historical cost whereas unrealized gains and losses (fair value changes) are excluded from taxable income to provide reliable, verifiable, and fair tax payments that meet the underlying ability-to-pay principle of tax systems. As a result of the differences in measurement of financial assets across book and taxable income, firms incur book-tax differences that are potentially costly. Book-tax differences are, for example, positively associated with tax audit adjustments (Mills 1998) and audit fees (Hanlon, Krishnan, and Mills 2012) and can increase reporting and compliance costs.

To reduce compliance costs associated with book-tax differences some countries aligned tax accounting to financial accounting and include all unrealized gains and losses of HFT securities in taxable income (“fair value tax regime”) (Blaufus and Jacob 2018). As a result, all unrealized fair value gains of HFT securities are subject to tax whereas all unrealized fair value losses are tax deductible.⁶ Despite breaking the ability-to-pay principle, anecdotal evidence suggests that fair value tax regimes reduce compliance costs through aligning measurement bases of HFT securities across book and tax income, which equals a reduction of book-tax-differences. For example, the German parliament argued that the introduction of a fair value tax regime on banks’ HFT securities would result in a significant decline in banks’ compliance costs (Deutscher Bundestag 2008). In Hong Kong the investment banking industry actively lobbied for the introduction of a fair value tax regime on banks’ HFT securities to reduce compliance costs (EY 2018). However, fair value tax regimes can significantly affect liquidity because tax payments are not aligned with cash inflows from selling the asset.

From a regulatory perspective, banks’ HFT securities are recorded in the trading book, and organized and managed separately in particular with regard to banks’ risk management, capital requirements, and regulatory supervision.⁷ Bank management actively decides on capital allocation, such as increasing the trading business, or increasing the level of securities available for sale. Any reduction in HFT securities in the trading book, therefore, is likely not the result of a mere reclassification, which is normally prohibited for banks (as opposed to nonfinancial industries), but is, instead, an investment choice. Decision parameters include, among others, profitability, risk allocation, capital requirements, and—according to our study—tax and accounting issues.

The Effect of Fair Value Taxes on Banks’ Investment Portfolios

Banks, as financial intermediaries, collect funds of depositors, partially redistribute these as loans to their debtors and invest in various equity and debt instruments to manage their market risks, liquidity risks, regulatory capital, and after-tax earnings. As a result, banks’ investment portfolios comprise several types of equity and debt instruments that vary in maturity, liquidity, risk, and return including treasury bills, bonds, mortgage-backed securities, equity securities, or cash and balances with central banks. Depending on their business focus, banks consider their investment portfolio as a separate division that maximizes the portfolio’s risk adjusted return (in particular investment banks) or use their investment portfolios as a tool to manage overall interest rate risk and liquidity risk (savings banks) (Heggestad and Houston 1992). Banks optimize the return of their investment portfolios along bank-specific liquidity and regulatory capital requirements as well as risk tolerances that vary with the banks’ business focus. Consequently, several factors shape the size and composition of banks’ investment portfolios including capital requirements, market- as well as industry-wide conditions, and bank-specific characteristics.

In the absence of fair value taxes, that is without differences in the taxation of unrealized gains and losses of HFT and non-HFT securities, banks do not consider fair value taxes and hold securities or cash that match their risk-return preferences. When, however, unrealized gains and losses are taxed differently for HFT and non-HFT securities, banks additionally consider the costs and benefits of investing in securities that are taxed at fair value relative to securities that are not subject to fair value taxes. Fair value taxes can therefore reduce (increase) banks’ investment in HFT securities when fair value taxes impose additional (less) economic costs relative to investments in securities not taxed at fair value or holding cash.

The taxation of unrealized gains and losses can impose additional economic costs on banks for two reasons. First, the taxation of unrealized gains can result in significant cash outflows when HFT securities increase in value over time. Thus, in this scenario, fair value taxation results in a cash flow disadvantage and reduces banks’ liquidity and capital adequacy, which are key concerns for banks. Accordingly, the taxation of unrealized gains and losses can reduce the net present value of HFT securities through a timelier inclusion of taxes relative to securities with a comparable risk-return profile that are not taxed at fair value. Second, the taxation of unrealized gains and losses on HFT securities deprives

⁶ Losses not subject to the fair value tax regime can be carried forward or backward in line with the country’s tax loss offset regulations. We account for country-specific loss offset rules in our empirical analyses.

⁷ We acknowledge exceptions to the rule. Not all IAS 39 or IFRS 9 instruments measured at fair value through profit or loss are included in the trading book.

managers of timing associated tax payments via disposal of the financial asset, which affects regulatory capital and increases the risk of regulatory intervention. Prior research shows that banks are sensitive to volatility in regulatory capital and manage their investment portfolios to minimize the risk of regulatory intervention (e.g., [Beatty 1995](#); [Hodder, Kohlbeck, and McAnally 2002](#)). Along these lines, [Chircop and Novotny-Farkas \(2016\)](#) provide evidence that investors perceive the additional volatility in regulatory capital through the inclusion of unrealized fair value gains and losses on AFS securities in regulatory capital as costly. Accordingly, banks reduce investments in AFS securities to reduce volatility in regulatory capital.

In contrast, the fair value taxes can result in economic benefits and can increase banks' incentives to invest in HFT securities. Tax deductibility of unrealized losses (i.e., tax deductible impairment) leads to a tax benefit, which adds to cash-inflow and increases the after-tax net present value of a financial asset.⁸ Also, adopting fair value measurement of HFT securities in banks' tax accounts reduces firms' compliance costs through increased book-tax conformity. As a result, banks need to keep track of only one measurement base for HFT securities to comply with both financial and tax accounting requirements.

As mentioned above, anecdotal evidence suggests that the reduction in compliance costs constitutes a major motivation to implement fair value taxes for legislators and banks alike. Further, prior research postulates lower compliance costs as one of the benefits associated with higher book-tax conformity (e.g., [Desai and Dharmapala 2009](#); [Freedman 2008](#); [Hanlon and Maydew 2009](#); [Hanlon and Shevlin 2005](#)) as it reduces the number of experts needed or the complexity of internal information systems to comply with both tax and accounting regulation ([Desai and Dharmapala 2009](#)). In this sense, book-tax differences (or the lack of book-tax conformity) increase the complexity of tax systems and drive compliance costs ([Hoppe, Schanz, Sturm, and Sureth-Sloane 2023](#); [Slemrod and Blumenthal 1996](#)) as firms need to account for and correctly interpret an increased number of regulations and cross-references ([Marcuss et al. 2013](#)).

Overall, whether the taxation of unrealized gains and losses on HFT securities affects banks' investment portfolios depends on whether fair value taxes incur additional economic costs or benefits relative to the taxation of realized gains and losses. That is, if the taxation of unrealized gains and losses is economically less costly than the taxation of realized gains and losses, assuming all else equal, banks have incentives to increase their positions in HFT securities. Alternatively, if the taxation of unrealized gains and losses is more costly than the taxation of realized gains and losses, all else equal, banks have incentives to increase their positions in non-HFT assets or cash holdings to manage their interest, liquidity, and market risks. Ultimately, this is an empirical question and, therefore, we pose our first hypothesis in null format:

H1: There is no association between fair value taxes and banks' level of HFT securities.

The Effect of Fair Value Taxes on Banks' Risk Taking

In this section, we discuss the effects of including unrealized gains and losses on HFT securities in taxable income on bank risk taking. When HFT securities are measured at fair value in both financial and tax accounts, tax payments affect banks' after-tax return also in holding periods. In other words, whereas banks pay cash taxes on unrealized gains of HFT securities, they also receive cash tax refunds on unrealized losses. As a result, the government directly participates in banks' unrealized gains and losses associated with HFT securities in holding periods, which is equivalent to a symmetric tax treatment of gains and losses. Full and immediate taxation of unrealized gains combined with full and immediate deduction of unrealized losses in a fair value tax regime reduces the variance of after-tax returns on HFT securities in holding periods and, consequently, makes risk taking more attractive ([Domar and Musgrave 1944](#); [Langenmayr and Lester 2018](#) on realized losses).

Prior literature provides evidence that government risk sharing through taxes is associated with more risk taking in firms' operations. For example, [Langenmayr and Lester \(2018\)](#) show that the duration of loss carryforwards, a form of indirect government participation in firms' losses, is positively associated with firms' risk taking. This effect can be attenuated by specific country risk factors that constrain the effectiveness of loss offset rules ([Osswald and Sureth-Sloane 2020](#)). In a similar vein, [Drebler and Overesch \(2013\)](#) provide evidence that firms' investment is positively associated with the availability of tax loss carryforwards, suggesting that firm investment is sensitive to government participation in losses. Along these lines, [Ljungqvist et al. \(2017\)](#) show that tax rate increases are associated with reduced risk taking of firms as the government's participation in the gains on the investment relative to the losses increases.

Overall, including unrealized gains and losses on HFT securities in taxable income is associated with two benefits that provide incentives for banks to increase risk positions in their HFT securities, which would be reflected in the

⁸ Such benefit may not exist in tax systems, where tax deductible impairment losses on financial assets are normally (i.e., under historical cost convention) available.

volatility of their yield. First, taxing unrealized gains and losses reduces the variance of unrealized returns and, ultimately, net cash flow. Second, including unrealized losses reduces tax payments in the same period and provides a liquidity advantage to banks that partly compensates for incurred losses. Prior literature suggests that higher liquidity is positively associated with bank risk-taking (Acharya and Naqvi 2012; Khan, Scheule, and Wu 2017; Wagner 2007). Both effects increase with the tax rate a bank faces when unrealized gains and losses are subject to tax (in the presence of a fair value tax regime). Prior literature also provides evidence that banks' risk taking is generally sensitive to changes in tax regimes, as for example, to the reduction in tax discrimination between equity and debt capital (Schepens 2016). We therefore hypothesize

H2: There is a positive association between fair value taxes and banks' risk taking.

III. EMPIRICAL SETUP

Identification Strategy and Research Design

Effect of Fair Value Taxes on Banks' Investment Portfolios

We exploit cross-sectional and intertemporal variation in corporate tax rates and variation in fair value tax regimes across countries to analyze the effect of fair value taxes on banks' investment portfolios and risk taking. Our identification strategy is comparable to other studies exploiting cross-country and intertemporal variation in tax regimes and tax rates to identify, for example, the effect of tax regimes on banks' loan loss provisioning (Andries, Gallemore, and Jacob 2017) or firms' risk taking (Langenmayr and Lester 2018). To analyze the effect of fair value taxes on banks' investment portfolios, we estimate the following regression model in a first step

$$HFT_{i,t} = \beta_0 + \beta_1 CTR_{j,t} + \beta_2 FVTAX_{j,t} + \beta_3 CTR_{j,t} \times FVTAX_{j,t} + \sum CONTROLS + \rho_j + \epsilon, \quad (1)$$

where $HFT_{i,t}$ is bank i 's level of HFT securities (HFT) in year t , scaled by total assets.⁹ $CTR_{j,t}$ represents the statutory corporate tax rate for country j in year t , including bank-specific income taxes, standardized to have a mean of 0 and a standard deviation of 1 such that the coefficient β_2 represents the effect of fair value taxes given the average corporate tax rate in the sample. $FVTAX_{j,t}$ is an indicator variable equal to 1 for country-years in which country j taxes banks' unrealized gains and losses on HFT securities (fair value tax). $FVTAX_{j,t}$ equals 0 if country j does not have a fair value tax regime in place in year t . In these cases, unrealized gains are not taxed, and the tax deductibility of unrealized losses is restricted or prohibited. Since fair value tax regimes do not significantly change within countries across time, β_2 could also capture unobserved country-level factors correlated with the presence of fair value tax regimes and firms' structure of their investment portfolios. We therefore interact $FVTAX_{j,t}$ with the standardized corporate tax rate ($CTR_{j,t} \times FVTAX_{j,t}$) to capture the incremental effect of a change in the corporate tax rate on banks' investment portfolios when unrealized gains and losses on HFT securities are taxed ($FVTAX = 1$). If fair value taxes reduce banks' incentives to hold HFT securities in their investment portfolios, the coefficient β_3 on the interaction term should be negative and statistically significant.

When banks perceive fair value taxes as costly and reduce their holdings in HFT securities, banks can use other instruments to manage their market, interest, and liquidity risks. We therefore replace the dependent variable $HFT_{i,t}$ in our previous regression model with other variables for instruments that banks use to manage their market, interest, and liquidity risks. First, we use nonheld-for-trading securities ($NONHFT$) and total investment portfolio ($Securities$) as dependent variables to analyze whether banks substitute HFT securities and invest in alternative securities that are not subject to fair value taxes. If fair value taxes induce banks to increase alternative investments, we expect coefficient β_3 on the interaction term ($CTR_{j,t} \times FVTAX_{j,t}$) to be positive and statistically significant when using $NONHFT$ as dependent variable.

We include a vector of firm and country-level control variables. We control for the size of banks ($Size$) because larger banks hold relatively more securities and have a more diversified investment portfolio. We also control for the banks' performance (ROA), growth ($Growth$), and customer deposits ($Deposits$) to account for the effect of increasing available funds on banks' investment portfolios. We additionally include banks' leverage ($Leverage$) to account for

⁹ We include our dependent variables as levels and not changes as banks usually set a target level of securities that match their risk-return preferences. Similar to cash holdings, investment securities do not exhibit much intertemporal variation. Results of our main regression hold when using HFT over total securities as dependent variable (untabulated).

banks' financial constraints and include year fixed effects ρ_j to control for unobserved, macro-level heterogeneity in investment across time.

Lastly, we include measures to control for country-level characteristics that may affect the relation between banks' structure of investment portfolios and countries' tax regimes.¹⁰ We create two country factors *EconScore* and *RegScore* that capture a variety of different country attributes (Isidro, Nanda, and Wyszocki 2020). Specifically, we employ factor analysis including gross domestic product (GDP) per capita (*GDPCapita*), inflation (*Inflation*), and the World Bank's index for political stability (*Political Stability*) with one oblique rotation following Daske, Hail, Leuz, and Verdi (2008) to create the *EconScore* country factor. *EconScore* therefore controls for a variety of countries' economic differences. To create *RegScore*, we include the World Bank's Regulatory Quality Index (*Regulatory Quality*), the Voice and Accountability Index (*Voice & Account*), the Rule of Law Index (*Rule of Law*), and a country's level of creditor protection (*Creditor Rights*) in our factor analysis. Both *EconScore* and *RegScore* are standardized to have a mean of 0 and a standard deviation of 1. Although our country-level covariates control for several differences in countries' economic and regulatory environments, we acknowledge that potentially other unobserved factors can affect our results (Isidro et al. 2020).

To eliminate differences between banks that are and are not subject to fair value taxes, we also match samples on their covariates. Appendix A provides an overview of all variables used, definitions, and data sources. Lastly, we cluster standard errors at the country-year level following Langenmayr and Lester (2018)¹¹ and we Winsorize all continuous variables at the 1st and 99th percentiles.

Effect of Fair Value Taxes on Banks' Risk Taking

We also analyze whether fair value taxes on unrealized gains and losses are associated with banks' risk-taking behavior. We re-estimate the previous regression model using different measures that reflect banks' risk taking as dependent variables. To capture banks' risk taking, we use their standard deviation of adjusted ROA over three years (*RISK3*) and five years (*RISK5*) (Langenmayr and Lester 2018) as dependent variables. If banks assume more (less) risk associated with fair value taxes, *RISK3/RISK5* increases (decreases) and the coefficient β_3 on the interaction term ($CTR_{j,t} \times FVTAX_{j,t}$) should be positive (negative) and statistically significant. We additionally use banks' z-score (*ZSCORE*), which measures a bank's distance to insolvency (Laeven and Levine 2009). Higher values of *ZSCORE* indicate a higher distance to insolvency and, consequently, less risk taking (Demirgüç-Kunt and Huizinga 2010; Laeven and Levine 2009). Coefficient β_3 should therefore be negative (positive) and statistically significant when fair value taxes are positively (negatively) associated with banks' risk taking. We also include the length of countries' tax loss carry forward (*TLCF*) and tax loss carry backward (*TLCB*) measured in years to control for the effect of tax loss carry forward on banks' risk taking (Langenmayr and Lester 2018; Osswald and Sureth-Sloane 2020). In line with Langenmayr and Lester (2018) we set the period to 20 years if a country allows for indefinitely carrying forward tax losses. All other control variables remain unchanged.

Sample Selection and Descriptive Statistics

To analyze the effect of fair value taxes on banks' investment portfolios and risk taking, we collect information on countries' tax regimes including information on whether a country taxes unrealized gains and losses on HFT securities (presence of fair value tax). The information on the presence of a fair value tax regime is retrieved from the European Commission (2012); Blaufus and Jacob (2018); and our own research. Additionally, we partially validated the fair value tax regime information surveying 32 practitioners and academics in the field. We augmented the tax regime information with country-level corporate tax rates for each fiscal year of our sample period. Table 1, Panel B provides an overview of countries' tax regimes including information on whether countries mandate GAAP or IFRS for tax purposes or leave it at the firm's choice (column "Tax Base"), on the presence of fair value tax regimes (column "FV Tax"), and on the corporate tax rate per country and per year during our sample period. We collected the corporate income tax rates applicable for banks for each country-year in our sample. In the process we identified sector-specific income tax rates for banks in Italy and Spain.¹² In all other countries in our sample, the general corporate income tax rates apply. Overall, our sample includes 27 countries for which we could retrieve information on fair value taxation.

To construct our cross-country panel dataset, we retrieve all data of banks' unconsolidated accounts that are used for tax purposes from Bureau van Dijk's Bankfocus database spanning 2010 to 2018. We start our sample period in

¹⁰ We do not include bank or country-fixed effects to allow for variation in our variable of interest *FVTAX*. Because countries do not exhibit variation in the presence of fair value tax regimes, bank or country fixed effects would eliminate important variation needed for identification.

¹¹ Our results are robust when clustering standard errors at the bank-level.

¹² Bank levies in other countries are not income taxes but are levied on specific assets.

TABLE 1
Sample Composition and Tax Information

Panel A: Sample Construction

Step	Less	No. of Obs.
BvD Bankfocus data of unconsolidated bank accounts from 2009 to 2018		37,139
Less: Bank-years with missing, 0, or negative values for HFT securities and non-HFT securities	24,276	12,863
Less: Bank-years with missing or negative values for total assets, cash holdings, deposits, liabilities, loans, operating income, profit before tax, and income tax expense	1,685	11,178
Less: Missing revenue growth	3,283	7,895
Less: Missing country control variables	17	7,878
Final sample (2010–2018)		7,878

Panel B: Sample Composition

Country	n	Tax Base	FV Tax	Tax Rate per Year								
				2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	2,714	GAAP	No	25%	25%	25%	25%	25%	25%	25%	25%	25%
Belgium	21	GAAP	No	34%	34%	34%	34%	34%	34%	34%	34%	29%
Bulgaria	42	IFRS	Yes	10%	10%	10%	10%	10%	10%	10%	10%	10%
Canada	1	GAAP	Yes	31%	28%	26%	26%	27%	27%	27%	27%	27%
Switzerland	942	GAAP	No	19%	18%	18%	18%	18%	18%	18%	18%	18%
Cyprus	41	IFRS	No	10%	10%	10%	13%	13%	13%	13%	13%	13%
Czech Republic	97	IFRS	Yes	19%	19%	19%	19%	19%	19%	19%	19%	19%
Germany	743	GAAP	Yes	29%	29%	29%	30%	30%	30%	30%	30%	30%
Denmark	218	GAAP	Yes	25%	25%	25%	25%	25%	22%	22%	22%	22%
Estonia	22	IFRS	No	21%	21%	21%	21%	21%	20%	20%	20%	20%
Spain	7	GAAP	Yes	30%	30%	30%	30%	30%	30%	30%	30%	30%
Finland	42	GAAP	Yes	26%	26%	24%	24%	23%	21%	20%	20%	19%
France	64	GAAP	Yes	33%	33%	33%	33%	33%	33%	33%	33%	33%
United Kingdom	311	Optional	Yes	28%	26%	24%	23%	21%	20%	20%	19%	19%
Greece	58	Optional	No	24%	20%	20%	26%	26%	29%	29%	29%	29%
Croatia	87	IFRS	Yes	17%	17%	17%	17%	17%	17%	17%	17%	17%
Hungary	11	GAAP	Yes	19%	19%	19%	19%	19%	19%	19%	9%	9%
Ireland	59	Optional	Yes	13%	13%	13%	13%	13%	13%	13%	13%	13%
Italy	1,623	Optional	Yes	31%	31%	33%	32%	32%	32%	32%	32%	32%
Lithuania	41	Optional	No	15%	15%	15%	15%	15%	15%	15%	15%	15%
Luxembourg	50	GAAP	No	29%	29%	29%	29%	29%	29%	29%	27%	26%
Malta	37	IFRS	No	35%	35%	35%	35%	35%	35%	35%	35%	35%
Poland	139	Optional	No	19%	19%	19%	19%	19%	19%	19%	19%	19%
Portugal	158	IFRS	Yes	25%	25%	25%	25%	23%	21%	21%	21%	21%
Sweden	238	Optional	Yes	26%	26%	26%	22%	22%	22%	22%	22%	22%
Singapore	26	IFRS	Yes	17%	17%	17%	17%	17%	17%	17%	17%	17%
Slovenia	86	Optional	Yes	20%	20%	18%	17%	17%	17%	17%	19%	19%

This table presents the sample construction in Panel A. We use BvD Bankfocus data of unconsolidated bank accounts from 2009 to 2018. After removing bank-years with missing, 0, or negative values for our variables, we arrive at the final sample of 7,878 observations from 2010 to 2018. Panel B presents the sample composition, including the number of observations per country (n), the accounting standard on which taxation is based (Tax base), and whether HFT securities (*HFT*) are taxed at fair value or not (FV Tax). Further, Panel B reports the country-specific corporate tax rate for each year of the sample period. The corporate income tax rates include the sector-specific corporate tax rates for banks in Italy and Spain.

2010 (to exclude effects of the financial crisis) with 37,139 bank-year observations and eliminate observations with missing values or values equal to or smaller than 0 for HFT securities and non-HFT securities (less 24,276 observations) to construct variables for banks' investment portfolios. In this way, we capture the effects of fair value tax regimes only for

banks holding an active trading and investment portfolio that can be affected by fair value taxes. We additionally eliminate bank-year observations with missing or negative values for total assets (less 0 observations), cash holdings (less 469 observations), deposits (less 918 observations), liabilities (less 0 observations), and loans (less 60 observations) to construct our control variables. We additionally drop bank-year observations with missing values for operating income (less 66 observations), profit before tax (less 0 observations), and income tax expense (less 172 observations) to construct pre-tax risk measures. Finally, we drop observations with missing values for *Growth*, one of our control variables (less 3,283 observations) and observations with missing values for *EconScore* and *RegScore* (less 17 observations). Our final sample therefore includes 7,878 bank-year observations across 27 countries from 2010 to 2018. Table 1, Panel A summarizes our sample construction steps.

In Table 2, Panel A, we present descriptive statistics for our full sample including banks that are and are not subject to fair value taxes. Panel B presents descriptive statistics separately for bank-years not subject to fair value taxes (*FVTAX* = 0) and bank-years subject to fair value taxes (*FVTAX* = 1). Overall, banks subject to fair value taxes hold more securities as of total assets relative to banks not subject to fair value taxes. Although the mean (untabulated median) of *Securities* is 0.218 (0.202) for bank-years subject to fair value taxes, the mean (untabulated median) of *Securities* is 0.10 (0.099) for bank-years not subject to fair value taxes. These differences prevail when comparing HFT securities and non-HFT securities. Although banks not subject to fair value taxes exhibit a mean (untabulated median) of 0.022 (0.012) for *HFT*, banks subject to fair value taxes exhibit a mean (untabulated median) of 0.048 (0.004). On average, banks subject to fair value taxes also exhibit higher risk (mean of *RISK3* = 0.046 versus 0.024). Further, banks subject to fair value taxes on average are larger (mean of *Size* = 14.149 versus 12.813), exhibit higher growth (mean of *Growth* = 0.049 versus 0.043), have fewer deposits (mean of *Deposits* = 0.589 versus 0.754), and are more profitable (mean of *ROA* = 0.033 versus 0.027).

Other than that, both groups of banks exhibit comparable levels of leverage (*Leverage* = 0.909 versus 0.898). Lastly, banks subject to fair value taxes can use slightly longer tax loss carryforward and backward periods (18.463 versus 16.125 years and 0.317 versus 0.108 years). We also report mean differences for our matched sample in Table 2,

TABLE 2
Descriptive Statistics

Panel A: Full Sample

	n	Mean	Std. Dev.	P1	P25	P50	P75	P99
<i>Securities</i>	7,878	0.157	0.141	0.000	0.044	0.128	0.235	0.606
<i>HFT</i>	7,878	0.035	0.069	0.000	0.001	0.008	0.032	0.392
<i>NONHFT</i>	7,878	0.120	0.125	0.000	0.009	0.084	0.189	0.524
<i>RISK3</i>	4,242	0.034	0.032	0.003	0.018	0.024	0.035	0.155
<i>RISK5</i>	1,985	0.031	0.026	0.005	0.018	0.025	0.034	0.137
<i>ZSCORE</i>	4,237	1.716	1.168	-0.548	1.093	1.602	2.142	5.795
<i>Size</i>	7,878	13.458	2.204	9.269	11.863	13.087	14.705	20.262
<i>ROA</i>	7,878	0.030	0.017	0.004	0.022	0.028	0.034	0.132
<i>Growth</i>	7,878	0.046	0.220	-0.538	-0.049	0.018	0.094	1.182
<i>Leverage</i>	7,878	0.904	0.051	0.645	0.883	0.912	0.934	0.987
<i>Deposits</i>	7,878	0.674	0.207	0.010	0.573	0.739	0.823	0.932
<i>Reg Quality</i>	7,878	1.363	0.424	0.590	0.896	1.453	1.723	2.058
<i>Voice & Account</i>	7,878	1.291	0.258	0.402	1.047	1.384	1.449	1.640
<i>Rule of Law</i>	7,878	1.436	0.638	0.246	1.002	1.802	1.858	2.042
<i>Creditor Rights</i>	7,878	11.940	1.707	6.000	11.000	12.000	13.500	15.000
<i>GDP Capita</i>	7,878	10.685	0.399	9.439	10.474	10.755	10.847	11.369
<i>Inflation</i>	7,878	0.013	0.011	-0.011	0.005	0.012	0.020	0.039
<i>Political Stability</i>	7,878	0.896	0.376	0.037	0.508	0.944	1.194	1.403
<i>EconScore</i>	7,878	0.000	1.000	-2.536	-0.895	0.253	0.791	1.708
<i>RegScore</i>	7,878	0.000	1.000	-2.245	-1.081	0.433	0.762	1.195
<i>TLCB</i>	7,878	0.209	1.109	0.000	0.000	0.000	0.000	1.000
<i>TLCF</i>	7,878	17.256	5.460	5.000	20.000	20.000	20.000	20.000

(continued on next page)

TABLE 2 (continued)

Panel B: (Non)Fair Value Tax Samples

	<i>FVTAX</i> = 0		<i>FVTAX</i> = 1		Unmatched Sample		Matched Sample	
	n	Mean	n	Mean	Diff.	t-stat	Diff.	t-stat
<i>Securities</i>	4,065	0.100	3,813	0.218				
<i>HFT</i>	4,065	0.022	3,813	0.048				
<i>NONHFT</i>	4,065	0.078	3,813	0.165				
<i>RISK3</i>	2,228	0.024	2,014	0.046				
<i>RISK5</i>	1,040	0.025	945	0.038				
<i>ZSCORE</i>	2,225	1.725	2,012	1.707				
<i>Size</i>	4,065	12.813	3,813	14.146	1.334***	28.147	-0.001	-0.027
<i>ROA</i>	4,065	0.027	3,813	0.033	0.006***	15.965	0.000	0.007
<i>Growth</i>	4,065	0.043	3,813	0.049	0.006	1.203	0.000	0.015
<i>Leverage</i>	4,065	0.909	3,813	0.898	-0.011***	10.032	0.000	0.013
<i>Deposits</i>	4,065	0.754	3,813	0.589	-0.164***	38.369	0.000	0.009
<i>EconScore</i>	4,065	0.610	3,813	-0.650	-1.260***	71.931	0.000	0.021
<i>RegScore</i>	4,065	0.428	3,813	-0.456	-0.884***	43.720	0.001	0.024
<i>TLCB</i>	4,065	0.108	3,813	0.317	0.209***	8.402	0.000	0.011
<i>TLCF</i>	4,065	16.125	3,813	18.463	2.338***	19.443	0.010	0.101

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

Panel B, which eliminates significant differences in covariates between banks subject to fair value taxes and not subject to fair value taxes, as indicated by the insignificant differences for our independent variables. We align both groups (observations subject to fair value tax and not subject to fair value tax) in their covariates using entropy balancing following Hainmueller (2012).¹³ We use the matched sample in our subsequent analyses and report our findings based on the matched sample.¹⁴

IV. THE EFFECT OF FAIR VALUE TAXES ON BANKS' INVESTMENT PORTFOLIOS

Main Results

We start with presenting evidence on the association between fair value taxes and banks' investment portfolios. In Table 3, we report regression results when using total securities (*Securities*) (column (1)), HFT securities (*HFT*) (column (2)), and non-HFT assets (*NONHFT*) (column (3)) as dependent variables. The results suggest that banks subject to a fair value tax regime have, on average, larger investment portfolios relative to total assets compared to banks not subject to a fair value tax regime as indicated by the positive and significant coefficient β_2 on *FVTAX* across all specifications. The coefficient β_2 on *FVTAX* is positive and statistically significant at the 1 percent level when using total securities (column (1), t-statistic: 7.09), HFT securities (column (2), t-statistic: 3.57), and non-HFT securities (column (3), t-statistic: 4.45) as dependent variables. The differences in the size of banks' investment portfolios relative to total assets can, however, reflect unobserved country-specific characteristics that correlate with the presence of fair value tax regimes, because fair value tax regimes do not exhibit intertemporal variation within countries in our sample. We therefore interact the indicator variable *FVTAX* with the standardized corporate tax rate *CTR* to introduce additional variation in the economic significance of fair value tax regimes across countries and time. Thus, the coefficient β_3 on the interaction term $FVTAX \times CTR$ captures the incremental economic effect of fair value taxes on banks' investment portfolios.

When using banks' total investment portfolios (*Securities*) as the dependent variable in Table 3, column (1), the coefficient β_3 on the interaction term $FVTAX \times CTR$ is economically and statistically insignificant. Taken together, the results suggest that fair value taxes are not significantly associated with banks' overall investment portfolios.

¹³ We employ entropy balancing across the whole sample period and include all firm-level and country-level covariates in the procedure.

¹⁴ Results based on the unmatched sample are similar to the reported matched sample results.

TABLE 3
Effect of Fair Value Taxation on Banks' Investment Portfolios

	<i>Securities</i> (1)	<i>HFT</i> (2)	<i>NONHFT</i> (3)
<i>CTR</i>	0.012 (0.008)	-0.001 (0.003)	0.014** (0.007)
<i>FVTAX</i>	0.078*** (0.011)	0.025*** (0.007)	0.049*** (0.011)
<i>FVTAX</i> × <i>CTR</i>	0.003 (0.010)	-0.019*** (0.005)	0.022** (0.010)
<i>Size</i>	-0.013*** (0.003)	-0.004* (0.002)	-0.008*** (0.002)
<i>ROA</i>	0.021 (0.211)	0.326** (0.132)	-0.387* (0.234)
<i>Growth</i>	-0.015 (0.020)	-0.011 (0.007)	-0.002 (0.016)
<i>Leverage</i>	-0.122* (0.074)	-0.139** (0.063)	0.008 (0.078)
<i>Deposits</i>	-0.101*** (0.022)	-0.073*** (0.016)	-0.008 (0.020)
<i>EconScore</i>	-0.031*** (0.009)	-0.005 (0.005)	-0.026** (0.010)
<i>RegScore</i>	0.020** (0.009)	0.010** (0.005)	0.010 (0.011)
Observations	7,878	7,878	7,878
Year-FE	Yes	Yes	Yes
R ²	0.205	0.155	0.190
Cluster	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' holdings of total securities (*Securities*) (column (1)), HFT assets (*HFT*) (column (2)), and non-HFT assets (*NONHFT*) (column (3)) using the matched sample. *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator variable that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

However, when using HFT securities (*HFT*) as dependent variable in column (2), the coefficient β_3 is negative and statistically significant at the 1 percent level (t-statistic: 3.80), suggesting that fair value taxes negatively affect banks' level of HFT securities. The size of the coefficient suggests that banks subject to fair value taxes hold 1.9 percentage points less HFT securities for a one-standard-deviation increase in the corporate tax rates relative to banks that are not subject to fair value taxation. Our results in [Table 3](#) suggest that fair value taxes are negatively associated with banks' level of HFT assets.

Conversely, the coefficient β_3 is positive and statistically significant at the 5 percent level (t-statistic: 2.20) when using non-HFT assets (*NONHFT*, column (3)) as the dependent variable, suggesting that fair value taxes positively affect banks' level of non-HFT securities. The coefficient's size indicates that non-HFT assets of banks subject to fair value taxes increase by 2.2 percentage points for a one-standard-deviation increase in corporate tax rates relative to banks not subject to fair value taxes. We additionally replicate our main specification using only banks located in the EU that are subject to homogenous banking regulation and a homogenous economic environment yielding similar results. The results reported in [Table 3](#) are also robust to excluding each country separately from the sample.¹⁵

¹⁵ We report EU only results in [Online Appendix](#) Table OA.1. We report detailed results of our country exclusion analysis in [Online Appendix](#) Figure OA.1.

TABLE 4
Effect of Fair Value Taxation on Banks' Investment Portfolios (Sample Split)

<i>FVTAX</i>	<i>Securities</i>		<i>HFT</i>		<i>NONHFT</i>	
	No (1)	Yes (2)	No (3)	Yes (4)	No (5)	Yes (6)
<i>CTR</i>	0.015** (0.007)	0.019*** (0.006)	-0.001 (0.003)	-0.017*** (0.003)	0.017*** (0.006)	0.037*** (0.007)
<i>Size</i>	-0.012*** (0.004)	-0.013*** (0.003)	-0.005 (0.003)	-0.004* (0.002)	-0.007** (0.003)	-0.009** (0.004)
<i>ROA</i>	0.331 (0.337)	-0.275 (0.216)	-0.320*** (0.114)	0.975*** (0.159)	0.657** (0.297)	-1.451*** (0.208)
<i>Growth</i>	-0.019 (0.033)	-0.003 (0.015)	-0.015 (0.012)	-0.013* (0.008)	-0.003 (0.026)	0.015 (0.016)
<i>Leverage</i>	-0.029 (0.121)	-0.115 (0.078)	-0.236** (0.099)	0.006 (0.048)	0.184 (0.121)	-0.115 (0.074)
<i>Deposits</i>	-0.115*** (0.031)	-0.100*** (0.027)	-0.066** (0.026)	-0.093*** (0.009)	-0.040 (0.025)	0.030 (0.029)
<i>EconScore</i>	-0.032** (0.016)	0.015 (0.011)	-0.012* (0.006)	0.032*** (0.009)	-0.020 (0.017)	-0.017 (0.012)
<i>RegScore</i>	0.013 (0.019)	0.006 (0.009)	0.009 (0.007)	0.001 (0.005)	0.005 (0.021)	0.004 (0.011)
Diff. <i>CTR</i> [t-statistic]	-0.0040 [0.18]		0.0161*** [11.76]		-0.0199*** [5.78]	
Observations	4,065	3,813	4,065	3,813	4,065	3,813
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.169	0.146	0.154	0.217	0.092	0.195
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' holdings of total securities (*Securities*) (columns (1) and (2)), HFT assets (*HFT*) (columns (3) and (4)), and non-HFT assets (*NONHFT*) (columns (5) and (6)) separately for banks not subject to fair value taxes (*FVTAX* = No) and subject to fair value taxes (*FVTAX* = Yes). *CTR* is the standardized corporate income tax rate. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

In a next step, we analyze the effect of corporate taxes on banks' investment portfolios separately for the sample of banks that are subject to fair value taxation (*FVTAX* = 1) and a sample of banks that are not subject to fair value taxation (*FVTAX* = 0). We therefore regress *Securities*, *HFT* and *NONHFT* on the standardized corporate tax rate (*CTR*) and control variables.¹⁶ We report results of our sample split analysis in [Table 4](#). In columns (1) and (2) we report results for the effect of the corporate tax rate on banks' total investment portfolios separately for firms not taxed at fair value (column (1)) and taxed at fair value (column (2)). The coefficient on *CTR* is in both cases positive and statistically significant at least at the 5 percent level suggesting an increase in 1.9 percentage points (1.5 percentage points) in banks' overall investment portfolio when (not) taxed at fair value for a one-standard-deviation increase in the corporate tax rate. The difference in the effect is economically and statistically insignificant (t-statistic: 0.18).

For HFT securities (*HFT*), we observe a statistically and economically significant difference in the effect of corporate taxes between banks taxed and not taxed at fair value. Although the coefficient on *CTR* remains economically and statistically insignificant (column (3)) for banks not subject to fair value taxes, the coefficient is negative and statistically significant at the 1 percent level for banks subject to fair value taxes (column (4)). Accordingly, for any standard deviation increase in the tax rate, banks subject to fair value taxes reduce their HFT securities by 1.70 percentage points. The sample difference in the coefficient on *CTR* is statistically significant at the 1 percent level. In contrast, when turning to

¹⁶ This approach is equivalent to extending [Equation \(1\)](#) to a fully interacted model.

non-HFT securities (*NONHFT*, columns (5) and (6)), our results suggest that banks subject to fair value taxes invest relatively more in non-HFT securities than banks not subject to fair values taxes as the corporate tax rate increases. The difference of 1.99 percentage points is statistically and economically significant ($p\text{-value} < 0.01$; $t\text{-statistic: } 5.78$).

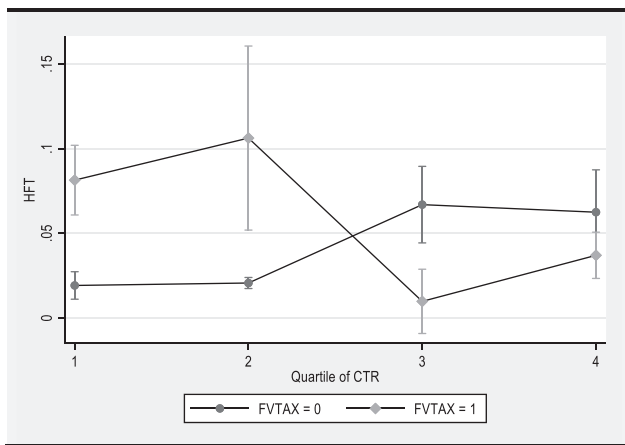
Overall, our results suggest that the taxation of unrealized gains and losses are associated with lower incentives for banks to hold liquid HFT assets and instead incentivize an increase in alternative securities to manage their market, interest, and liquidity risks.

We provide graphical evidence of the effect in Figure 1, “Marginal effects of fair value taxes on banks’ investment portfolios,” which plots the marginal effects of the corporate tax rate on (non)HFT assets for banks that are (not) subject to fair value taxes. When moving from the first to the fourth quartile of *CTR*, banks’ level of HFT assets decreases from approximately 8.5 percent of total assets to 3.8 percent of total assets when subject to fair value taxes. In contrast, HFT assets increase from the first to the fourth quartile of *CTR* by about 4 percentage points (2 percent to approximately 6 percent of total assets) when the bank is not subject to fair value taxes.

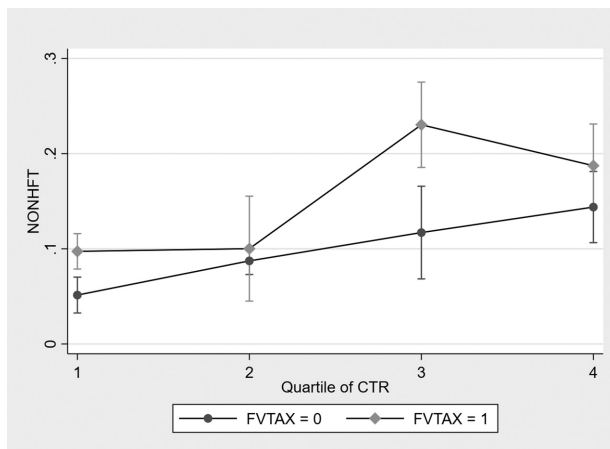
In contrast, non-HFT assets increase for both types of firms moving from the first to the fourth quartile of the tax rate, but significantly more for banks subject to fair value taxes.

FIGURE 1
Marginal Effects of Fair Value Taxes on Banks’ Investment Portfolios

Panel A: Marginal Effects of CTR on HFT



Panel B: Marginal Effects of CTR on NONHFT



This figure presents the marginal effect of fair value taxes on banks’ investment portfolios. The *x*-axis represents quartiles of countries’ corporate income tax rate. The *y*-axis represents linear predictions of banks’ average (non)HFT securities controlling for *Size*, *ROA*, *Growth*, *Leverage*, *Deposits*, *EconScore*, *RegScore*, and year-fixed effects. The vertical bars indicate the confidence intervals at the 95 percent level.

Sensitivity Analyses

In a next step, we conduct several sensitivity analyses. First, in Table 5, we report results for the analysis of differences in the effect of fair value taxes on banks' investment portfolios between commercial/investment banks and savings/cooperative banks, drawing on Merz and Overesch (2016) who show that a bank's response to taxation varies with its business model. Traditionally and inherent to their business models, savings and cooperative banks tend to operate in smaller organizational units with higher liquidity needs to meet cash demands of depositors as well as lower risk tolerances on average (Bülbul et al. 2013; Kim and McKillop 2019; Köhler 2015). Therefore, the cash disadvantage of taxing unrealized gains and losses on HFT assets is potentially more important to savings banks relative to commercial and

TABLE 5
Commercial and Investment Banks versus Savings and Cooperative Banks

	Commercial and Investment			Savings and Cooperative Banks		
	<i>Securities</i> (1)	<i>HFT</i> (2)	<i>NONHFT</i> (3)	<i>Securities</i> (4)	<i>HFT</i> (5)	<i>NONHFT</i> (6)
<i>CTR</i>	0.039*** (0.006)	0.010*** (0.003)	0.030*** (0.005)	0.035** (0.017)	0.032*** (0.010)	0.002 (0.016)
<i>FVTAX</i>	0.027*** (0.010)	0.024*** (0.006)	-0.001 (0.010)	0.101*** (0.028)	0.083*** (0.021)	0.013 (0.022)
<i>FVTAX</i> × <i>CTR</i>	-0.045*** (0.008)	-0.011*** (0.004)	-0.034*** (0.007)	0.013 (0.022)	-0.072*** (0.017)	0.087*** (0.016)
<i>Size</i>	-0.007*** (0.002)	-0.006*** (0.001)	-0.001 (0.001)	-0.013*** (0.005)	-0.004*** (0.001)	-0.008* (0.005)
<i>ROA</i>	0.219 (0.220)	0.240* (0.145)	-0.208 (0.181)	-0.063 (0.342)	1.156*** (0.295)	-1.207*** (0.306)
<i>Growth</i>	0.001 (0.012)	-0.007 (0.006)	0.009 (0.010)	0.012 (0.019)	-0.004 (0.008)	0.016 (0.019)
<i>Leverage</i>	-0.110 (0.089)	0.043 (0.042)	-0.149** (0.074)	-0.250*** (0.077)	-0.039 (0.033)	-0.210*** (0.073)
<i>Deposits</i>	-0.069*** (0.018)	-0.070*** (0.012)	0.023** (0.010)	0.015 (0.060)	-0.000 (0.010)	0.019 (0.061)
<i>EconScore</i>	-0.010* (0.006)	-0.012*** (0.003)	-0.000 (0.005)	-0.038 (0.028)	0.064*** (0.017)	-0.103*** (0.026)
<i>RegScore</i>	-0.002 (0.005)	0.025*** (0.004)	-0.023*** (0.004)	0.035 (0.022)	-0.033*** (0.009)	0.070*** (0.021)
Diff. (1) versus (4) [t-statistic]			-0.0581*** [6.88]			
Diff. (2) versus (5) [t-statistic]			0.0604*** [13.35]			
Diff. (3) versus (6) [t-statistic]			-0.1214*** [52.23]			
Observations	2,130	2,130	2,130	5,114	5,114	5,114
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.134	0.161	0.116	0.417	0.343	0.451
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' investment portfolios for both commercial and investment banks (columns (1)–(3)) as well as savings and cooperative banks (columns (4)–(6)). We use total securities as dependent variable in columns (1) and (4), HFT securities in columns (2) and (5), and non-HFT securities in columns (3) and (6). *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator variable that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in Appendix A.

investment banks. As a result, fair value taxes can discourage savings banks from investing in HFT securities. Hence, we split our sample into two subsamples for commercial and investment banks versus savings and cooperative banks.

In line with our prediction, the negative association between HFT securities and the economic importance of fair value taxes is particularly pronounced for savings and cooperative banks. Savings and cooperative banks reduce HFT assets by about 7.20 percentage points of total assets for every standard deviation increase in the tax rate when taxed at fair value. The coefficient on $FVTAX \times CTR$ in column (5) is negative and statistically significant ($p < 0.01$; t-statistic: 4.23). In contrast, the corresponding coefficient β_3 for commercial and investment banks (column (2)) is economically less significant (-0.011 ; p-value < 0.01). The difference in coefficients of 0.06 is statistically significant at the 1 percent level. Non-HFT securities of savings and cooperative banks increase by 8.70 percentage points of total assets for any standard deviation increase in the corporate tax rate when subject to fair value taxes as suggested by the positive and statistically significant (p-value < 0.01) coefficient in column (6). Taken together, our results suggest that savings and cooperative banks consider fair value taxes to be costly and reduce HFT securities taxed at fair value while substituting with alternative securities. Further, these findings support the notion that a bank's response to the tax system depends on its business model, which is in line with prior evidence (Merz and Overesch 2016).

Next, we analyze potential differences in effects between banks reporting under local GAAP for tax purposes as opposed to IFRS. Prior research suggests that managers have discretion under IFRS when classifying investment securities as HFT or AFS at initial recognition (Beatty 1995; Chircop and Novotny-Farkas 2016) and use this discretion to manage earnings, regulatory capital, and taxes (Beatty, Chamberlain, and Magliolo 1995; Beatty and Liao 2014). In the presence of a fair value tax on HFT securities, managers might therefore have an incentive to classify securities as AFS at initial recognition if they perceive fair value taxes as costly. We therefore split our sample into banks that report under local GAAP for tax purposes and banks reporting under IFRS for tax purposes. We re-estimate our regression Model (1) using both subsamples. We report the results in Table 6 for banks reporting under local GAAP for tax purposes (columns (1) to (3)) and for banks reporting under IFRS for tax purposes (columns (4) to (6)).

The coefficient β_3 on the interaction term $FVTAX \times CTR$ remains statistically insignificant for local GAAP and IFRS banks when using total securities (*Securities*) as the dependent variable in columns (1) and (4). In contrast, when using HFT securities (*HFT*) as dependent variable, the coefficient β_3 is negative and statistically significant at the 1 percent level for both local GAAP (-0.064 ; p-value < 0.01) and IFRS banks (-0.016 ; p-value < 0.01) in columns (2) and (5). The result suggests a negative effect of fair value taxes on banks' level of HFT securities in line with our previous results. The magnitude of the effect is, however, higher for local GAAP banks compared to IFRS banks (-0.064 versus -0.016) as suggested by the statistically significant difference in the coefficients (difference: -0.048 ; t-statistic: 20.03). Our results are in line with the notion that IFRS provides discretion in classifying securities as either HFT or AFS. In contrast, when using non-HFT securities (*NONHFT*) as dependent variable, the coefficient on β_3 on $FVTAX \times CTR$ is positive and statistically significant only for "local GAAP" banks, and economically larger compared to IFRS banks (0.034 versus 0.009). The difference in size is statistically significant at the 1 percent level (t-statistic: 3.17). Overall, the results presented in Table 6 suggest that fair value taxes are economically more important for banks reporting under local GAAP compared to banks reporting under IFRS. This is in line with results from prior research suggesting that bank managers use their discretion in classifying securities as either HFT or AFS at initial recognition to manage earnings, regulatory capital, and taxes (Beatty et al. 1995; Collins, Geisler, and Shackelford 1997).

In additional tests, we find that the negative effect of fair value taxes on HFT assets is concentrated within the level 1 fair value category for banks that report in accordance with IFRS. This is consistent with the notion that fair value taxes primarily affect traded securities such as stocks.¹⁷

We additionally analyze whether banks that exhibit less liquid assets relative to their deposits and short-term funding (*Liquidity*) are more sensitive to the liquidity disadvantages of a fair value tax and therefore invest less in HFT assets. In Table 7, we report results when splitting the sample into banks in the first quartile (more constrained) and banks in the fourth quartile (less constrained banks) of *Liquidity*. Our results suggest that more constrained banks (banks in the first quartile of *Liquidity*) exhibit lower levels of HFT assets with increasing tax rates when taxed at fair value (Table 7, column (2)). The coefficient on $FVTAX \times CTR$ is negative and statistically significant at the 1 percent level, suggesting a 3.3 percentage point reduction in *HFT* for a one-standard-deviation increase in the corporate tax rate when taxed at fair value. In contrast, we do not find a comparable effect for less constrained banks (Table 7, column (5)). The difference in the coefficients (0.0244) is statistically significant at the 1 percent level (t-statistic: 3.11). Taken together, we find some evidence that fair value taxes are perceived as costly by more liquidity-constrained banks.

¹⁷ We report results in Online Appendix Table OA.2.

TABLE 6
Effect of Fair Value Taxation on Banks' Investment Portfolios (GAAP versus IFRS)

	Local GAAP Banks			IFRS Banks		
	<i>Securities</i> (1)	<i>HFT</i> (2)	<i>NONHFT</i> (3)	<i>Securities</i> (4)	<i>HFT</i> (5)	<i>NONHFT</i> (6)
<i>CTR</i>	0.069*** (0.008)	0.022*** (0.008)	0.050*** (0.008)	0.016** (0.007)	0.008*** (0.002)	0.008 (0.007)
<i>FVTAX</i>	0.186*** (0.019)	0.118*** (0.025)	0.052*** (0.019)	0.001 (0.013)	-0.019*** (0.005)	0.021 (0.013)
<i>FVTAX</i> × <i>CTR</i>	-0.022 (0.013)	-0.064*** (0.014)	0.034*** (0.012)	-0.009 (0.008)	-0.016*** (0.003)	0.009 (0.008)
<i>Size</i>	0.002 (0.002)	-0.004*** (0.002)	0.008*** (0.001)	-0.016*** (0.004)	0.001 (0.001)	-0.017*** (0.004)
<i>ROA</i>	0.234 (0.166)	0.688*** (0.146)	-0.500*** (0.189)	-0.222 (0.261)	0.742*** (0.193)	-1.162*** (0.264)
<i>Growth</i>	-0.003 (0.013)	-0.002 (0.010)	0.004 (0.011)	-0.005 (0.015)	-0.013*** (0.005)	0.011 (0.015)
<i>Leverage</i>	-0.294*** (0.053)	0.037 (0.040)	-0.337*** (0.048)	-0.154* (0.091)	-0.107*** (0.038)	-0.033 (0.078)
<i>Deposits</i>	0.054*** (0.019)	-0.068*** (0.012)	0.148*** (0.016)	-0.137*** (0.019)	-0.079*** (0.008)	-0.029* (0.015)
<i>EconScore</i>	0.065*** (0.015)	0.068*** (0.018)	-0.012 (0.012)	0.021** (0.009)	0.011** (0.005)	0.008 (0.010)
<i>RegScore</i>	-0.066*** (0.017)	-0.070*** (0.023)	0.026 (0.026)	-0.011 (0.009)	0.010*** (0.003)	-0.019** (0.009)
Diff. (1) versus (4) [t-statistic]			-0.0137 [0.66]			
Diff. (2) versus (5) [t-statistic]			-0.0482*** [20.03]			
Diff. (3) versus (6) [t-statistic]			0.0255*** [3.17]			
Observations	5,071	5,071	5,071	2,807	2,807	2,807
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.394	0.316	0.388	0.219	0.184	0.267
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' investment portfolio both for banks reporting under local GAAP for tax purposes (columns (1)–(3)) and banks that report under IFRS for tax purposes (columns (4)–(6)). *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator variable that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

V. THE EFFECT OF FAIR VALUE TAXES ON BANKS' RISK TAKING

Main Results

We now present evidence on the association between fair value taxes and banks' risk taking. We report regression results in [Table 8](#) when using the standard deviation of banks' ROA over three years (*RISK3*) (column (1)) and five years (*RISK5*) (column (2)) as well as banks' distance to insolvency (*ZSCORE*) (column (3)) as dependent variables to capture banks' risk taking.

On average, banks subject to fair value taxation exhibit more volatile ROA as indicated by the statistically significant coefficient β_2 on *FVTAX* when using *RISK3* ($p < 0.01$; t-statistic: 2.33) as dependent variables (column (1)). The

TABLE 7
Low versus High Liquidity

	1st Quartile <i>Liquidity</i> (More Constrained Banks)			4th Quartile <i>Liquidity</i> (Less Constrained Banks)		
	<i>Securities</i> (1)	<i>HFT</i> (2)	<i>NONHFT</i> (3)	<i>Securities</i> (4)	<i>HFT</i> (5)	<i>NONHFT</i> (6)
<i>CTR</i>	0.027 (0.018)	0.010* (0.006)	0.018 (0.020)	0.057*** (0.008)	0.010** (0.005)	0.046*** (0.007)
<i>FVTAX</i>	0.080*** (0.024)	0.016** (0.007)	0.059** (0.026)	0.049*** (0.019)	0.027*** (0.009)	0.021 (0.015)
<i>FVTAX</i> × <i>CTR</i>	-0.005 (0.019)	-0.033*** (0.007)	0.031 (0.021)	-0.043*** (0.013)	-0.009 (0.007)	-0.041*** (0.009)
<i>Size</i>	-0.012*** (0.004)	-0.012*** (0.002)	-0.001 (0.004)	-0.002 (0.002)	-0.000 (0.001)	0.000 (0.002)
<i>ROA</i>	-0.411 (0.299)	1.224*** (0.248)	-1.526*** (0.279)	0.558** (0.249)	0.530*** (0.173)	-0.200 (0.192)
<i>Growth</i>	-0.018 (0.022)	-0.001 (0.009)	-0.013 (0.019)	-0.018 (0.013)	-0.017** (0.008)	0.007 (0.010)
<i>Leverage</i>	-0.303*** (0.104)	-0.123 (0.083)	-0.162* (0.097)	-0.102 (0.080)	0.001 (0.044)	-0.165*** (0.052)
<i>Deposits</i>	-0.016 (0.036)	-0.012 (0.011)	0.022 (0.033)	-0.101*** (0.023)	-0.087*** (0.013)	0.029** (0.013)
<i>EconScore</i>	-0.046*** (0.009)	0.014** (0.006)	-0.059*** (0.010)	0.012 (0.009)	0.002 (0.006)	0.011* (0.006)
<i>RegScore</i>	0.013 (0.008)	-0.001 (0.005)	0.011 (0.009)	0.015 (0.010)	0.002 (0.006)	0.008 (0.009)
Diff. (1) versus (4) [t-statistic]				-0.0373* [1.89]		
Diff. (2) versus (5) [t-statistic]				0.0244*** [3.11]		
Diff. (3) versus (6) [t-statistic]				-0.0723*** [9.48]		
Observations	1,970	1,970	1,970	1,969	1,969	1,969
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.273	0.398	0.353	0.149	0.185	0.099
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' investment portfolios for more constrained banks (columns (1)–(3)) with *Liquidity* in the first and less constrained banks (columns (4)–(6)) with *Liquidity* in the fourth quartile of the distribution. We use total securities as dependent variable in columns (1) and (4), HFT securities in columns (2) and (5), and non-HFT securities in columns (3) and (6). *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

positive association between fair value taxation and banks' risk-taking increases in the tax rate as suggested by the positive and statistically significant coefficient β_3 on the interaction term *FVTAX* × *CTR* when using *RISK3* ($p < 0.01$; t-statistic: 2.60) and *RISK5* ($p < 0.05$; t-statistic: 2.33) as dependent variables. The negative coefficient presented in column (3) when using *ZSCORE* as the dependent variable supports the notion that increasing fair value taxes induces more risk taking. The coefficient β_3 on the interaction term *FVTAX* × *CTR* is negative and statistically significant at the 5 percent level (t-statistic: 2.53).

These results are in line with the theoretical prediction (Domar and Musgrave 1944) and prior empirical evidence (Langenmayr and Lester 2018) that the immediate inclusion of gains and losses in the tax base, coinciding in a more

TABLE 8
Effect of Fair Value Taxation on Banks' Risk Taking

	<i>RISK3</i>	<i>RISK5</i>	<i>ZSCORE</i>
	(1)	(2)	(3)
<i>CTR</i>	0.000 (0.003)	-0.001 (0.002)	-0.173 (0.117)
<i>FVTAX</i>	0.012** (0.005)	0.002 (0.005)	0.530*** (0.200)
<i>FVTAX</i> × <i>CTR</i>	0.013*** (0.005)	0.014** (0.006)	-0.373** (0.147)
<i>Size</i>	0.000 (0.001)	-0.000 (0.001)	-0.103*** (0.021)
<i>ROA</i>	-0.099 (0.085)	-0.098 (0.083)	12.053*** (2.269)
<i>Growth</i>	0.000 (0.003)	-0.001 (0.002)	0.141 (0.173)
<i>Leverage</i>	0.007 (0.017)	0.054** (0.021)	-8.484*** (0.838)
<i>Deposits</i>	-0.006 (0.005)	-0.004 (0.007)	0.925*** (0.159)
<i>EconScore</i>	-0.020*** (0.006)	-0.014** (0.007)	0.150 (0.160)
<i>RegScore</i>	0.031*** (0.008)	0.022** (0.009)	-0.343* (0.202)
<i>TLCF</i>	0.028 (0.022)	0.044** (0.022)	-1.233 (0.850)
<i>TLCB</i>	-0.000 (0.000)	-0.000 (0.000)	-0.035*** (0.010)
Observations	4,239	1,983	4,234
Year-FE	Yes	Yes	Yes
R ²	0.485	0.458	0.554
Cluster	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' risk taking using the matched sample. In columns (1) and (2) we report regression results when using the standard deviation of *ROA* over three (five) years as dependent variable. In column (3) we report regression results when using the distance to insolvency (*ZSCORE*) as dependent variable. *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator variable that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

symmetric tax regime, is associated with higher risk taking, while controlling for tax loss carryforward and carryback. Overall, these results suggest that fair value taxes induce banks to reduce their level of HFT assets while increasing risk.¹⁸

In a next step, we analyze the effect of corporate taxes on banks' risk taking separately for the sample of banks subject to fair value taxation (*FVTAX* = 1) and the sample of banks not subject to fair value taxation (*FVTAX* = 0). We therefore regress *RISK3*, *RISK5*, and *ZSCORE* on the standardized corporate tax rate (*CTR*) and control variables.¹⁹ We report results of our sample split analysis in [Table 9](#). Overall, these results support our previous findings. The coefficient on the standardized corporate tax rate *CTR* is positive and significant at the 1 percent level for banks that are

¹⁸ The results are robust to excluding each country separately from the sample. We report detailed results of our country-exclusion analysis in [Online Appendix Figure OA.1](#).

¹⁹ This approach is equivalent to extending [Equation \(1\)](#) to a fully interacted model.

TABLE 9
Effect of Fair Value Taxation on Banks' Risk Taking (Sample Split)

<i>FVTAX</i>	<i>RISK3</i>		<i>RISK5</i>		<i>ZSCORE</i>	
	No (1)	Yes (2)	No (3)	Yes (4)	No (5)	Yes (6)
<i>CTR</i>	0.001 (0.002)	0.016*** (0.003)	0.000 (0.002)	0.016*** (0.004)	-0.070 (0.100)	-0.589*** (0.080)
<i>Size</i>	0.001 (0.001)	-0.001* (0.001)	0.000 (0.001)	-0.001* (0.001)	-0.089** (0.038)	-0.067*** (0.022)
<i>ROA</i>	0.421*** (0.133)	-0.223*** (0.078)	0.334** (0.127)	-0.207*** (0.075)	7.771 (4.869)	12.628*** (2.051)
<i>Growth</i>	-0.006* (0.003)	-0.003 (0.004)	-0.006* (0.004)	-0.004 (0.003)	0.257 (0.191)	0.189* (0.104)
<i>Leverage</i>	0.066* (0.035)	-0.042* (0.023)	0.140*** (0.037)	-0.002 (0.024)	-8.313*** (1.782)	-5.386*** (0.586)
<i>Deposits</i>	-0.022*** (0.003)	0.010 (0.007)	-0.017*** (0.004)	0.008 (0.008)	0.793*** (0.176)	0.643*** (0.158)
<i>EconScore</i>	0.002 (0.005)	0.011* (0.006)	-0.008 (0.007)	0.018** (0.009)	-0.431 (0.283)	0.002 (0.170)
<i>RegScore</i>	0.006 (0.006)	0.009** (0.004)	0.016* (0.009)	0.003 (0.006)	0.089 (0.359)	0.120 (0.119)
<i>TLCF</i>	-0.000 (0.000)	-0.002*** (0.001)	0.000 (0.000)	-0.002*** (0.001)	-0.001 (0.018)	0.005 (0.027)
<i>TLCB</i>	0.002** (0.001)	0.054*** (0.009)	-0.001* (0.001)	0.051*** (0.012)	-0.103*** (0.026)	-2.000*** (0.218)
Diff. <i>CTR</i> [t-statistic]	-0.0155*** [41.44]		-0.0153*** [23.81]		0.5189*** [17.21]	
Observations	2,228	2,014	1,040	945	2,225	2,012
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.437	0.695	0.490	0.710	0.517	0.710
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents OLS regression results for the association between fair value taxes and banks' risk taking separately for banks not subject to fair value taxes (*FVTAX* = No) and subject to fair value taxes (*FVTAX* = Yes). In columns (1)–(4), we use the standard deviation of *ROA* over three (five) years as dependent variable. In columns (5) and (6), we use the distance to insolvency (*ZSCORE*) as dependent variable. *CTR* is the standardized corporate income tax rate. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

subject to fair value taxes when using *RISK3* and *RISK5* as dependent variables. In contrast, the coefficient on the standardized corporate tax rate *CTR* is economically insignificant and statistically insignificant when using *RISK3* (*RISK5*) as the dependent variable and the bank is not subject to fair value tax. The differences in coefficients on *CTR* between both samples are statistically significant at the 1 percent level. The results are equivalent when using *ZSCORE* as the dependent variable. The coefficient on *CTR* is negative and significant at the 1 percent level for banks that are subject to fair value taxes, suggesting increased risk taking.

Sensitivity Analyses

Lastly, we present cross-sectional results in [Table 10](#) between types of banks with different business models and types of banks that differ in their reporting for tax purposes. In [Table 10](#), Panel A, we present results for differences between commercial and investment banks versus savings and cooperative banks, where different business models imply different risk preferences. Our results suggest that the increase in risk taking is limited to savings and cooperative banks. The coefficient on the interaction term is positive and significant at the 1 percent level when using *RISK3* and *RISK5* as

TABLE 10
Risk Taking: Sensitivity Analyses

Panel A: Commercial and Investment versus Savings and Cooperative Banks

	Commercial and Investment			Savings and Cooperative Banks		
	<i>RISK3</i> (1)	<i>RISK5</i> (2)	<i>ZSCORE</i> (3)	<i>RISK3</i> (4)	<i>RISK5</i> (5)	<i>ZSCORE</i> (6)
<i>CTR</i>	0.001 (0.002)	0.001 (0.001)	-0.171* (0.091)	-0.002 (0.004)	0.005 (0.004)	-0.035 (0.191)
<i>FVTAX</i>	0.001 (0.003)	-0.000 (0.002)	0.395** (0.182)	0.005 (0.008)	-0.008 (0.012)	1.044*** (0.206)
<i>FVTAX</i> × <i>CTR</i>	0.000 (0.002)	0.001 (0.001)	-0.192 (0.122)	0.034*** (0.008)	0.033*** (0.009)	-1.351*** (0.220)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,157	591	1,152	2,764	1,245	2,764
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.158	0.285	0.44	0.837	0.811	0.761
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

Panel B: Local GAAP Banks versus IFRS Banks

	Local GAAP			IFRS		
	<i>RISK3</i> (1)	<i>RISK5</i> (2)	<i>ZSCORE</i> (3)	<i>RISK3</i> (4)	<i>RISK5</i> (5)	<i>ZSCORE</i> (6)
<i>CTR</i>	0.011*** (0.004)	0.009** (0.004)	-0.017 (0.123)	-0.001 (0.002)	0.001 (0.001)	-0.011 (0.096)
<i>FVTAX</i>	0.010 (0.012)	0.003 (0.016)	1.418*** (0.313)	-0.003 (0.004)	-0.005 (0.003)	-0.124 (0.235)
<i>FVTAX</i> × <i>CTR</i>	0.038*** (0.008)	0.043*** (0.013)	-1.555*** (0.217)	0.003 (0.002)	0.002 (0.002)	-0.371*** (0.128)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,639	1,142	2,639	1,603	843	1,598
Year-FE	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.756	0.703	0.687	0.225	0.304	0.471
Cluster	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year	Country-Year

***, **, * Indicate significant differences at the 1 percent, 5 percent, and 10 percent levels, respectively.

This table presents cross-sectional OLS regression results for the association between fair value taxes and banks' risk taking. In Panel A, we present differences between commercial and investment banks (columns (1) to (3)) as well as savings and cooperative banks (columns (4) to (6)). In Panel B, we present results for differences between banks that report in local GAAP and IFRS for tax purposes. In columns (1), (2), (4), and (5), we use the standard deviation of *ROA* over three (five) years as dependent variable. In columns (3) and (6), we use banks' distance to insolvency (*ZSCORE*) as dependent variable. *CTR* is the standardized corporate income tax rate. *FVTAX* is an indicator that equals 1 if the bank is subject to a fair value tax regime, 0 otherwise. Robust standard errors clustered at the country-year level are reported in parentheses.

Variable definitions are reported in [Appendix A](#).

dependent variables in the subsample of savings and cooperative banks only. Along these lines, the coefficient on the interaction term is negative and statistically significant at the 1 percent level when using *ZSCORE* as the dependent variable in the sample of savings and cooperative banks. Again, and even more pronounced than in our prior analysis of portfolio choices, we find support for a bank's reaction to fair value taxation depending on its business model. Savings and cooperative banks seem to take on more risk when HFT securities are taxed at fair value, possibly because these types of banks are smaller in size and benefit relatively more from risk-sharing with the government.

Next, in [Table 10](#), Panel B, we split the sample into banks that report in accordance with local GAAP or IFRS. The coefficient on the interaction term is positive and statistically significant at the 1 percent level when using *RISK3* and

RISK5 as dependent variables for the subsample of banks that report in accordance with local GAAP for tax purposes. Likewise, the coefficient on the interaction term is negative and statistically significant at the 1 percent level when using *ZSCORE* as dependent variable. In contrast, only one out of three coefficients of interest are statistically significant at the 1 percent level in the subsample of banks that report in accordance with IFRS for tax purposes. Overall, these results suggest that risk taking is positively associated with fair value taxes especially for banks that report under local GAAP for tax purposes.

VI. CONCLUSION

We analyze the implications of including unrealized gains and losses of HFT securities in taxable income (fair value taxation) on banks' investment choices and risk taking exploiting cross-country variation in fair value tax regimes and intertemporal variation in tax rates in a sample of 27 countries.

Our results suggest that banks' HFT securities that are taxed at fair value are sensitive to changes in the tax rate. We provide evidence that banks hold less HFT securities when the economic significance of fair value taxes increases, and hold more positions in non-HFT securities. Particularly, the effect can be observed in savings and cooperative banks that are smaller, have higher liquidity needs, and lower risk tolerances. The reduction in HFT securities taxed at fair value is stronger for banks that report under local GAAP instead of IFRSs for tax purposes. These results are in line with the notion that, whereas fair value taxes on HFT securities potentially reduce compliance costs through higher book-tax conformity, fair value taxes potentially also impose economic costs on banks through increased liquidity needs. We also find that savings and cooperative banks take on more risk when the economic significance of the fair value tax increases. These results are in line with the notion that banks' risk-taking increases when the government participates more directly in the downward risk of investments. Yet, as a reflection of distinct risk behavior and regulation of banks, our results depend on the bank's business model.

We acknowledge limitations of our study. Our identification relies on cross-country variation in fair value tax regimes, which do not exhibit intertemporal variation within countries during our sample period. Therefore, differences in banks' HFT securities and risk taking across countries with and without fair value tax regimes in place could be the result of unobserved country characteristics that correlate with fair value tax regimes. Therefore, we also include countries' tax rates to increase intertemporal variation in the economic significance of fair value taxes across countries that implemented fair value tax regimes. Also, we acknowledge possible reverse causality: the banking landscape, and financial asset structure differ among countries. It is possible that the tax regime for HFT securities is not exogenous but influenced by the country-specific banking industry. We address this concern by analyzing cross-country, cross-sectional, and intertemporal variation. Finally, we acknowledge that our study cannot identify whether the shift from HFT to non-HFT securities under fair value taxation results from classification choices, or from investment choices. However, a reclassification of financial assets is unlikely because of regulatory restrictions.

The discussion on using IFRS, and fair value accounting, as a tax base, is relevant beyond the financial industry. For instance, the OECD's Inclusive Framework on BEPS suggests using IFRS as a basis for elements of global corporate taxation, and the recent EC directive proposal on the implementation of tax-deductibility of allowance for corporate equity²⁰ links to the equity figure from financial statements. As our results are not necessarily generalizable to the nonfinancial industry or for global corporate taxation, they suggest that moving toward a more forward-looking tax base can have potential unintended consequences on the real economy and on risk taking, which we leave for future research to explore.

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²⁰ Available at: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12995-Debt-equity-bias-reduction-allowance-DEBRA-_en

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APPENDIX A
Variable Definitions

Variable	Definition
<i>Creditor Rights</i>	<i>Creditor Rights</i> captures the strength of the legislative creditor rights protection in a country. (Source: World Bank)
<i>CTR</i>	<i>CTR</i> is defined as the standardized corporate income tax rate in country j in year t , inclusive of banks-specific income taxes, with mean 0 and standard deviation of 1.
<i>Deposits</i>	<i>Deposits</i> is defined as deposits and short-term funding (Bankfocus item: 91200) scaled by total assets (Bankfocus item: 52600).
<i>EconScore</i>	<i>EconScore</i> captures country-specific economic characteristics. It is a factor variable that incorporates <i>GDP</i> Capita, <i>Inflation</i> , and <i>Political Stability</i> .
<i>FVTAX</i>	<i>FVTAX</i> is an indicator variable that equals 1 if the respective country taxes unrealized gains and losses of HFT securities (Fair Value Tax), 0 otherwise.
<i>GDP</i> Capita	<i>GDP</i> Capita is defined as the country's GDP per capita. (Source: World Bank)
<i>Growth</i>	<i>Growth</i> is defined as the percentage growth in revenue (Bankfocus item: 93200).
<i>HFT</i>	<i>HFT</i> is defined as HFT securities (Bankfocus item: 50600) scaled by total assets (Bankfocus item: 52600).
<i>Inflation</i>	<i>Inflation</i> is defined as the change in the consumer price index. (Source: World Bank)
<i>Leverage</i>	<i>Leverage</i> is defined as total liabilities (Bankfocus item: 61900) scaled by total assets (Bankfocus item: 52600).
<i>Liquidity</i>	<i>Liquidity</i> is defined as banks' liquid assets (Bankfocus item: 92700) scaled by deposits and short-term funding (Bankfocus item: 91200).
<i>NONHFT</i>	<i>NONHFT</i> is defined as the sum of securities that are not HFT (Bankfocus items: 50700, 50800, 50810) scaled by total assets (Bankfocus item: 52600).
<i>Political Stability</i>	<i>Political Stability</i> captures the country's political stability. (Source: World Bank)
<i>RegScore</i>	<i>RegScore</i> captures the country-specific regulatory environment. It is a factor variable that incorporates <i>Regulatory Quality</i> , <i>Voice & Account</i> , <i>Rule of Law</i> , and <i>Creditor Rights</i> .
<i>Regulatory Quality</i>	<i>Regulatory Quality</i> captures the well functioning of a country's regulatory environment. (Source: World Bank)
<i>RISK3</i>	<i>RISK3</i> is defined as the standard deviation of the difference between the bank's pretax ROA and the country-year mean of ROA over three years (see Langenmayr and Lester 2018).
<i>RISK5</i>	<i>RISK5</i> is defined as the standard deviation of the difference between the bank's pretax ROA and the country-year mean of ROA over five years (see Langenmayr and Lester 2018).
<i>Rule of Law</i>	Value of the rule of law indicator as percentile rank that captures countries' voice and accountability, political stability, government effectiveness. (Source: World Bank)
<i>Securities</i>	Total securities is defined as the sum of HFT securities (Bankfocus item: 50600) and other securities (Bankfocus item: 50810) scaled by total assets (Bankfocus item: 52600) for banks reporting under local GAAP. For banks reporting under IFRS, total securities are defined as the sum of HFT securities (Bankfocus item: 50600), AFS securities (Bankfocus item: 50700), and HTM securities (Bankfocus item: 50800) scaled by total assets (Bankfocus item: 52600).
<i>Size</i>	<i>Size</i> is defined as the natural logarithm of total assets (Bankfocus item: 52600).
<i>Voice & Account</i>	<i>Voice & Account</i> captures the accountability of a government for its actions and the peoples' opportunity to exercise voice. (Source: World Bank)
<i>ZSCORE</i>	<i>ZSCORE</i> is the bank's ROA plus the capital asset ratio (CAR) divided by the standard deviation of the bank's ROA. CAR is defined as shareholders' equity (Bankfocus item: 63100) scaled by total assets (Bankfocus item: 52600).
<i>TLCF</i>	Tax loss carryforward is defined as maximum number of years a country's law permits carrying forward losses. When the <i>TLCF</i> period is infinite, it was set to 20 years following Langenmayr and Lester (2018) .
<i>TLCB</i>	Tax loss carryback is defined as maximum number of years a country's law permits carrying back losses.