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Understanding households' bank bond holdings

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Abstract

Using unique data on Italian households from 2011 to 2015, we examine how investor demand-side and bank supply-side characteristics relate to households' holdings of bonds issued by their own bank. Households with a higher concentration of own bank bonds tend to have a lower education level, a shorter investment horizon, and less wealth. Controlling for investment and investor attributes, households exhibit high bank bond concentration when the issuing bank has high funding needs, low profitability, or a high branch market share. Furthermore, we show that a buy-and-hold strategy on bank bonds yields lower returns than one on government bonds over the same period. These findings offer insights into retail bond issuance, an important source of funding for banks in times of market stress.

Keywords: Bank bond holdings, household finance, financial intermediation.
JEL classifications: G50, G11, G21.

1. Introduction

Banks' failures over the 2007–2009 financial crisis and the subsequent sovereign debt crisis posed a risk to investors in bank bonds. In Europe, this was further amplified by the introduction of a bail-in mechanism through the Bank Recovery and Resolution Directive (BRRD). Under this framework, in the case of bank resolution, unsecured bondholders and shareholders must have incurred losses before any public debt is used. As bondholders' exposure to losses has increased, previously unexplored conflicts of interest between banks and their clients may emerge. In this article, we investigate the factors influencing retail investors' holdings of bonds issued by the bank at which they hold an investment account.

According to standard portfolio theory, investors' choices should primarily be shaped by investor and investment characteristics. In this view, once investor and investment factors are accounted for, bank and branch characteristics should not be related to investment decisions (Foerster et al. 2017; Foà et al. 2019). This holds even when—as is the case in our setting—investors receive financial recommendations from bank employees who are expected to tailor their advice to clients' needs. However, an alternative perspective suggests that banks, especially during periods of liquidity shortages and funding market stress, may, through the medium of bank employees, encourage clients to invest in their own

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bonds (Guiso and Viviano 2015). As a result, financial decisions may arise from the interaction between investor demand and the time-varying nature of banks' supply incentives.

We study the role of investor demand-side and bank supply-side characteristics in explaining the share of households' investments in own bank bonds.[1] We access unique data from eight Italian local banks over the period 2011–2015. These banks are *banche di credito cooperativo* (hereinafter cooperative credit banks, or CCBs) and provide information on investors' demographics, financial and account characteristics, and portfolio allocation, as well as on bank accounting data and branch characteristics. Italy's CCBs are characterized by being local, mutual, not-for-profit cooperatives. Contrary to US credit cooperatives, which are generally government sponsored, Italy's CCBs are private enterprises whose stated objectives are the "wellbeing of their stakeholders and the development of the local economy" (Article 2 of the Standard CCB Corporate Statute). They make up a large portion of the Italian banking system thanks to their widespread distribution across the country.

Italy provides a particularly well-suited context for our study for three main reasons. First, the sovereign debt crisis in 2010–2011 severely affected Italy, resulting in higher interest rate spreads compared to other countries and increased funding costs for both government and financial institutions.[2] Second, retail bank bond holdings in Italy were notably larger than in other countries. In December 2015, approximately 38 percent[3] of bonds issued by Italian financial institutions were held (as direct investments) by euro area households. This percentage was by far the highest among euro area countries[4] and corresponded to an outstanding amount of EUR 223 billion in Italian bank bonds held in household portfolios. Third, according to household survey data (Linciano, Gentile, and Soccorso 2016), bank bonds were the most widely held financial products among Italian households in 2015. Under the bank resolution framework, international authorities raised concerns about bank bond exposure, as documented by the IMF 2016 Article IV Consultation,[5] which highlights its potential adverse effects.

What determines cross-sectional variation in investors' own bank bond concentration? In classical portfolio theory, differences in investment characteristics and investor risk tolerance account for portfolio choices. More recently, factors such as investors' demographics, account characteristics, and socioeconomic status have also been shown to shape financial decisions (e.g., Campbell 2006; Calvet, Campbell, and Sodini 2007). We examine this hypothesis and investigate the role of investor demand-side factors in explaining variation in own bank bond share. Since portfolio allocation might also be influenced by supply-side factors through branch employees, we leverage the time-varying nature of banks' incentives and identify three key dimensions that shape them: funding needs, bank profitability, and competition in the local market in which branches operate.

We first document that investors concentrate 70 percent of their bond portfolio and around 40 percent of their total portfolio (the 75th percentile of the bank-bond-to-total-

[1] We define own bank bonds as bonds issued by the bank at which households have an investment account.

[2] See, for instance, Penty and Sirletti (2011), whose October 21, 2011, Bloomberg article is entitled "*Saving Wars from Italy to Portugal Drive Costs Higher*." The article effectively depicts the severity of the period, describing the difficulties banks faced in raising resources in the wholesale market and their rush to exploit the retail financing channel albeit at penalizing costs.

[3] This percentage is constructed using data from the Securities Holdings Statistics (SHS) of the European Central Bank (ECB). The SHS data are available here: https://www.ecb.europa.eu.

[4] In December 2015, about 13 percent of bonds issued by German banks were held by euro area households, corresponding to an outstanding amount of 80,000 million euros of German bank bonds in households' portfolios. In the UK and in France, around 4 percent (an outstanding amount of 22,970 million euros) and 5 percent (an outstanding amount of 43,000 million euros) of bank bonds were held by euro area households, respectively. These figures are computed using data from the SHS of the ECB. The SHSs data are available here: https://www.ecb.europa.eu.

[5] The IMF's 2016 article IV Consultation—Press Release, Staff Report, and Statement by the Executive Director for Italy.

portfolio distribution is 78 percent) in own bank bonds.[6] This evidence both confirms that the lack of diversification is severe and is in line with national surveys documenting that bank bonds are the primary asset choice of individuals within the country (Linciano, Gentile, and Soccorso 2016).

We then turn to understanding how much of this portfolio concentration is explained by bond and by investor characteristics. We find that households' own bank bond concentration is positively related to the bank bond risk premium, measured as the bank bond return above the risk-free rate, and negatively related to bond maturity, likely reflecting the short-term nature of the investment. Interestingly, while controlling for bond returns, we document a positive relationship between banks' default probability, as estimated by internal ratings, and the share of bank bonds in investors' portfolios. This finding aligns with the work of Guiso and Viviano (2015), who, using Italian data from 2007 to 2009, show a positive relationship between bank credit default swap (CDS) and investors' likelihood of purchasing bonds issued by their own bank. Regarding investor attributes, we document that, on average, households concentrating more on own bank bonds are characterized by a low level of education, a long relationship with the bank, a short investment horizon, and low wealth (in terms of both income and total assets). Furthermore, they exhibit moderate risk tolerance and low financial experience. Economically, a low level of education and low total assets are relevant variables, each associated with a 3.8 percent and 3.5 percent increase in bank bond share, respectively. The strongest effect is associated with high risk tolerance, which is related to an 11.6 percent reduction in bank bond share.

Next we investigate if the observed asset allocation is influenced by the supply side, as reflected by time-varying bank and branch characteristics. Own bank bond concentration rises when the bank is less profitable, characterized by a weaker funding structure, and its branches having higher penetration in the local market. Economically, the effect of the supply side is notable, especially in the case of a weak funding structure. A 1-SD increase in funding needs is associated with a 13 percent increase in own bank bond concentration. Importantly, these results hold after controlling for bank and branch fixed effects, which take into account any sorting of clients based on unobservable time-invariant attributes (Foà et al. 2019). Furthermore, they are robust to the inclusion of province and investor fixed effects, which control for local shocks and unobservable investor-specific attributes.

Finally, we combine the demand and supply dimensions to examine how the time-varying bank attributes relate to investors' share of own bank bonds, considering different levels of financial sophistication or relationship length with the bank. Using both single and double sorting on investor attributes, we document that less financially sophisticated households exhibit greater portfolio concentration when bank funding needs increase. In contrast, we find no significant differences in portfolio concentration across households when considering bank profitability, branch market share, or varying relationship lengths.

While our findings suggest that banks may influence their clients' portfolios to generate benefits for themselves, we cannot completely rule out other explanations for clients' behavior. First, investors' decisions may have been driven by unobserved investor characteristics that covary with bank or branch characteristics.[7] Second, despite the typical investor being relatively naive, it may still have been beneficial for investors to allocate money to bank bonds, rather than investing in other assets, or simply exiting the market.

[6] Using Danish data, Andersen, Hanspal, and Nielsen (2019) show a similar pattern for equity: during the 2007–2009 financial crisis, households allocated more than 40 percent of their portfolio to their own bank's stocks.

[7] For instance, the decision to invest in own bank bonds might reflect investors' decision to support their bank's funding during periods of liquidity need, possibly driven by an informational advantage. This could suggest that unobservable, time-varying investor characteristics may be correlated with bank or branch characteristics. Conversely, if these unobserved characteristics are time invariant, as are certain types of preferences, they are captured by investor fixed effects.

We therefore also shed light on the potential performance implications of this behavior. First, we test for market discipline by regressing bank bond spreads on bond and bank risk measures. The result reveals a weak relationship, which suggests that these bond issues were priced without fully reflecting the underlying risks (Grasso et al. 2010). Second, we show that a buy-and-hold portfolio strategy with government bonds would have yielded higher returns than an equivalent strategy with bank bonds. This evidence suggests that, under certain conditions, investing in own bank bonds may have been a poor investment strategy and that alternative (potentially more beneficial) options may have been available to investors.

To further analyze the performance effects of active changes in bank bond holdings, we investigate the relationship between active changes and rebalancing across other asset classes. We find that active purchases of own bank bonds are mainly associated with reductions in mutual fund shares and with reductions in government bond shares, of approximately 3 percent and 4 percent, respectively. For government bonds, we find that rising sovereign risk, as indicated by CDS spread changes, strengthens this negative relationship, suggesting a substitution effect: as sovereign credit risk increases, investors shift from riskier government bonds to bank bonds, which are perceived as safer (Linciano, Gentile, and Soccorso 2015). However, the economic magnitude of this effect is modest, at less than 1 percent.

Unlike other household–bank relationships explored in the literature, the behavior we study in this article is likely to emerge only under certain circumstances, such as those experienced by European banks in the aftermath of the 2007–2009 financial crisis. Banks were severely affected by the liquidity crisis (Acharya and Mora 2015) and to address funding needs drew on all possible sources available. One way to achieve this was indeed through retail bond issuance (Guiso and Viviano 2015). The retail bank bond market features unique characteristics that make this channel particularly attractive for banks. First, it is a more stable funding source than deposits, which are often subject to bank runs in turbulent times. The recent collapse of Silicon Valley Bank (SVB) in March 2023 is a notable example of this risk. Second, the yields on bank bonds from peripheral countries did not fully reflect the issuer risk and market liquidity, as yields were low compared to their implicit risk, highlighting the low-cost nature of this funding channel. Because banking crises are rare events, this behavior has not received much attention.

Our article is closely related, first, to research analyzing conflicts of interest between financial institutions and retail investors (see, e.g., Inderst and Ottaviani 2009; Hackethal, Haliassos, and Jappelli 2012; Guiso and Viviano 2015; Foerster et al. 2017; Hoechle et al. 2018; Florentsen et al. 2022). However, our work differs from this prior literature as, to our knowledge, we are the first to examine how the time-varying characteristics of banks and their branches are related to households' portfolio choices. Unlike previous literature that either confirms or contests the presence of conflicts of interest, our results support the argument that time-varying dimensions are relevant. Similar to Foà et al. (2019), we explore bank supply-side factors and investors' financial decisions. But whereas Foà et al. (2019) focus on the choice between fixed- and floating-rate mortgages, we look at households' exposure to own bank bonds—a stable and low-yield source of financing for banks during liquidity shortages. Understanding retail bond issuance provides valuable insights into a funding channel that has historically received limited attention from both academics and regulators.

Second, we contribute to the large literature on the asset allocation of retail investors, with a specific focus on diversification and local bias (e.g., Huberman 2001; Ivkovíc and Weisbenner 2005; Goetzmann and Kumar 2008). It is well known that households favor domestic over foreign investments (e.g., Kenneth and Poterba 1991; Cooper and Kaplanis 1994) or, within their country, invest disproportionately in the stocks of the company they themselves work for (Benartzi 2001; Liang and Weisbenner 2002). Using Danish data,

Andersen, Hanspal, and Nielsen (2019) report that during the 2007–2009 financial crisis households disproportionately invested in the stocks of their own banks. Those who incurred losses due to bank failures subsequently reduced their risk-taking, resulting in under-diversified portfolios. While this topic has been widely studied in the context of household portfolio equity positions, bond investments remain under-explored, despite evidence that home bias is more pronounced in bond holdings than in equity holdings. Moreover, while home bias in equity holdings has exhibited a downward trend, this phenomenon is much less pronounced in the case of bonds (Coeurdacier and Rey 2013).

Third, we contribute to the limited literature on bank bond issuance and its effect on portfolio decisions. Gil-Bazo, Hoffmann, and Mayordomo (2020) demonstrate that bank-affiliated mutual funds purchase their bank's bonds in the primary market to provide funding support during times of financial distress. Similar to our study, they also provide evidence that bank bonds are overpriced in the primary market, suggesting that banks secure more favorable funding conditions when issuing debt. We extend these findings by providing suggestive evidence that a similar effect may also apply directly to retail investors, which is a particularly valuable channel to explore, given this effect's regulatory implications.

Finally, we contribute to the literature on local financial markets. Previous studies have primarily focused on local lending conditions, documenting that information-intensive relationships between banks and their clients have significant economic implications (Degryse, Masschelein, and Mitchell 2011; Nguyen 2019). We extend this literature by examining another aspect of banking services and intermediation: how local competition, measured by branch-level deposit market share, relates to households' portfolio choices.

The article is organized as follows. Section 2 describes the data and the variable construction. Section 3 discusses the characteristics of the bank bond market in detail. Section 4 outlines the empirical strategy. Section 5 presents the findings. Section 6 provides a performance analysis of bank bonds and discusses portfolio reallocation. Section 7 displays robustness checks and limitations. Finally, Section 8 concludes.

2. Data and variables construction

We use data supplied by eight Italian CCBs, which issue relatively illiquid bonds as most of these bonds are unlisted. These banks provide a diversified spectrum of services—such as bank accounts, investment accounts, loans, and mortgages—that resemble those offered by standard brokerage firms in the USA (Hoechle et al. 2017). The banks operate through a network of branches spread across local communities.

Bank employees authorized to make financial recommendations under the Markets in Financial Instruments Directive (MiFID) regulation[8] work as advisors in these branches. This advisory service is free of charge and is provided through personal meetings between the client and the advisor.[9] Under this framework, advice is offered to all investors even when it is not directly solicited. To execute transactions via their bank, households are required to sign a contract with the bank that allows it to provide investment recommendations, which they are then free to follow or disregard.[10] Each bank supplied year-end

[8] This is a fundamental regulation in the European Union aimed at enhancing transparency, investor protection, and competition in financial markets.

[9] Advisory contacts made by telephone are very limited in number (around 1 percent), and no consultancy service is offered via email or in writing.

[10] Bank employee remuneration is based on a fixed wage plus a bonus that depends on bank and branch performance. We do not have information on the compensation contracts of bank advisors. However, having examined a typical incentive program at one of the banks in the dataset we can reasonably infer that this bonus constitutes around 10 percent of the overall compensation package. This is a relatively modest figure, but it is important to note that the sources of conflicts of interest are not limited to explicit, monetary incentives alone (Fecht, Hackethal, and Karabulut 2018), but may also be found in implicit incentives such as career progress and the reputational concerns of bank employees.

observations on households' asset allocation choices and households' responses to a MiFID questionnaire[11] over the period 2011–2015. The data provided include the portfolio composition of each household. Specifically, we have the following portfolio data concerning investments: account cash balance, own bank bonds, other bonds, government bonds, certificates of deposit, stocks, mutual funds, repos, insurance policies, and derivatives. With regard to investors' characteristics, data include the length of the bank–customer relationship, sociodemographic information, and investors' responses to questions addressing mainly financial experience and risk aversion.[12] The final dataset consists of 23,501 households who had an active investment account at some point during the period examined. In addition to the information on individuals, we collect bank- and branch-level data for the same period. At the bank level, we obtained bank characteristics and balance sheet data. Importantly, although heterogeneous in terms of operating policies our banks are characterized by a similar business structure and therefore comprise a homogeneous dataset of financial institutions. At the branch level, we have year-end information on the deposits collected from customers and on the specific geographic area in which these branches operate. We match the bank-supplied dataset with information from the Statistical Database of the Bank of Italy,[13] which offers local market data on the number of bank branches and deposits collected. Most importantly, this information is available at the municipality level, allowing us to precisely identify the reference market for our bank branches. Finally, we complement the above dataset with characteristics of all bonds issued by our banks and targeted at retail investors and outstanding over the period 2011–2015. More specifically, we collect information from Bloomberg and Refinitiv Eikon on bond type, yield, maturity, amount allocated, seniority, and the interest rate swap (IRS) rates. Overall, we obtain 383[14] bond issues by our eight banks outstanding over our sample period, of which 163 are fixed-rate, 136 are variable-rate (i.e., step-up and step-down bonds), and the remainder are floating-rate coupons (i.e., bonds with a coupon expressed as a fixed margin over index).[15] All issues are unsecured and therefore excluded from the deposit insurance scheme and subject to bail-in regulation under the BRRD.[16] Our dataset includes detailed features of investors, the reference banks, the branches, the bonds issued, and information on the local market.

2.1 Institutional background

With their widespread distribution across the country, Italian CCBs comprise 55.9 percent[17] of the total number of banks operating in Italy. The funding structure of CCBs is relatively simple and primarily composed of two channels: retail funding from deposits[18] and debt securities, and institutional funding from the national holding bank. During the period under analysis, in contrast to CCBs, some commercial banks underwent a bail-in procedure.[19] In each case, the losses affected only shareholders and subordinated bondholders, while senior bondholders always received the amounts contractually agreed upon. This does not, however, imply that they were not exposed to the risk of a bail-in.

[11] Investors filled out a questionnaire designed to gather information on investment experience, financial knowledge, risk profile, wealth, and investment goals. The information provided via the questionnaire was then reviewed by bank advisors to verify the suitability and appropriateness of various potential investment products. Most of our banks require their clients to fill out this questionnaire every three years.

[12] We provide a detailed discussion of the dataset's data cleaning in Supplementary Appendix Section A.1.

[13] The Statistical Database of the Bank of Italy is available here: https://infostat.bancaditalia.it.

[14] We exclude bonds with mixed coupons or complex floating rates.

[15] These banks do not issue callable, puttable, or convertible bonds.

[16] It is important to highlight that even though the bail-in regulation came into force on January 1, 2015, it also affects previous bank bond issues—that is, all unsecured outstanding bank bonds.

[17] In December 2015.

[18] A deposit insurance scheme guarantees deposits of up to EUR 100,000 per depositor.

[19] The best known cases concerned four regional banks (Banca Etruria, Banca Marche, Cassa di Risparmio di Ferrara, and Carichieti) and Monte dei Paschi di Siena, the third largest Italian bank at that time.

It is important to note that tax regime in Italy changed in 2012, making investments in bank bonds more costly, compared to those in government bonds. As a result, banks increased the yields on their issues to maintain the attractiveness of such investments.[20]

2.2 Bank bond characteristics

We observe aggregate data on each investor's own bank bond holdings. The lack of information on individual bond holdings prevents us from measuring bond characteristics at the investor level. We proxy this by constructing a bank-level measure, which we compute as the year-end weighted average of the bond characteristic on the amount allocated to retail investors (Guiso and Viviano 2015). We focus on two main characteristics: risk premium, proxied using bond spread, and the maturity of the bonds.[21]

As credit ratings at the issue level are not available for the bonds in our sample, we construct a measure of credit risk at the issuer level. Specifically, we use banks' internal credit ratings as external credit ratings are not available. These ratings are assigned by the national holding bank, yearly, to all banks in our sample except one. Internal ratings divide bank credit risk into seven classes, where Class 1 has the lowest and Class 7 has the highest credit risk assessment. In general, banks belonging to Classes 1–4 are considered relatively safe and can conduct their regular business. Banks in Classes 5 or 6 require some supervision by the national holding bank, while those with a Class 7 rating are considered very risky and might even have their business operations curtailed. More importantly, the holding bank estimates the corresponding default probability over a 1-year horizon for each of these classes. These probabilities quantify banks' perceived creditworthiness and should, therefore, be reflected in bond pricing. We thus use banks' estimated default probabilities to measure credit risk. Table 1 (Panel A) reports descriptive statistics.

2.3 Investor demand-side factors

We use a comprehensive set of investor-specific characteristics that, according to prior literature (e.g., Foerster et al. 2017), should be of first-order importance in determining investors' asset allocation choices. These characteristics include demographics, account and socioeconomic information, as well as measures of risk tolerance and financial experience. For the last of these, scores are obtained by branch advisors through the MiFID questionnaire, which is filled out by the investor when advisory first begins. Specifically, risk tolerance is computed from responses to questions regarding the investor's financial status and investment objectives and horizon, as well as regarding reactions to negative market movements. Financial experience, meanwhile, is constructed from responses to questions related to the type of financial products the investor knows and has invested (or is currently investing) in.

Table 2 shows summary statistics for demand-side investor attributes. With respect to demographics (Panel A), we have an almost equal split between female and male households (49 percent are female), who are, on average, 54 years old. Almost half (46 percent) report having a high-school diploma, 44 percent have completed elementary or middle school, and the remaining hold a university degree. As far as work is concerned, 42 percent of the individuals are employed, 22 percent are self-employed, and 25 percent are retired, while the remaining 10 percent belong to the "unemployed" category, which also includes homemakers and students.

Looking at account and socioeconomic characteristics (Panel B), we observe that investors are characterized by a long relationship with their bank, with an average duration of around 16 years. As investing is, for the average household, likely to have a retirement focus, we observe a long investment horizon of more than 7 years, which is more than three

[20] Until 2012, bank bonds shared a 12.5 percent tax rate with government bonds but later aligned with other instruments (20 percent), rising to 26 percent in 2014, while government bond rates remained unchanged.
[21] Details on the construction of these variables are available in Supplementary Appendix Section A.2.

Table 1. Bank bond and portfolio characteristics.
This table reports bank-level bond characteristics defined in Section 2.2 (Panel A) and portfolio characteristics (Panel B). Portfolio characteristics are reported as a share of the bond portfolio and total portfolio. The category *Other bonds* includes bonds not issued by the banks in the sample. The category *Others* includes repos, insurance policies, and derivatives. All portfolio values are in € and scaled by dividing by 1,000. The statistics are computed cross-sectionally across banks or account holders, after averaging in the time-series dimension at the bank or account holder level.

Variable	Mean	Pctl(25)	Median	Pctl(75)	Std. Dev.
Panel A: Bank-level bond characteristics					
Risk premium (%)	1.10	0.92	1.07	1.38	0.35
Maturity (years)	2.01	1.89	1.96	2.33	0.54
Credit risk (1-year PD, %)	1.78	0.55	1.06	1.65	2.19
Panel B: Portfolio characteristics					
Bond portfolio share					
Own bank bonds	0.69	0.38	0.93	1.00	0.39
Government bonds	0.11	0.00	0.00	0.01	0.25
Other bonds	0.08	0.00	0.00	0.00	0.22
Certificates of deposit	0.12	0.00	0.00	0.00	0.29
Tot portfolio share					
Own bank bonds	0.40	0.00	0.31	0.78	0.39
Government bonds	0.06	0.00	0.00	0.00	0.19
Other bonds	0.04	0.00	0.00	0.00	0.15
Certificates of deposit	0.07	0.00	0.00	0.00	0.23
Equity	0.06	0.00	0.00	0.00	0.19
Mutual funds	0.28	0.00	0.05	0.48	0.38
Others	0.09	0.00	0.00	0.00	0.22
Portfolio value in €					
Own bank bonds	26.72	0.00	9.51	30.54	60.01
Government bonds	6.54	0.00	0.00	0.00	34.68
Other bonds	4.15	0.00	0.00	0.00	20.64
Certificates of deposit	4.54	0.00	0.00	0.00	26.99
Equity	2.07	0.00	0.00	0.00	14.63
Mutual funds	8.18	0.00	1.26	7.05	25.68
Others	8.65	0.00	0.00	0.00	45.83
Total portfolio	60.84	10.08	27.75	65.83	114.61

times the average bond maturity. When it comes to wealth, the majority of investors (i.e., 53 percent) have total assets (i.e., financial products, real estate, and cash) of less than EUR 200,000 and report on average an annual income of EUR 23,320. The average income resembles that reported in the study of Stolper and Walter (2018), but is slightly lower than that in data from the Bank of Italy's Survey of Household Income and Wealth (SHIW) of 2015, which reports an average annual income of roughly EUR 30,000.

Finally, focusing on risk tolerance and financial experience (Panel C), we document that the vast majority of investors (82 percent) report "moderate" risk tolerance, while only 8 percent and 10 percent have, respectively, "low" and "high" risk tolerance. In all, 69 percent of the investors report "moderate" experience in financial markets and 23 percent "low" experience, while only a small fraction (8 percent) belong to the "high" experience category. It is not surprising that only few households fall within the highest categories. It is well documented that financial literacy and market participation are typically low in Italy (Lusardi and Mitchell 2011). Furthermore, for those who do engage with the market, investments have historically been primarily focused on assets with lower market volatility than equity, such as fixed-income investments, which are typically classified by banks as

Table 2. Descriptive statistics for investor characteristics.
This table reports summary statistics for investor characteristics. Panel A reports demographic information. Panel B states account and socioeconomic characteristics. Panel C focuses on measures of risk tolerance and financial experience, described in detail in Section 2.3. In Panel B, the income measure is in € and scaled by dividing by 1,000. The statistics are computed cross-sectionally across account holders, after averaging in the time-series dimension at the account holder level.

Variable	Mean	Pctl(25)	Median	Pctl(75)	Std. Dev.
Panel A: Demographics					
Female	0.49	0.00	0.00	1.00	0.50
Age	53.95	44.00	53.00	64.50	14.76
Education					
Below high school	0.44	0.00	0.00	1.00	0.49
High school	0.46	0.00	0.00	1.00	0.49
Above high school	0.10	0.00	0.00	0.00	0.30
Occupation					
Self-employed	0.22	0.00	0.00	0.00	0.41
Employed	0.42	0.00	0.00	1.00	0.49
Unemployed	0.10	0.00	0.00	0.00	0.30
Retired	0.25	0.00	0.00	0.60	0.43
Panel B: Account and socioeconomic characteristics					
Length of relationship (years)	15.72	9.00	16.33	22.00	7.96
Investment horizon (years)	7.39	5.00	9.00	10.00	2.78
Total assets					
< 200,000€	0.53	0.00	1.00	1.00	0.49
200,000€–500,000€	0.36	0.00	0.00	1.00	0.47
500,000€–1,000,000€	0.08	0.00	0.00	0.00	0.26
> 1,000,000€	0.03	0.00	0.00	0.00	0.17
Income (in €)	23.52	10.00	22.50	30.00	15.56
Panel C: Risk tolerance and financial experience					
Risk tolerance					
Low	0.08	0.00	0.00	0.00	0.26
Moderate	0.82	1.00	1.00	1.00	0.37
High	0.10	0.00	0.00	0.00	0.28
Experience					
Low	0.23	0.00	0.00	0.00	0.41
Moderate	0.69	0.00	1.00	1.00	0.45
High	0.08	0.00	0.00	0.00	0.26

low-to-medium risk. At the same time, the low frequency in the lowest categories might reflect the fact that households, to be eligible to invest, still have to fulfill banks' compliance criteria. Indeed, households with low financial knowledge and risk tolerance experience significant restrictions with regard to the assets they can invest in: investing in equity, for example, is not allowed. Furthermore, given that these scores are based on households' self-evaluation responses, convergence to moderate score levels is expected. Importantly, all households are eligible to invest in unstructured bonds (bank bonds, government bonds, or similar fixed-income investments) irrespective of their level of risk tolerance or financial experience.

2.4 Bank supply-side factors

We use three measures of supply-related factors that should affect the propensity of banks to raise funds through the advisors operating at their branches. The first is the share of

loans over direct funding from customers (*Funding gap*), which captures the asset–liability mismatch. As discussed by Acharya and Mora (2015), when crises hit the banking system itself, as during the 2007–2009 crisis, banks short of deposits need additional funding to keep up with credit line demand. This liquidity management problem arises when market stress scenarios hit the role of banks as liquidity providers, who otherwise would be seen as safe havens by depositors[22] during regular crises and would not experience weak funding inflows. As our setting covers the period after the onset of such a financial crisis, following this argument we expect banks that have a higher share of loans not sufficiently covered by funding sources to experience a further increase in their loan-to-funding ratio, and therefore a higher funding gap. As a result, to meet funding needs these banks should have an incentive to steer investors toward the bonds they issue, which should result in an immediate and stable injection of liquidity.

The second measure of supply-related factors is a standard measure of bank profitability, the return on average assets (*ROA*). When banks are less profitable, they have a natural incentive to set operating policies that aim at increasing their performance. Such policies are set by the headquarters and are then transmitted to all branches. Advisors operating in these relatively less profitable banks might have an incentive to suggest investing in the bonds issued by the banks, which are a relatively low-interest-rate channel via which to raise funds (Grasso et al. 2010).

The third variable is constructed at the branch level and is a proxy of market power. Because competition plays an important role in shaping conflicts of interest (Mehran and Stulz 2007), market power clearly influences the supply of bank bonds.[23] In this framework, we construct the following proxy of a branch's market share, in terms of deposits:

$$MarketShare_{a,b,t} = \frac{TotalBranchDeposits_{a,b,t}}{TotalMarketDeposits_{t}} \quad (1)$$

The variable is constructed at time t for branch b of bank a, for a specific geographic area (i.e., the municipality) in which the branch operates. It is the ratio between the branch b total amount of deposits raised from customers and the total amount of deposits raised from customers by all bank branches operating in that municipality. Higher values of the variable reflect stronger presence within the local community, thereby translating into more market power. Table 3 (Panel A) shows summary statistics for supply-side bank and branch characteristics.

3. The Italian bank bond market at a glance

Several aspects of the Italian bank bond market warrant some discussion. First, bank bonds are relatively illiquid: they are mostly traded OTC, where market makers set indicative prices through standard data providers. However, quotes are not consistently available.[24] Even assuming an active OTC market, it is important to note that this remains a relatively illiquid investment for retail investors, since access to market information is costly to them

[22] The main reason for this is that depositors are covered by deposit insurance.

[23] If a bank branch is monopolist in its local market, it can choose the type of advice it wants to provide and there is a clear funding advantage for it in recommending its bonds to clients. An increase in the number of bank branches, meanwhile, generates competition with regard to the value of the advice on offer.

[24] In our setting, only 124 of the issued bonds have partial secondary price data available in Refinitiv Eikon, and of these, only nine have price data spanning their entire lifetime, from issuance until maturity. Secondary price data are not available at all from other standard data providers such as Bloomberg. We observe that the availability of these secondary market data starts around 2009 as a result of a communication by the Consob (the Italian Securities and Exchange Commission) regarding rule changes for the placement of illiquid securities. As the legislation made it more complex to place illiquid bonds with clientele, banks started quoting their bonds to comply with this rule. However, Refinitiv Eikon discontinued coverage of secondary market data for the bonds in our sample in 2012 due to the lack of observable market issues and stale pricing.

Table 3. Descriptive statistics for banks and their branches.
This table shows summary statistics for banks and their branches. Specifically, Panel A reports statistics for the bank and branch supply-side factors defined in Section 2.4. Panel B focuses on other bank and branch characteristics. Own bank bond funds are the amount in bonds collected by bank branches, while deposits are the amount in deposits collected by bank branches. These latter measures are in € and are scaled by dividing by 1,000. The statistics are computed cross-sectionally across banks or branches, after averaging in the time-series dimension at the bank or branch level.

Variable	Mean	Pctl(25)	Median	Pctl(75)	Std. Dev.
Panel A: Bank and branch supply-side factors					
Bank					
Funding gap	0.95	0.88	0.95	1.00	0.11
ROA (%)	0.15	0.05	0.20	0.30	0.25
Branch					
Market share (%)	1.91	0.44	1.25	2.55	2.15
Panel B: Other characteristics					
Bank					
Tier1 (%)	13.00	11.44	12.93	14.74	2.23
Log Assets	13.49	12.85	13.61	14.17	0.82
Branch					
Own bank bond funds (in €)	3,856.81	1,261.67	2,656.47	4,649.46	5,129.80
Deposits (in €)	2,974.51	1,292.79	2,198.73	3,681.66	3,135.83

and only rarely sought. As a result, investors mainly buy bank bonds in the primary market, thus taking a buy-and-hold position (Grasso et al. 2010).

Second, as these bonds are extremely illiquid and stale, they display mispricing during the aftermath of the financial crisis. This was especially the case in the retail market. We discuss this issue in detail in Section 3.1 for our setting, but it is part of a much bigger phenomenon that affected bond issues in various countries more affected by the sovereign debt crisis in the late 2000s and early 2010s (Gil-Bazo, Hoffmann, and Mayordomo 2020): bond yields were low and contributed to keeping banks' funding costs low.

Third, when placing their bonds in the primary market banks do not charge fees, thus replicating the case for government bonds. By law, banks are not allowed to charge fees for underwriting government bonds, as the Italian government compensates them for the placement. In the secondary market, the same transaction fee applies to both bank and government bonds.

Overall, the characteristics of the primary market made the placement of bonds among retail clients a particularly convenient funding channel for banks at a time when high levels of uncertainty hampered access to other market-based funding sources (ECB 2012). It is important to stress that they represent a low-cost funding source, as reflected by the low bond yields. Moreover, it provides a more stable funding channel compared to deposits, which, despite being less costly, are subject to bank runs (Acharya and Mora 2015). A notable example of this vulnerability was the collapse of SVB in March 2023, when the bank faced a severe liquidity crisis due to the rapid and large-scale withdrawal of deposits. This event underscores the risks associated with deposit-based funding during periods of financial distress. In sum, alternative funding channels were either poorly accessible at that time (e.g., interbank market) or relatively less appealing to banks in terms of the price–stability ratio (e.g., deposits).[25]

[25] In Supplementary Appendix Section A.3, we show and discuss the evolution of bond flows targeted at retail investors for the banks in our sample over the period 2011–2015.

3.1 Test for market discipline

According to the market discipline literature, bond yields should reflect the issuer's risk-taking characteristics. This implies that if bank characteristics are weakly related to bond spread, then market discipline is weak and market mispricing of banks' risks is likely to occur. If this is the case, the risk of holding a portfolio with a high exposure to own bank bonds would hardly be optimal. To test this mechanism, we perform two sets of analyses. First, we compare the yields at issuance between our banks' and government bonds over time. Specifically, we examine the difference between the yield to maturity of the bonds in our sample and the yield of maturity-matched Italian government bonds. Second, we run regressions of bank bond spreads, defined as the difference between the yield to maturity and that of the corresponding maturity-matched IRS (risk-free rate),[26] on bond characteristics and standard bank risk-taking attributes, which, as theory would predict, should affect pricing.[27]

Figure 1 shows the difference at issuance between bank bonds and government bonds. As a striking result, we observe that the spread is negative for several issues, especially over the 2007–2008 financial crisis and the subsequent European sovereign debt crisis. A negative spread implies that the market perceives the bonds issued by the government as riskier than those issued by the CCBs that are the object of our analysis. This evidence appears counterintuitive. There is a well-known literature documenting the strong bank–sovereign relationship (Acharya, Drechsler, and Schnabl 2014). Sovereign risk affects banks via different channels. Typically, Italian banks have large exposures to domestic government debt. While the specific reasons for this linkage are beyond the scope of this article, the literature supports the idea that banks' risks, as reflected in yields, should be at least comparable to those of the country in which they are located.

In support of the abovementioned mispricing argument, Table 4 documents a weak relationship between bank characteristics and bond spreads. Bank size and profitability exhibit a positive, though weakly significant, coefficient in some specifications. In general, however, there does not appear to be a strong and robust pattern connecting banks' accounting measures and bond prices. Regarding credit risk, a notable result emerges: a higher 1-year default probability, as estimated by the banks' internal credit systems, is associated with a lower spread.

4. Empirical strategy

According to classical portfolio theory, households' portfolio choices should depend on the expected risk-adjusted return of the investment. This information, together with investor-specific characteristics (e.g., Campbell 2006; Calvet, Campbell, and Sodini 2007), should have first-order importance in explaining investors' asset allocation choices (e.g., Foerster et al. 2017) and reflect the demand for specific assets—particularly own bank bonds in this context. We test this hypothesis by estimating baseline regressions to investigate the role of investor attributes (such as demographics, account and socioeconomic factors, risk tolerance, and financial experience) and investment features (such as risk premium and maturity). These are primary determinants of portfolio choices and thus reflect the demand side. Our specification reads as follows:

$$\begin{aligned} OwnBankBonds_{i,a,b,t} = {} & \beta_1 InvestorChars_{i(,t)} + \beta_2 BondChars_{a,t} \\ & + \mu_t + \mu_{a(b)} + \mu_g + \varepsilon_{i,a,b,t}, \end{aligned} \tag{2}$$

where the dependent variable is own bank bond share—that is to say, the total portfolio share invested in bonds issued by bank a at time t for investor i, who receives

[26] For details of the choice of the risk-free rate, see Supplementary Appendix Section A.2.
[27] Descriptive statistics of bank characteristics are available in Panels A and B of Table 3.

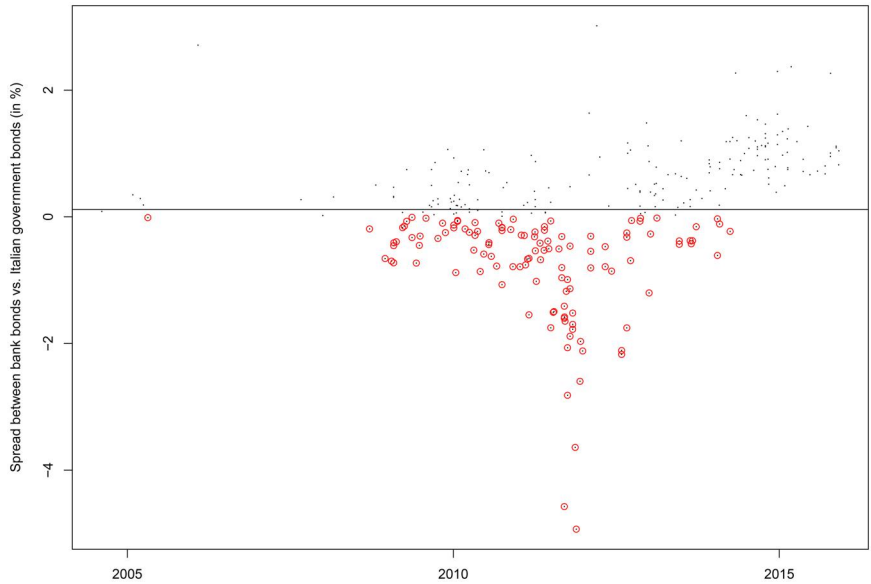

Figure 1. Spread at issuance between bank and government bonds.

The figure illustrates the difference in yields (in percent) at issuance between bank bonds and maturity-matched Italian government bonds. For bank bonds, we use issuance data of fixed-rate securities from the eight local banks in our sample. The time period is from November 2004 to December 2015.

recommendations from advisors operating in branch b of bank a.[28] The $InvestorChars_{i(,t)}$ vector includes a different set of household-specific characteristics, namely: (i) demographics, (ii) account and socioeconomic characteristics, and (iii) measures of risk tolerance and financial experience, as detailed in Section 2.3. The $BondChars_{a,t}$ vector comprises proxy variables for investment attributes. As defined in detail in Section 2.2, we include the bank bond risk premium and aggregate bond maturity.[29] For the latter, we construct a dummy variable based on a 2-year cutoff to reflect the minimum reserve requirements that banks must meet for bonds with maturities of less than 2 years. The year fixed effects, which capture year-specific unobserved characteristics, are indicated by μ_t. Bank (bank branch) fixed effects are indicated by μ_a (μ_b), respectively. These factors are important to capture time-invariant bank(branch)-specific characteristics. Finally, μ_g indicates province fixed effects to control for local shocks at the province level.

Next we examine the role of bank and branch characteristics. Investor attributes should be sufficient to explain portfolio choices, conditional on investor and investment characteristics. This expectation holds even when investors receive financial advice from bank employees, who are responsible for providing recommendations tailored to clients' needs. However, an alternative perspective (e.g., Inderst and Ottaviani 2009, 2012; Foà et al. 2019) suggests that banks may have incentives to guide clients, through their employees, toward purchasing their own securities, such as their own bonds. In this case, bank- or branch-level incentives could influence portfolio decisions, even after controlling for bond and investor characteristics, potentially favoring the bank. This implies that two investors with similar risk-adjusted returns and observable characteristics may have different exposures to own bank bonds, depending on the advice received from employees at different banks or branches. We test this hypothesis

[28] In other words, for each portfolio, four dimensions were considered: investor i, time t, reference bank a, and branch b. Unfortunately, the dataset does not include information about which branch advisor each client spoke to. Therefore, inference is provided at the branch level.

[29] Section 2.2 also includes a bank-level measure of credit risk. We investigate the role of credit risk in detail in Section 5.3.

Table 4. Test of market discipline.
This table shows estimates from regressing bank bond spread on bank risk-taking variables and bond characteristics. For fixed coupon bonds, the bank bond spread is the difference between bond yield to maturity and the maturity-matched IRS. For variable coupon bonds—i.e., bonds with fixed margin over index—the bank bond spread is the margin rate. The *Funding gap* variable is defined as the share of loans over direct funding from customers. The *ROA* variable is the return on average assets (in percent). The *Tier1* variable is the Tier 1 ratio (in percent). The *Log assets* variable is the logarithm of total banks' assets. The *Maturity* variable is the bond maturity in years. The *Log Amount issued* variable is the logarithm of total amount of bonds issued. *Fixed coupon* and *Guaranteed* are dummy variables taking the value of 1 for bonds with a fixed coupon structure or a bank guarantee. The *Credit risk* variable measures banks' probability of default (in percent), as measured by their internal credit ratings. *Raised tax rate* is a dummy variable indicating bonds issued after the increase in the interest rate tax. Standard errors clustered at the bank level are reported in parentheses. ***, **, and * denote that estimates are statistically significant at the 1, 5, and 10 percent levels.

	Bank bond spread		
	(1)	**(2)**	**(3)**
Funding gap	1.48	2.85	3.36
	(1.89)	(1.68)	(2.70)
ROA	1.11**	0.234	1.22**
	(0.398)	(0.286)	(0.390)
Tier1	−0.018	−0.027	−0.233*
	(0.071)	(0.080)	(0.115)
Log assets	1.87*	2.17**	0.026
	(0.929)	(0.852)	(1.07)
Maturity	0.003	0.016	−0.007
	(0.032)	(0.035)	(0.041)
Log amount issued	0.004	0.013	0.029
	(0.017)	(0.015)	(0.015)
Fixed coupon dummy	0.931***	0.909***	0.779***
	(0.160)	(0.158)	(0.198)
Guaranteed dummy	−0.751***	−0.794***	−0.635*
	(0.202)	(0.195)	(0.288)
Credit risk (1-year PD)		−0.064**	−0.039**
		(0.019)	(0.015)
Raised tax rate dummy			1.08**
			(0.339)
Bank FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
Observations	214	196	196
Adjusted R^2	0.585	0.601	0.539

about the role of bank and branch characteristics and extend equation (2) to incorporate this information. Specifically, we estimate the following regression model:

$$\begin{aligned} OwnBankBonds_{i,a,b,t} = {} & b_1 BankChars_{a,t-1} + b_2 BranchChar_{b,t} \\ & + b_3 InvestorChars_{i(t)} + b_4 BondChars_{a,t} \\ & + \mu_t + \mu_{a(b)} + \mu_g + \varepsilon_{i,a,b,t}, \end{aligned} \tag{3}$$

where *BankChars* captures a set of characteristics for bank a observed at year $t-1$, as detailed in Section 2.4. This includes the funding gap (*Funding gap*), as defined by the share of loans to total funding from customers, and the return on average assets (*ROA*).[30]

[30] The bank variables are measured at time $t-1$ to address potential reverse causality issues between balance sheet characteristics and investor choices. The following are possible reverse causality concerns: banks facing

The *BranchChar* variable observed for branch b at time t is the bank branch's market share, expressed in terms of deposits. If demand-side factors are the only drivers of own bank bond concentration, then equation (2) should be the most informative specification. If, however, supply-side factors also matter, then we expect equation (3) to reveal potentially interesting additional dynamics. If this is the case, the coefficients of b_1 and b_2 should show statistical significance and economic relevance.

In this framework, a potential concern is related to sorting (Foà et al. 2019). More risk-loving investors might cluster at banks (or branches) that exhibit a better ability to sell products, which would generate a correlation between investor investment choices and bank (or branch) characteristics. As long as sorting involves a time-invariant component, this problem is addressed by including bank or branch fixed effects.[31] Another problem is related to the potential correlation between unobserved individual attributes and time-varying bank and branch characteristics. To address this problem, we proceed in two steps. First, we control for investor fixed effects in some specifications. Second, we use a correlated hybrid model, namely a random-effect model with Mundlak (1978) corrections.

5. Results

In this section, we discuss the main results. First, we provide stylized evidence about the characteristics of bank bond investors. Next we investigate the role of investor demand-side factors as well as bank supply-side factors. Finally, we analyze the role of credit risk.

5.1 Portfolio characteristics of households investing in own bank bonds

Table 1 (Panel B) shows portfolio characteristics. As a striking observation, the average investor in the dataset holds about 70 percent of her or his *bond* portfolio in own bank bonds, with the median of the distribution being 100 percent. These are very large numbers and clearly indicate that the lack of diversification is extremely pronounced. If we look at the total portfolio, the situation is still severe: the average investor holds a 40 percent share of her or his *total* portfolio in own bank bonds and, most importantly, the 75th percentile of the distribution is 78 percent. The remaining fractions of the total portfolio are mainly invested in funds (28 percent), in certificates of deposits (7 percent) and in other bonds (4 percent). Investment in equity and government bonds appears marginal (6 percent). One reason for the low fraction of government bond investment could be related to the negative spillovers of the sovereign debt crisis: with uncertainty levels escalating following the collapse of Greece and subsequent bailout packages, investing in government bonds simply became less attractive.

Even when looking at portfolio values, own bank bonds stand out compared to other investments. Own bank bond value is indeed roughly three times that of the second largest investment (i.e., EUR 26,720 versus EUR 8,650). In general, we document that portfolio values are right-skewed, with the mean value of EUR 60,840 above the median of EUR 27,750. In terms of total portfolio size, the average values are consistent with previous studies on household finance (e.g., Stolper and Walter 2018).

Overall, these statistics highlight a clear picture: investment in bank bonds is extremely popular. There are clearly multiple reasons why this pattern emerges. In the following, we investigate them in detail.

stronger demand for bank bonds might document higher profitability as a result of the fact that bonds are a relatively low-yield source of funding, or banks might attempt to attract more deposits. By using lagged variables, we rule out these possibilities: a current shift in the demand for bank bonds cannot affect banks' balance sheet characteristics of the previous year.

[31] However, sorting could also happen in the case of a time-varying component. If this is the case, it would most likely occur through bank characteristics—that is to say, balance sheet information. Given investors' limited access to banks' balance sheet information, we do not expect banks' clientele base to change with their balance sheet information.

5.2 What drives concentration in own bank bonds?

In the following, we report the relationship between bank bond concentration and prominent features of the demand (i.e., Section 2.3) and the supply side (i.e., Section 2.4).

5.2.1 Role of investor demand-side factors

Figure 2 reports the estimated coefficients from equation (2), analyzing how investor demand-side factors, as well as bond characteristics, relate to households' bank bond share. To ease the interpretation, all continuous variables are standardized to have a standard deviation of one.[32] Panel A focuses on demographic information. We find that, on average, female investors hold a higher bank bond share. Interestingly, investors who report having an education level above high school level (relative to investors with a high school education only) concentrate less of their bond portfolio in own bank bonds, whereas investors who report having an education level below high school (relative to investors with a high school education) concentrate more of their bond portfolios in these securities. This result supports the literature that states that education matters in investment decisions (Guiso and Jappelli 2005; Campbell 2006; Calvet, Campbell, and Sodini 2007; Kumar 2009). Age and occupation are weakly relevant and do not exhibit a consistent pattern.

Panel B includes account and socioeconomic characteristics. The length of the bank–client relationship—a measure for trust (Glaeser et al. 2000)—has a positive and significant sign (the p-value is 0.033), documenting that households with longer banking relationships concentrate more than households with shorter banking relationships.[33] This effect is consistent with the literature that shows that long-lasting bank–client relationships are associated with feelings of trust toward the issuer. Stolper and Walter (2018) show that familiarity and the length of the relationship are indeed essential factors in influencing the extent to which a client follows their advisor's suggestions. As an interesting result, investors who report having total assets below EUR 200,000 concentrate more in bank bonds than investors with assets above this level. In line with this evidence, income has a negative and statistically significant coefficient, indicating that households with higher levels of this variable allocate a lower portfolio share to own bank bonds than investors with lower levels. These findings are consistent with Goetzmann and Kumar (2008), who find that less sophisticated investors hold under-diversified portfolios. Long investment horizons negatively affect own bank bond share. This result is probably explained by the fact that these securities are short- to medium-term investments. Indeed, as reported in Table 1 (Panel A) the average bank bond maturity is 2 years.

Panel C shows results for measures of risk tolerance and financial experience. Clients' risk tolerance shows a positive coefficient for investors with moderate risk tolerance, but a negative coefficient for investors with high risk tolerance. We interpret this latter outcome as evidence that high-risk-tolerant households, being more prone to losses, prefer to invest in asset classes that are riskier in terms of market volatility, including, for example, equity (Foerster et al. 2017). At the same time, this effect may reveal the common misconception—probably more common among households characterized by low/moderate risk tolerance—that investing in own bank bonds ensures a relatively safe investment. This argument is also consistent with the banks' compliance criteria (see Section 2.3), which classify unstructured fixed-income investments such as bank bonds as low-risk investments. Investing experience is inversely related to share in own bank bonds, consistent

[32] The results, in table format, are available in Supplementary Appendix Table B1. Specifically, the output from figure 2 is related to the specification as in Column (3) of Supplementary Appendix Table B1. Note that the coefficients in Supplementary Appendix Table B1 are not standardized. To address potential multicollinearity, we compute the variance inflation factor (VIF) for the regressors, all of which are below the standard cutoff of 5, and report the correlation coefficients in Supplementary Appendix Table B2.

[33] Throughout this article, "concentration" refers to proportion of investments. To "concentrate" in, say, own bank bonds thus describes the act of investing more in such bonds.

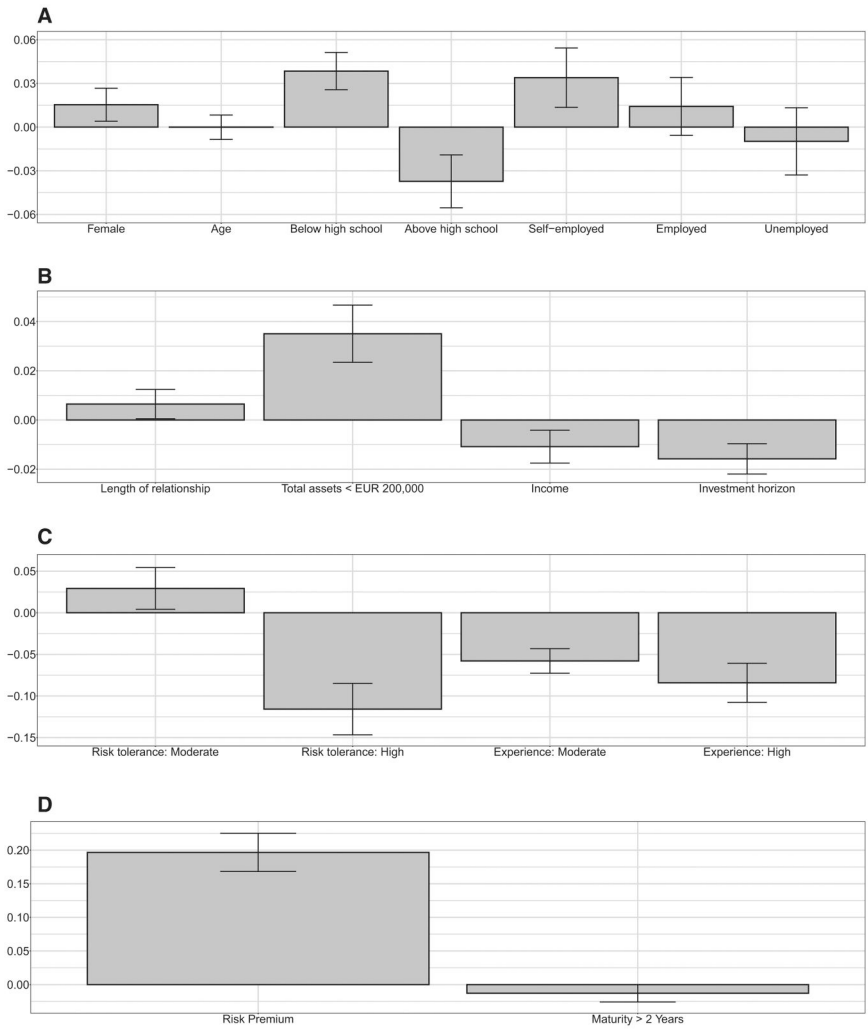

Figure 2. Coefficients from a regression of own bank bonds on investor demand-side factors and bond characteristics.

(A) Demographics. (B) Account and socioeconomic characteristics. (C) Risk tolerance and financial experience. (D) Bond characteristics. The panels plot the coefficients from regressing own bank bonds on investor demand-side factors and bond characteristics, controlling for bank and year × province fixed effects. To ease the interpretation, we standardize all continuous variables. The gray bars represent coefficient estimates, and the black lines are the 95 percent confidence intervals with standard errors clustered at the investor level. Demand-side factors are defined in detail in Section 2.3. Bond characteristics are defined in Section 2.2. The detailed regression output (unstandardized) is reported in Column (3) of Supplementary Appendix Table B1.

with the results of Goetzmann and Kumar (2008) for retail investors and of Bailey, Kumar, and Ng (2011) for mutual funds.

Finally, Panel D reports the effect of bond characteristics. We document that the bank bond risk premium has a positive and statistically significant effect on bank bond concentration. This finding is consistent with Guiso and Viviano (2015), who document that higher bond returns are associated with a higher probability of buying own bank bonds. The relationship between bank bond concentration and bond maturity above 2 years,

meanwhile, is negative and statistically significant only at the 10 percent level (the *P*-value is .054). One possible explanation for this is that investors perceive longer maturity as riskier and therefore prefer to invest in short-term bank bonds, eventually rolling them over. Furthermore, it is important to note that this result is also consistent with the short investment horizon for investors with high own bank bond concentration.

In sum, we observe that households with a higher share of their investments in bank bonds tend, on average, to have a lower education level, a longer relationship with the bank, lower income and wealth (in terms of total assets), and a shorter investment horizon. Furthermore, they report moderate risk aversion and low financial experience. Therefore, investor-specific characteristics capture relevant variation in own bank bond holdings. In terms of economic magnitude, it is not surprising that the bank bond risk premium has the strongest effect: a one standard deviation increase in this premium results in around a 20 percent increase in the share of bank bonds held. Among investor characteristics, the most relevant are those related to education below high school level and total assets below EUR 200,000, which are associated with a 3.8 percent and 3.5 percent increase in bank bond share, respectively. Regarding the risk tolerance and financial experience variables, the most significant effect is associated with high risk tolerance, with a coefficient of −11.6 percent.

5.2.2 Role of bank supply-side factors

Table 5 shows regression estimates when including bank supply-side factors. These analyses seek to explain investors' own bank bond concentration using time-varying measures at the bank and branch level (while controlling for bank/branch, and time fixed effects). Columns (1) and (2) use the funding gap (*Funding gap) and return on average assets (ROA*) as time-varying supply-side measures. We observe not only that these variables are highly statistically significant but also that their signs are in the direction of the banks' own interests. Both when the issuer bank has low profitability and when it experiences a higher funding gap, investors concentrate more in their own bank's bonds. The economic impact of these variables is far from negligible. Considering the results in the first column of Table 5, a 1-SD increase in the funding gap is associated with a 13.2 percent increase in own bank bond concentration. Similarly, a one standard deviation decrease in profitability is associated with a 6.75 percent increase in bank bond concentration.

In the third column, we add our third supply-side measure—that is, a bank branch's market share. We expect that high market share, that is, high penetration in the local community, affects the supply of bank bonds. Reduced competition in the local market where branches operate may allow banks with a stronger competitive position to exert a greater influence over portfolio recommendations, which could result in a closer alignment with the bank's interests. We observe that when branches have a higher market share, investors concentrate more in their own bank bonds. Economically, a 1-SD increase in the variable is associated with a 4.52 percent increase in own bank bond concentration. Importantly, results are confirmed when running the hybrid model. Indeed, the fourth column reports estimates from the random regression model with Mundlak corrections, which allows us to control for investor fixed effects while simultaneously including year and bank random effects.

In Supplementary Appendix Table B3, we provide additional evidence of the role of bank and branch measures. Even when controlling for investor-specific time-invariant unobserved characteristics, as well as for local shifts in demand, results remain unaltered.

Taken together, this evidence is consistent with the hypothesis that changes in funding needs, profitability, and market penetration are related to investors' concentration in own bank bonds, which appears to be greater when banks have a heightened incentive to raise funding.

Table 5. Regression of own bank bonds on bank supply-side factors.
This table shows estimates from panel regressions of households' own bank bond exposure on bank supply-side measures, controlling for investor and investment characteristics. Investor characteristics include all the investor-specific variables, as defined in Section 2.3. Bond characteristics include the bank bond risk premium and bond maturity, as defined in Section 2.2. Standard errors are clustered at the investor level and are reported in parentheses. ***, **, and * denote that estimates are statistically significant at the 1, 5, and 10 percent levels.

Bank bond share (Total portfolio)

	(1)	(2)	(3)	(4)
Funding gap	1.20***	1.01***	0.964***	0.579***
	(0.086)	(0.084)	(0.084)	(0.067)
ROA	−0.270***	−0.257***	−0.240***	−0.156***
	(0.007)	(0.007)	(0.007)	(0.007)
Market share			0.021***	0.013***
			(0.002)	(0.002)
Observations	44,621	44,621	44,621	44,621
Adjusted R^2	0.138	0.201	0.203	0.137
Investor characteristics	Yes	Yes	Yes	Yes
Bond characteristics	Yes	Yes	Yes	Yes
Bank FE	Yes	No	No	Yes
Branch FE	No	Yes	Yes	No
Year FE	Yes	Yes	Yes	Yes
Investor effects (Mundlak)	No	No	No	Yes

5.2.3 Investor level of financial sophistication and bank relationship

Results so far show a significant joint effect between investor demand-specific and bank supply-specific characteristics. Next, we combine these two dimensions to investigate if—and if so, in which direction—they influence each other. We are interested in understanding whether the effect of time-varying bank factors on investors' share of own bank bonds changes for different groups of investors. In this regard, we focus on investor attributes that research has identified as important dimensions in diversification decisions (Goetzmann and Kumar 2008) or that relate to the banking relationship (Stolper and Walter 2018). Specifically, we analyze financial sophistication and measure it, as in the work of Calvet, Campbell, and Sodini (2007), using wealth, proxied by the total amount of assets or income, along with the level of education. Additionally, we include the length of the relationship, which can serve as a proxy for trust (Glaeser et al. 2000). Consistent with prior literature, these investor characteristics also display a significant relationship with the variation in the share of own bank bonds (see fig. 2). We then estimate equation (3) separately for households with high and with low levels of these variables. To enhance the identification of these two groups, we perform a double sort on investor attributes, focusing on households in the top and the bottom 50 percent of the distribution for the two measures. We present results for all combinations, except for income and wealth as both serve as proxies for wealth.[34]

Table 6 shows the results. Columns (1) and (2) (or Columns (4) and (5)) report the estimates for households in the low and high categories, respectively, while Column (3) (or Column (6)) shows the test for the difference between the two subgroups. We document that households in the low category display a much stronger positive relation to increases

[34] As education is not a continuous variable, we classify investors that report having either high school or above high-school level education as having a high education level. As a result, we classify investors that report having below high-school level education as having a low education level.

Table 6. Double sort on financial sophistication and bank relationship.
This table shows estimates from panel regressions of households' own bank bond exposure on bank supply-side measures, for different groups of investors. Specifically, we divide investors based on three proxies for financial sophistication: total amount of assets, total income, and the level of education. Additionally, we divide investors based on the length of the bank relationship. We perform a double sort on investor attributes, focusing on households in the top and in the bottom 50 percent of the distribution for each measure. As education is not a continuous variable, we classify as highly educated those who report having either high school or above-high-school education levels. Conversely, we classify as less educated those who report having below-high-school-level education. For assets, we classify high (low) assets as those investors who report having total assets above (below) EUR 200,000. Standard errors are clustered at the investor level and are reported in parentheses. ***, **, and * denote that estimates are statistically significant at the 1, 5, and 10 percent levels.

Bank bond share (Total portfolio)

	Low assets and low education	High assets and high education	Difference (1) – (2)	Low income and low education	High income and high education	Difference (4) – (5)
	(1)	(2)	(3)	(4)	(5)	(6)
Funding gap	1.38***	0.531***	0.849***	1.15***	0.691***	0.455**
	(0.185)	(0.173)	(0.253)	(0.175)	(0.151)	(0.231)
ROA	−0.319***	−0.188***	−0.132	−0.310***	−0.216***	−0.093
	(0.016)	(0.014)	(0.021)	(0.015)	(0.012)	(0.019)
Market share	0.004**	0.002	0.002	0.005***	0.001	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
Observations	9,664	12,495		10,627	18,462	
Adjusted R^2	0.153	0.147		0.156	0.140	
	Low assets and low rel. length	High assets and high rel. length	Difference (1) – (2)	Low income and low rel. length	High income and high rel. length	Difference (4) – (5)
	(1)	(2)	(3)	(4)	(5)	(6)
Funding gap	1.60***	0.969***	0.626***	1.46***	1.04***	0.423*
	(0.186)	(0.159)	(0.245)	(0.212)	(0.160)	(0.265)
ROA	−0.293***	−0.200***	−0.093	−0.304***	−0.217***	−0.087
	(0.018)	(0.012)	(0.022)	(0.021)	(0.012)	(0.024)
Market share	0.001	0.003*	−0.002	0.004	0.002	0.002
	(0.002)	(0.002)	0.002	(0.002)	(0.001)	(0.003)
Observations	12,609	12,156		8,640	13,191	
Adjusted R^2	0.093	0.205		0.094	0.181	
Investor characteristics	Yes	Yes		Yes	Yes	
Bond characteristics	Yes	Yes		Yes	Yes	
Bank FE	Yes	Yes		Yes	Yes	
Year FE	Yes	Yes		Yes	Yes	
Province FE	Yes	Yes		Yes	Yes	

in the funding gap than households in the high category and that the difference between these groups is statistically significant.[35] For bank profitability and local market power, while the direction of the effect generally aligns with our expectations, the difference is not statistically significant.

[35] With the exception of relationship length combined with education, the results of which are reported in Supplementary Appendix Table B4.

To investigate which investor attributes matter the most in explaining this stronger relationship, we break down the analysis in Table 6 and conduct a univariate sort on each characteristic. Supplementary Appendix Table B5 reports these results. Consistent with previous findings, the coefficient of the bank funding gap is significantly higher for less wealthy households than for wealthier households (and the difference is statistically significant). Similarly, households with low education levels exhibit a similar pattern. In contrast, we do not find significant differences among households with different lengths of bank relationship.

5.3 The role of credit risk

Table 7 tests the role of credit risk in explaining variation in own bank bonds. Specifically, we use the estimated 1-year default probability of the bank, as measured by internal credit ratings since external ratings are not available (for more detail, see Section 2.2). A consistent pattern emerges: a higher estimated default probability is associated with a higher share in own bank bonds. Specifically, a 1-SD increase in default probability is related to a 2.63 percent increase in bank bond share (Column (1)). It is important to note that this positive effect holds when controlling for bond characteristics (i.e., bond returns and maturity) as well as for demand–supply factors and multiple fixed effects.[36] This result is consistent with the work of Guiso and Viviano (2015), who, while controlling for the bank's bond return, show that bank CDS positively affects investors' likelihood of purchasing bank bonds. If we combine this result with the evidence in Table 4, which shows a negative relationship between credit risk and bond spreads, these findings suggest that the risk associated with holding a higher share in own bank bonds may not be fully reflected in returns.[37]

6. Performance of bank bonds and portfolio reallocation

The findings thus far suggest the need for a detailed analysis of the return implications associated with overinvestment in bank bonds. In this section, we begin by examining the performance of a buy-and-hold portfolio strategy in bank bonds. This strategy is motivated by the poor liquidity of this market, as outlined in Section 3 and also confirmed by Grasso et al. (2010), who report that these investments can effectively be considered illiquid for retail investors.[38] We then complement this passive approach by, in the spirit of Calvet, Campbell, and Sodini (2009), analyzing active changes in households' bank bond holdings, and assess their impact on portfolio reallocations.

6.1 Buy-and-hold strategy performance

We examine the returns an investor would achieve by investing in bonds issued by the banks in our sample and compare these returns to those from maturity-matched Italian government bonds. This approach allows us to assess performance implications through a representative agent, as we observe aggregate holdings at the account level but not single security holdings. To implement the buy-and-hold portfolio strategy, we assume that the investor purchases all issued bonds in the primary market and holds them until maturity.

[36] Table 7 includes investor attributes as well as bank and branch characteristics. The estimated coefficients for these variables are omitted from the output table, but they remain qualitatively and quantitatively unchanged compared to the previous results.

[37] As a robustness check, we replicate all regression analyses from Section 5 using an alternative dependent variable constructed with the bond portfolio (instead of the total portfolio). Specifically, the own bank bond share (relative to the bond portfolio) is the share of the bond portfolio invested in own bank bonds. Results using this alternative dependent variable are reported in Supplementary Appendix Section C. Overall, the results remain broadly unchanged.

[38] Grasso et al. (2010) specifically report that in June 2009 only 9 percent of all bank bonds issued by Italian banks had a secondary market for retail investors.

Table 7. The role of credit risk.
This table shows estimates from panel regressions of households' own bank bond exposure on bank credit risk, controlling for investor, investment, bank, and branch characteristics. Credit risk is the estimated 1-year default probability of the bank as measured by internal credit ratings; for details, see Section 2.2. Standard errors are clustered at the investor level and are reported in parentheses. ***, **, and * denote that estimates are statistically significant at the 1, 5, and 10 percent levels.

Bank bond share (Total portfolio)			
	(1)	(2)	(3)
Credit risk (1-year PD, %)	0.012***	0.011***	0.005**
	(0.003)	(0.003)	(0.003)
Observations	42,859	42,859	42,859
Adjusted R^2	0.161	0.222	0.885
Bank and branch characteristics	Yes	Yes	Yes
Investor characteristics	Yes	Yes	Yes
Bond characteristics	Yes	Yes	Yes
Bank FE	Yes	No	No
Branch FE	No	Yes	Yes
Year × Province FE	Yes	Yes	Yes
Investor FE	No	No	Yes

The weight of each bond in the portfolio is therefore determined by the ratio of its issued amount to the total portfolio value (value-weighted approach).

We choose to compare the returns of bank bonds with those of Italian government bonds for three main reasons. First, government bonds are typically considered relatively safe investments in normal times. While their role as safe assets clearly faltered during the sample period, they remain an important benchmark. As the literature suggests (Acharya, Drechsler, and Schnabl 2014), all else being equal we expect the risk of banks, as reflected in bond yields, to be at least as large as that of the country of issuance. Second, along with bank bonds, government bonds are the investment instruments most familiar to Italian households, as documented by national surveys conducted by the Consob (see Linciano, Gentile, and Soccorso 2016). Third, government bonds represent an easily accessible investment asset for retail investors.

Figure 3 reports gross (top graph) and net (bottom graph) portfolio returns, the latter taking into account the tax regime shift (for details, see Section 2.1). While until August 2011 the return on government bonds was slightly lower than that on bank bonds, starting in September 2011, we observe a significant reversal in the spread between the two time series: gross (net) returns on bank bonds are on average 3.06 percent (2.6 percent) p.a., while gross (net) returns on government bonds are 3.40 percent (2.98 percent) p.a. over the September 2011–September 2014 period. This implies that a buy-and-hold portfolio strategy on government bonds yields, on average, 11 percent (15 percent) larger annual returns than one on bank bonds over the same period. Afterward, the spread narrows, eventually reversing for gross returns (top graph) while remaining positive (bottom graph) for net returns. Therefore, given the increase in interest taxes for bank bonds, the latter remained a less profitable investment until the third quarter of 2015.

This evidence can also be interpreted in the context of the Italian government bond crisis, which escalated in the summer of 2011 and peaked in November 2011 with the Prime Minister's resignation, when the spread between Italian government bonds and German bunds exceeded 550 basis points. The crisis began to stabilize in 2012, but yields remained volatile until the launch of ECB quantitative easing in January 2015. Extensive press

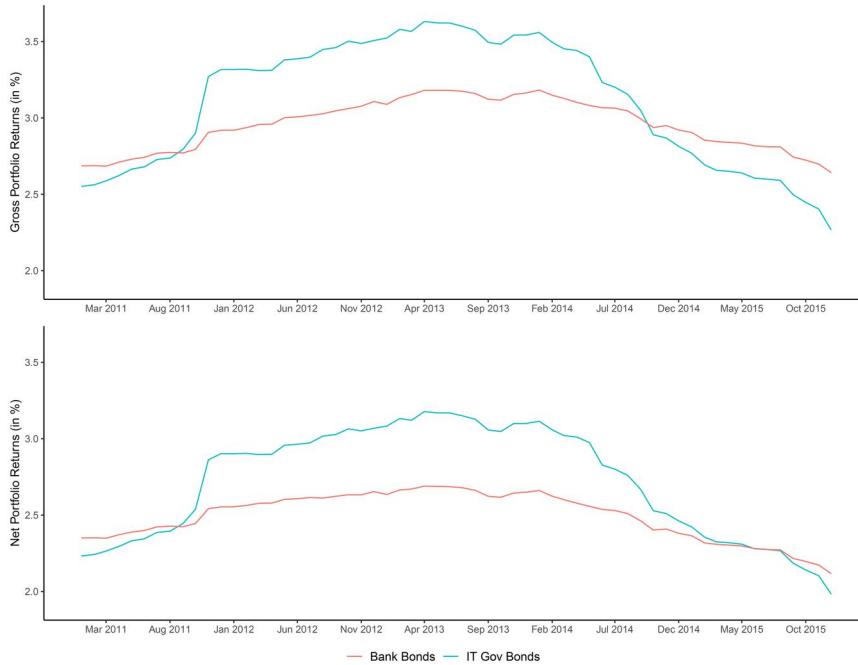

Figure 3. Portfolios "buy-and-hold" strategy returns.

The figure plots returns from a "buy-and-hold" portfolio strategy in bank bonds and in maturity-matched Italian government bonds. To implement the buy-and-hold portfolio strategy, we assume that the investor purchases all issued bonds in the primary market and holds them until maturity. The weight of each bond in the portfolio is therefore determined by the ratio of its issued amount to the total portfolio value (value-weighted approach). The top graph reports gross portfolio returns, while the bottom graph reports net portfolio returns. The latter takes into account the tax regime shift (for details, see Section 2.1).

coverage of the crisis may have contributed to a perception, documented in national surveys, of bank bonds as a comparatively safer investment class, as reflected in their much less volatile returns (see Linciano, Gentile, and Soccorso 2015).

6.2 Portfolio reallocation

6.2.1 *Portfolio weights over time*

The first step in the portfolio reallocation analysis is to provide a descriptive understanding of how investors' portfolio weights evolve over time. Figure 4 shows an area chart illustrating the allocation across all asset classes and over time. Consistent with the descriptive statistics in Table 1, the largest share is allocated to bank bonds. However, over the sample period we observe a gradual reduction in bank bond holdings as the ECB's unconventional monetary policy unfolds. Nevertheless, for 2015, the share of bank bonds remains considerably high, at 35 percent, in line with regulatory reports (IMF 2016). Another notable trend is the steady increase in the share of mutual funds, rising from 16 percent in 2011 to 35 percent in 2015. The share of government bonds is much lower and presents a downward trend.

Next, we show whether these portfolio reallocation trends differ for investors with varying levels of experience and risk tolerance. Supplementary Appendix Figure B1 presents the corresponding graphs for these subgroups of investors. Overall, similar patterns to those in figure 4 emerge across these groups. Interestingly, we observe that the lower the investor's

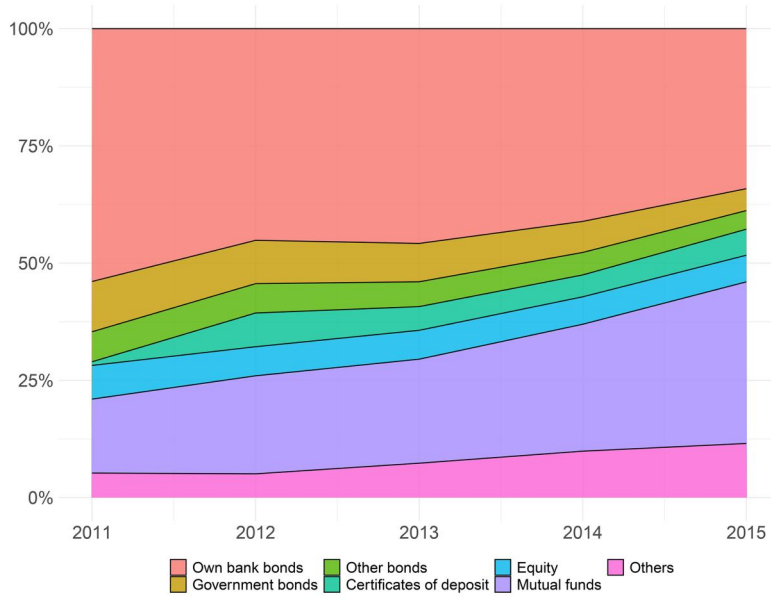

Figure 4. Investor portfolio weights over time.

The figure plots the portfolio weights of investors (in percent) by asset class over time. The sample is yearly between 2011 and 2015.

risk profile, the higher the allocation in bank bonds. Conversely, for investors with a higher risk profile we, as expected, document larger allocations to equity and mutual funds.

6.2.2 *Active bank bond changes*

Although most investors adopt a buy-and-hold strategy, they can still actively change their holdings. Similar to Calvet, Campbell, and Sodini (2009), we decompose changes in bank bond shares into passive changes, which are related to the return on the security, and active changes, which are associated with investors' active rebalancing decisions. As we focus on portfolio changes in fixed-income investments, we must also consider the role of maturity and related redemption. A decrease can occur for two reasons: the bond is redeemed at maturity, or the investor sells the bond before maturity. Strictly speaking, only the second case represents an active change. Since we only have records of aggregate bank bond holdings at the account level, it is impossible to distinguish between the two cases unequivocally. An increase, on the other hand, can result from either the subscription of new bonds in the primary market or the purchase of new bonds in the secondary market. Both circumstances can be classified as active changes. Therefore, due to the difficulty of identifying active changes when holdings value declines, we take a conservative approach by focusing on long-only active changes—that is, on those involving an increase in the value of bank bond holdings.

If an investor initially holds no bank bonds at t but has a positive exposure at $t+1$, an active change is evident. The challenge lies in identifying active changes in other cases. We therefore apply a three-step approach. First, we identify changes in the value of bank bond holdings from year t to $t+1$. Second, using all bonds issued by the banks in our sample, we compute the modified duration and construct bank-level portfolios of weighted average modified duration based on outstanding bonds. Following the standard bond elasticity relationship, we apply $\Delta P_{t\to t+1}/P_t \approx -Duration_{mod} \times \Delta y_{t\to t+1}$, from which we can infer the

price changes in bank bonds with respect to a variation in market yields over the same horizon.[39] Third, an active change is defined as: (i) a zero to positive change in bank bond value from t to $t+1$ or (ii) a movement in bank bond value that does not result mechanically from price changes—this occurs when the relative change in bank bond value from t to $t+1$ is greater than what the modified duration implies; that is to say, $\Delta P_{t\to t+1}/P_t$.

After having established active changes, we examine their relationship with rebalancing activities in other asset classes: government bonds, other bonds, certificates of deposit, stocks, and mutual funds. Specifically, we run regressions of the following form:

$$\begin{aligned}\Delta w_{j,i,a,t+1} = {} & \gamma_1 ActiveChange_{i,t+1} + \gamma_2 ActiveChange_{i,t+1} \times \Delta MarketStress_{i,t+1} \\ & + \gamma_3 w_{j,i,a,t} + \gamma_4 w_{-j,i,a,t} + \gamma_5 InvestorChars_{i(,t)} + \mu_t + \mu_a + \mu_g + \varepsilon_{j,i,a,t+1},\end{aligned} \tag{4}$$

where $\Delta w_{j,i,a,t+1}$ represents the change in the weight of asset class j within the total portfolio of investor i at bank a from t to $t+1$. $ActiveChange_{i,t+1}$ is a dummy variable that equals one when the change in bank bonds is classified as active, as defined above. The change in market conditions is indicated by $\Delta MarketStress_{i,t+1}$, and we capture it using either the spread on Italian CDS—a common measure of sovereign risk—or the returns of the Italian stock market.[40] Since changes in an investor's portfolio share are influenced by the initial share level (Calvet, Campbell, and Sodini 2009), we include the regressor $w_{j,i,a,t}$ representing the initial weight of asset class j at time t for investor i at bank a, and $w_{-j,i,a,t}$, a vector variable that controls for the initial weights of the other asset classes.[41] $InvestorChars_{i(,t)}$ represents investor-specific characteristics, as defined in Section 4. Time, bank, and province fixed effects are indicated by μ_t, μ_a, and μ_g, respectively.

Table 8 shows the portfolio response to active long changes in bank bond holdings, where each column reports the response for a different asset class. We find that changes in the portfolio weights are negatively affected by the initial share value. This result aligns with the work of Calvet, Campbell, and Sodini (2009) and supports a rebalancing approach that reduces exposure to asset classes with higher initial weights.[42]

Our variable of interest, the active change dummy, is negative and significant in all regressions.[43] This effect is stronger for portfolio changes in government bonds and mutual funds. Assuming that changes in market conditions are small ($\Delta MarketStress \approx 0$), an active change in bank bonds is associated with a 4.3 percent (4.4 percent) reduction in government bonds and 2.9 percent (2.8 percent) reduction in mutual funds in Panel A (Panel B). These results suggest that when actively purchasing bank bonds, investors reduce exposure to mutual funds, the second most invested asset class in our sample. As for government bonds, which are less commonly held by households in our sample, a plausible interpretation is that they act as substitute investments: investors shift from government bonds, considered risky at that time, to bank bonds, which were perceived as safer (Linciano, Gentile, and Soccorso 2015).[44]

[39] When measuring yield changes from year t to $t+1$, we consider duration-matched changes in market yields.

[40] Specifically, we collect data from Markit on the EUR-denominated Italian sovereign CDS spread with a 5-year maturity. Next, we calculate the average CDS spread at time t and $t+1$ and then compute the change in the spread over that period. For stock market data, we apply a similar approach: we average prices at times t and $t+1$ and then compute returns. In this case, data refer to the FTSE MIB Index and are collected from Bloomberg.

[41] The correlations among the initial share levels of the asset classes analyzed are low, ranging between −0.097 and 0.053.

[42] Economically, the effect is more pronounced for fixed-income investments than for equities, likely due to reimbursement effects. When the notional amount is reimbursed, changes in portfolio weights across periods can be substantial, unless offset by newly opened positions.

[43] Except in Column (3), Panel B of Table 8.

[44] This interpretation is further supported by the relatively high and negative correlation between changes in bank bonds and in government bonds, which is equal to −0.42.

Table 8. Portfolio reallocation for active bank bond changes.
This table reports coefficient estimates from equation (4). The change in the weight of asset class j is represented by $\Delta w_{j,i,a,t+1}$. The asset classes are government bonds, other bonds, certificates of deposit, stocks, and mutual funds. $ActiveChange_{i,t+1}$ is a dummy variable that equals one when the change in bank bonds is classified as active, as defined in Section 6.2.2. $\Delta MarketStress_{i,t+1}$ indicates the change in market conditions, which we capture using the spread on the Italian CDS—a common measure of sovereign risk—or the returns of the Italian stock market. Investor variables are defined in Section 2.3. Standard errors are clustered at the investor level and are reported in parentheses. ***, **, and * denote that estimates are statistically significant at the 1, 5, and 10 percent levels.

Portfolio weight change $\Delta w_{j,i,a,t+1}$

Panel A: CDS spread changes

	Government bonds	Other bonds	Certificates of deposits	Stocks	Mutual funds
	(1)	(2)	(3)	(4)	(6)
Active change	−0.043***	−0.020***	−0.005***	−0.008***	−0.029***
	(0.002)	(0.002)	(0.002)	(0.0008)	(0.002)
Active change × CDS change	−0.777***	0.386**	1.92***	−0.098	−0.211
	(0.262)	(0.187)	(0.206)	(0.080)	(0.188)
Initial share $w_{j,i,a,t}$	−0.254***	−0.284***	−0.594***	−0.097***	−0.062***
	(0.012)	(0.014)	(0.020)	(0.015)	(0.007)
Risk tolerance: Moderate	0.017***	0.0007	−0.002	−0.0004	0.002
	(0.004)	(0.003)	(0.005)	(0.0008)	(0.002)
Risk tolerance: High	0.016***	0.002	−0.003	−0.002	0.013***
	(0.004)	(0.004)	(0.005)	(0.002)	(0.004)
Experience: Moderate	0.005**	0.005***	0.003	0.002***	0.005***
	(0.002)	(0.002)	(0.002)	(0.0006)	(0.002)
Experience: High	0.005	0.004	0.001	0.004***	0.009***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Observations	23,322	23,322	23,322	23,322	23,322
Adjusted R^2	0.182	0.178	0.314	0.039	0.057

Panel B: Stock market returns

	Government bonds	Other bonds	Certificates of deposits	Stocks	Mutual funds
	(1)	(2)	(3)	(4)	(6)
Active change	−0.044***	−0.021***	−0.003	−0.008***	−0.028***
	(0.002)	(0.002)	(0.002)	(0.0008)	(0.002)
Active change × Stock returns	0.062***	−0.016	−0.143***	0.008	0.001
	(0.015)	(0.010)	(0.012)	(0.005)	(0.010)
Initial share $w_{j,i,a,t}$	−0.254***	−0.284***	−0.595***	−0.097***	−0.062***
	(0.007)	(0.014)	(0.020)	(0.010)	(0.007)
Risk tolerance: Moderate	0.017***	0.0008	−0.001	−0.0004	0.002
	(0.004)	(0.003)	(0.005)	(0.0008)	(0.002)
Risk tolerance: High	0.016***	0.003	−0.003	−0.002	0.012***
	(0.004)	(0.004)	(0.005)	(0.002)	(0.004)
Experience: Moderate	0.005**	0.005***	0.002	0.002***	0.005***
	(0.002)	(0.002)	(0.002)	(0.0006)	(0.002)
Experience: High	0.005*	0.004	0.001	0.004***	0.009***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Observations	23,322	23,322	23,322	23,322	23,322
Adjusted R^2	0.182	0.178	0.315	0.039	0.057
Initial share $w_{-j,i,a,t}$	Yes	Yes	Yes	Yes	Yes
Investor characteristics	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes

When accounting for market conditions ($\Delta MarketStress \neq 0$) as reflected in sovereign CDS spreads (Panel A) or market returns (Panel B), the effect strengthens only for fixed-income investments. Notably, for government bonds the interaction effect is negative when market stress is proxied by CDS spreads. This finding aligns with the substitution argument: as government bonds become riskier, investors increasingly substitute them with bank bonds. However, this effect is economically modest. For instance, assuming a CDS spread increase of 50 basis points, the reduction in the government bond share associated with active changes in bank bonds equals 4.7 percent[45] (when $\Delta MarketStress \approx 0$, the effect is −4.3 percent). For other fixed-income investments, increases in CDS spreads are associated with a less pronounced negative effect of active changes on the dependent variable, and the effect is economically very small. We report similar coefficients, though with an opposite sign, when market stress is proxied by the performance of the Italian stock market.

Consistent with previous literature, investors' risk tolerance and experience are also associated with rebalancing decisions. Experience and high risk tolerance are important factors in mutual fund weight adjustments, while only experience appears to be related to equity reallocations. Interestingly, all risk tolerance variables are significant for government bond weight changes, consistent with the notion that at the time households perceived this investment as risky and thus that only those with adequate risk profiles would rebalance more that portfolio share.

7. Robustness checks and limitations

7.1 Alternative measure of funding needs

Supplementary Appendix Table D1 reports the results from equation (3) using an alternative measure of funding needs—the wholesale funding ratio. This measure is motivated by the work of Acharya and Mora (2015), who use it as a proxy for banks' reliance on external funding. Specifically, we construct this variable as the ratio of debts to banks over total liabilities. It is, however, important to note that our sample period experienced significant changes in the ECB's policy interventions affecting both financial markets and intermediaries (ECB 2012). Such interventions have notably altered banks' wholesale funding ratios and their interpretation. Therefore, a meaningful analysis requires uncovering these time dynamics and interpreting the robustness of our findings by focusing on the period preceding the ECB started its non-standard monetary policy measures. As a result, we interact the wholesale funding measure with time dummy variables in the last column of Supplementary Appendix Table D1. The results are intuitive. At the beginning of our sample, when liquidity in the interbank market dried up, banks that relied more heavily on wholesale funding faced a greater need for liquidity. Consistent with previous arguments, these banks are associated with a higher share of bank bonds. The famous "whatever it takes" speech of ECB President Mario Draghi in the summer of 2012 marked a fundamental turning point in the turbulence of the euro area, paving the way for a gradual resolution of the crisis. The introduction of new TLTROs in 2014 and of quantitative easing in 2015 further improved bank funding conditions, which explains the change in sign during the last 2 years of our sample: banks with higher wholesale funding levels received more support from the ECB and were therefore less in need of raising additional funds through the retail bond channel.

7.2 Investors' financial assets to total wealth ratio

To gain further insight into the impact of supply-side measures on investors' own bank bond concentration, we examine their impact according to different levels of the ratio of

[45] This is the total effect of active changes on government bond adjustments when the CDS spread increases by 50 basis points. It can be computed as follows: $-0.043 - 0.005 \times 0.777$.

investors' financial assets (at our banks) to total assets. If the ratio is low, it means that the amount of investments at one of our banks covers a relatively low portion of households' total wealth. This might happen either because households have most of their financial investments at our banks but real estate investments or cash are relatively high, or because they have other financial investments at other intermediaries. We define investors with high and low financial coverage as those households above or below the median of the ratio's distribution, respectively. Supplementary Appendix Table D2 shows the regression results for these two subgroups, and the test for the difference between the regression coefficients. We observe a similar impact of supply-side measures on households' own bank bond concentration (see Columns (1) and (2)). This evidence confirms that banks' role in explaining households' bond portfolio allocation matters also for investors with a relatively high ratio of financial investments to total wealth. This finding provides some supporting evidence that the supply-side effects that we observe are not influenced by the share of financial portfolios invested through our banks.

7.3 Additional discussion

In this section, we discuss additional mechanisms that may explain our findings. First, we consider the potential information advantage of investors. Suppose that investors concentrate more heavily in bank bonds due to insider information derived from their relationship with the bank. If this were the case, investors might choose to support the bank's funding during periods of liquidity need. Consequently, the high portfolio share in bank bonds could reflect a deliberate portfolio decision by the investors. Although this hypothesis appears plausible, we find reasons for caution on two main points. First, it is challenging to argue that, based on insider information, investors would rationally choose to concentrate investments in bonds that are relatively illiquid, yield lower returns compared to government bonds, and do not strongly reflect the risk-taking characteristics of the issuer, as indicated by balance sheet data. Even if we accept this as a possibility, a second factor concerns the sophistication level of our investor base. Investors typically benefiting from insider information tend to trade in derivatives and manage large investment positions. In contrast, our sample comprises investors with relatively small portfolios who generally prefer fixed-income instruments from a single issuer. Furthermore, in our findings, we observe that more sophisticated investors—those with larger assets or income—allocate less, rather than more, to bonds from their own bank.

A second consideration relates to the factors influencing bank bond prices. Prices are generally determined by supply and demand dynamics, and if investors were able to impact bond prices, we would expect to observe a correlation between investor choices and bond prices. However, as long as this does not lead to omitted investor-specific demand variables that are relevant to the bond price, it does not present an issue in our context. Furthermore, even if such an effect were present, the investor fixed effects in Supplementary Appendix Table B3 would account for any omitted variables, provided that the unobserved investor-specific characteristics are time invariant. Moreover, there are several reasons to support the view that our investors act as price takers. Our investors acquire bonds in a primary market in which banks predefine the coupon rate in advance (with prices consistently set at par). This rate is determined based on the bank's historical capacity to attract funding rather than through case-by-case negotiation with investors.

Finally, one might consider the possibility that the observed effect is largely mechanical. If banks raise new debt by issuing bonds, this could lead to a mechanical increase in the concentration of their own bonds within client portfolios. For instance, a bank might choose to allocate a certain portion of these bonds across all its clients, resulting in an observed increase in the share of own bank bonds held in client portfolios. Suppose this were the case: the bank could decide to distribute the bonds equally among its clients or offer an amount proportional to each client's portfolio size. In both cases, we would not expect to

find statistically significant relationships for investment and investor attributes. However, as shown in Section 5.2.1, this is not the case. Furthermore, it is reasonable to assume that any mechanical allocation strategy would be specific to each bank and thus should be controlled for using bank or branch fixed effects. Additionally, strictly speaking even the effect described above is not purely mechanical as it involves an active decision by the bank to allocate bonds according to specific criteria.

7.4 External validity

To alleviate concerns about external validity, we provide evidence in this section that despite the limitations of our sample and setting, the phenomenon under investigation has potentially broader implications. The first concern is related to whether this phenomenon is specific to CCBs or applies more broadly to major Italian financial institutions. Regulatory reports on national statistics (IMF 2016) document that in 2015, the share of Italian households holding bank debt was approximately 35 percent, which is consistent with our sample and aligns with survey statistics for the five largest Italian banking groups at that time (Coletta and Santioni 2016). Furthermore, according to the Bank of Italy, households held approximately one-third of the total amount of senior debt issued by banks. These statistics reflect that this was a widespread phenomenon. Among European countries, the second largest figure is that for Germany, where households held approximately 13 percent of banks' debts (IMF 2016).

Another concern is whether the present study has implications outside the Italian setting. While Italian investors undoubtedly report the largest direct investments in bank bonds, other countries may have experienced a similar mechanism through indirect investments. In this respect, Gil-Bazo, Hoffmann, and Mayordomo (2020) provide interesting results for Spain, showing that bank-affiliated mutual funds buy (overpriced) bank bonds in times of crisis in the primary market to support their parent company. Furthermore, the authors document a stronger effect for funds targeting retail clientele. Their article suggests that although direct investments by Spanish investors in bank bonds were small (around 1 percent in 2015, see IMF 2016), indirect holdings could have been higher. Overall, this provides suggestive evidence that the implications of the present study may not be confined to the Italian setting.

8. Conclusions

The wave of bank defaults during the 2007–2009 financial crisis and the bail-in resolution framework have led to questioning of the suitability of households' exposure to bank bonds. In this article, we investigate the role of investor demand-side and bank supply-side characteristics in explaining households' exposure to bonds issued by their own bank. Using Italian data on eight local banks, our analysis offers insight into how both demand and supply characteristics interact and influence the asset allocation decisions of retail investors. We identify distinct patterns in investment behavior, notably a concentration of portfolios in own bank bonds, which is shaped both by investor attributes such as financial sophistication and risk tolerance and by bank characteristics such as funding needs, profitability, and branch-level market power.

The results suggest that during periods of liquidity need banks may leverage their local clients to raise funding, as evidenced by the relatively naive behavior of bank bond investors and the positive relationship between higher concentrations in bank bonds and increased bank funding needs. This evidence contrasts with standard portfolio theory, which posits that investor and investment characteristics should be the primary drivers of investors' portfolio choices, while time-varying bank or branch attributes should be irrelevant once such characteristics have been accurately accounted for.

While portfolio concentration in own bank bonds may introduce certain risks for investors, our findings should be interpreted with caution: we do not have counterfactual evidence, and we cannot rule out the possibility that our results may be confounded by unobserved characteristics. Furthermore, the external validity of our findings may be limited by our reliance on Italian data. However, Gil-Bazo, Hoffmann, and Mayordomo (2020) suggest that similar funding dynamics apply to Spanish data and show that bank-affiliated mutual funds provide funding to their parent companies through bond purchases in the primary market.

Moreover, the decision to concentrate in bank bonds might also reflect investors' perception that expected bailouts comprise implicit government guarantees. Over our sample period, no bail-in resolution tool for senior bondholders was implemented. This circumstance contrasts with the case of the banking crisis in Cyprus,[46] where the European Union's deal required Cyprus to bail-in senior bondholders as well.[47] While this evidence supports the argument that investors might have perceived this investment as government-backed, the fact that bail-in events are rare does not eliminate the risks involved or preclude the possibility of such events occurring in the future. Bail-in measures may also be prompted by evidence that a bailout not only distorts future incentives in the financial sector through moral hazard, but also incurs tangible costs that are priced into sovereign credit risk (Acharya, Drechsler, and Schnabl 2014).

Our results contribute to the large literature on household portfolio allocation and diversification decisions (e.g., Benartzi 2001; Liang and Weisbenner 2002; Ivkovíc and Weisbenner 2005; Goetzmann and Kumar 2008) by introducing a previously unexplored dimension of local bias—namely, the "own bank bias" in our setting. As overinvestment in bank bonds appears to be more pronounced among unsophisticated investors, our results underscore the importance of financial literacy in limiting concentration risk (Lusardi and Mitchell 2011; Guiso and Viviano 2015).

Additionally, this article offers insights into investor–bank dynamics by examining the interaction between bond issuance and investor behavior. It highlights that retail investors willing to purchase bonds can offer banks a stable, low-cost funding source during periods of financial stress. This underscores the importance of maintaining an active funding channel, while emphasizing the need for robust safeguards to prevent excessive risk-taking and protect retail investors from unwarranted exposure. These findings also extend the results of Gil-Bazo, Hoffmann, and Mayordomo (2020) on (overpriced) bank bond purchases by bank-affiliated mutual funds—where funding support is more pronounced among funds targeting retail investors—and suggest potentially wide-ranging wealth effects for both retail investors and banks.

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[46] In 2013, the Bank of Cyprus—the largest bank in the country—and Laiki Bank went bankrupt.
[47] For details, see www.consilium.europa.eu.

Supplementary material

Supplementary material is available at *Review of Finance* online.

Conflicts of interest: None declared.

Data availability

The data underlying this article are proprietary and cannot be shared publicly.

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