Green bond home bias and the role of supply and sustainability preferences*

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Abstract

Using nascent euro area green bond markets as an experimental set-up, we are able to show that home bias is a universal phenomenon. Exploiting dynamics around the scarcity of an asset class, we show that investors tend to turn to their domestic market as soon as their home market becomes available. Moreover, investors' home bias slowly increases further as the domestic market develops, even if these investors have previously acquired sufficient information about the non-domestic market through investing abroad first.

Using confidential bond-level holdings data of euro area investors between Q4 2013 and Q3 2021 in combination with green bond labels, we document that home bias in the euro area bond market is currently lower than in conventional bond markets. Green bond home bias increases over time, however, as investors revert back to their home market as soon as (more) green bonds become available domestically. Moreover, banks' sustainability

ambition drives cross-border green bond investments, although the results are heterogeneous across countries and the beneficial impact of banks' sustainability ambition on green bond home bias dissipates quickly once banks' domestic green bond market grows.

Keywords: home bias, sustainable finance, financial integration, green bonds, banks, capital markets

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1 Introduction

Investors' bias towards holding domestic financial assets, or home bias, has been extensively researched but still remains an important empirical puzzle in financial markets to date. Since the 1980s, a growing field of literature has proposed several partly competing and partly complementary explanations for investors' home bias. These explanations range from deviations from purchasing power parity (see e.g. Adler & Dumas, 1983; I. Cooper & Kaplanis, 1994; Lewis, 1996; Fidora, Fratzscher, & Thimann, 2007) barriers to trade such as capital controls, taxes, and institutional quality (see e.g. Black, 1974; Cole & Obstfeld, 1991; Martin & Rey, 2004), information costs and asymmetries (e.g. Ahearne, Griever, & Warnock, 2004; Coval & Moskowitz, 1999; Barron & Ni, 2008; Van Nieuwerburgh & Veldkamp, 2009, 2010; Eichler, 2012), to behavioural characteristics (see e.g. Pradkhan, 2016; Anderson, Fedenia, Hirschey, & Skiba, 2011; Beugelsdijk & Frijns, 2010). Only a few studies have looked at the role of supply in driving international cross-border lending (see e.g. Cerutti & Claessens, 2017; Giannetti & Laeven, 2012a, 2012b) and its effects on home bias in capital allocation. These papers typically use adverse economic shocks/financial crises to disentangle supply from demand to establish that lenders rebalance their loan portfolios in favor of domestic borrowers following a crisis. These papers provide insights specifically for banks but little is known about how overall market supply affects home bias.

Nascent and only slowly developing markets are an ideal set-up to assess how (limited and only gradually evolving) supply of an asset class affects cross-border investment decisions and ultimately country level home bias. Using the euro area green bond market, a market that is only gradually evolving, we explore how home bias develops over time. More specifically, exploiting dynamics around this gradual development, we are able to disentangle supply from demand and to tease out whether investors keen to invest in green assets abroad in a scarce or absent domestic market, favor their domestic market once available. This paper thus contributes to the literature by exploiting the scarcity of an asset class to understand how home bias develops from a dynamic perspective. Hence, we are able to provide insights whether home bias is a universal phenomenon that evolves even when investors have accumulated sufficient information about their non-domestic market through investing abroad first. To

our knowledge, the direct effect of supply constraints on home bias has not been studied yet. In addition, our paper provides important insights on the overall integration of the euro area green bond market and its drivers which are virtually unexplored, despite its relevance for the transition to a sustainable economy. This is surprising in and of itself, but even more so when considering that home bias in the euro area green bond market is currently lower than in conventional bond markets in all countries across Europe (see Figure 1).

To this end, this paper first compares the development of home bias of the green bond market against the aggregate bond market over time, first considering all investors and subsequently focusing on the euro area banking sector as a whole and the largest banking groups separately. Second, we assess the relationship between euro area green bond supply and euro area green bond (portfolio) home bias for different euro area investors. Our goal is to understand whether lower home bias in green bond markets is driven by the lack of domestic green bond supply stemming from the early stages of development of these markets. Finally, zooming in on the largest banking groups, we investigate whether investors' sustainability ambition could in part explain lower levels of green bond home bias.

We are able to explore these questions using confidential data on individual security-by-security holdings of euro area investors, which we can track over time. More specifically, the data set contains quarterly bond holdings of euro area investors at the country-sector level and banking group level, which we augment with green bond label data as well as granular bank level information.

We document that euro area investors have a significantly lower level of home bias in their green bond portfolios compared to their conventional bond portfolios. However, we observe an increase in green bond home bias over time, implying that green bond markets are becoming less integrated as they mature. This observation is corroborated by the results of our regression analysis, which captures the immediate effects of direct green bond market development as well as the gradual effects as domestic green bond markets develop further over time. In the aggregate across all euro area investors, we find that investors who only hold foreign green bonds in the absence of a domestic green bond market, shift their portfolios towards domestic bonds as soon green bonds become available in their home country. After

this initial correction, home bias slowly increases further as the domestic market develops, suggesting that the overall positive integration of green bond markets gradually diminishes. Similar to our findings across all investors, euro area banking sectors turn to their domestic green bond markets once these become available in their home country. However, after this initial jump effect, the further development of the domestic green bond market does not seem to affect their bias towards domestic green bonds. Finally, our regression analysis shows that an increase in large banks' sustainability ambition drives cross-border green bond investments and lowers the level of home bias. Yet, the beneficial impact of banks' sustainability ambition on green bond home bias seems to dissipate quickly, as banks rebalance their portfolio towards domestic green bonds as their home market grows.

Our research contributes to different strands of literature. First and foremost, our analysis reaffirms the existence of home bias as a universal phenomenon given that home bias also develops in initially well integrated nascent markets over time (as soon as a domestic market develops). At least since French and Poterba's (1991) seminal paper, investors' preference to buy domestic financial assets is known as home bias. Many papers have established this relationship since (for an overview see e.g. Coeurdacier & Rey, 2013). We add to this literature by assessing the role of supply constraints. Second, we contribute to the literature that provides explanations for why investors reveal a preference for their home countries' asset. Establishing the sustainability ambition of banks as a determinant, we particularly add to the literature that focuses on investors' behavioural characteristics as drivers of home bias (see e.g. Pradkhan, 2016; Anderson et al., 2011; Beugelsdijk & Frijns, 2010). Third, the results of this paper more generally contribute to studies that aim to disentangle the effect of supply and demand in cross border financial investment decisions, which has so far exploited crises to distinguish supply from demand (see e.g. Cerutti & Claessens, 2017; Giannetti & Laeven, 2012a, 2012b).

From a policy perspective, our results are more directly related to the discussion whether financing the climate transition could help advance financial integration in case green capital markets deepen further (Born et al., 2021) which is also linked to economies' limitations to finance large innovations (see e.g. Sørensen, Wu, Yosha, & Zhu, 2007)[1]. The transition to a

[1]It has been argued that home bias leads to suboptimal levels of capital market integration and risk-sharing,

sustainable economy arguably is the largest innovation challenge faced by society today. It is also one that requires substantial investments. Making Europe climate neutral by 2050 is expected to require at least EUR 1 trillion of investments in the upcoming decade (European Commission, 2021). While the European Union (EU) already set up various public funding initiatives, private sector involvement is deemed crucial by policy makers and regulators to meet the EU's goals. Hence, the European green bond market could play an important role in financing the transition to a sustainable economy.

The paper proceeds as follows. Section 2 describes the data used for this study and discusses variable construction. Section 3 provides an overview of the development of the euro area green bond market and compares home bias in green and conventional bond markets. Section 4 shows the results for our regression analysis on the relation between green bond supply constraints and investors' green bond home bias. Section 5 provides the results for our regression analysis on the relation between banks' sustainability ambition and their green bond portfolio home bias. Section 6 concludes.

2 Data and variable description

2.1 Data

Our analysis is based on the Securities Holdings Statistics (SHS) from the European System of Central Banks (ESCB). This unique and confidential database contains detailed information on the holdings of long-term (maturity > 1 year) debt securities by euro area residents, reported on a quarterly basis. Each observation in the database corresponds to an ownership position in a security identified by the security's unique International Security Identification Number (ISIN). There are two versions of the Securities Holdings Statistics. The first version reports bond-level ownership positions at the country-sector level. This means that we can observe, for instance, the German banking system's holdings of a particular Dutch government bond in a given quarter. The second version of the Securities Holdings Statistics contains

making countries more vulnerable to idiosyncratic crises and less able to finance large innovations.

bond-level ownership positions at the bank level, for the largest euro area banking groups.[2] The data are available at bank entity level.[3] For the purpose of our analysis, we aggregate the data at group level. We exclude intragroup holdings in order to exclude bonds that are used for financing or liquidity purposes, rather than portfolio investment purposes. Our data sample begins in 2013 Q4, when the ESCB first started collecting the data, and ends in 2021 Q3. We restrict our dataset to holdings of euro denominated bonds that are issued by euro area entities. We do so because we want to focus our analysis on home bias and green bond market integration in the euro area.

To identify green bonds, we complement our Securities Holdings Statistics data sets with Bloomberg's green bond label data. Bloomberg established its green bond database in 2014 and has a coverage dating back to the inception of the global green bond market in 2007. In the database, a bond is labelled a "green bond" when an issuer self-proclaims the bond as "green" in its issuance documentation and/or in official public communications that state that 100% of use of proceeds need to be dedicated to green activities as categorized by the Green Bond Principles established by the International Capital Market Association (International Capital Markets Association, n.d.). However, Bloomberg does not require the presence of any additional reporting on the management and use of proceeds, nor assurance from an external provider (GBP SBP Databases and Indices Working Group, 2018).

Finally, we complement our bank level Securities Holdings Statistics data set with additional information on the banks in our sample. First and foremost, we add information on whether and when the banks in our sample became a supporter of the Financial Stability Board's (FSB) industry-led Task Force on Climate Related Financial Disclosures (TCFD). The FSB TCFD has developed recommendations for more effective climate-related disclosures that could promote more informed investment decisions and enable market participants to better understand and assess climate related risks (Financial Stability Board Task Force on Climate-related Financial Disclosures, 2017). We use this information to create an indicator which proxies the banks' sustainability ambition. Second, we augment our data set with banks' core

[2]Up until 2018 Q2, the banking data contains information on bond holdings for the 26 largest banking groups with head office in the euro area. Between 2018 Q3 and 2020 Q3, the number of banking groups in the sample increased to 126, comprising all significant banking groups under direct ECB supervision.

[3]This means that holdings of all subsidiaries and branches within and outside euro area are observed.

equity Tier 1 and return on average equity data as controls. We retrieve these data from Bureau van Dijk's Bankfocus database.

2.2 Variable description

Table 1 provides a comprehensive overview and description of the variables we use for our analysis. To assess whether the degree of integration in the green bond market differs from that in the nongreen bond market, we first compare home bias in the green to non-green bonds. In line with the literature (e.g. Ahearne et al., 2004; Baele, Pungulescu, & Ter Horst, 2007; Fidora et al., 2007), we measure home bias as the degree to which investors overweigh domestic bonds, and underweigh foreign bonds, relative to a benchmark portfolio that would weigh home and foreign (i.e. other euro area) bonds according to their respective shares in the aggregate (euro area) bond market[4]. We estimate the following measure separately for the green and non-green bond market:

$$HB_{it} = 1 - \frac{HS_{it}^{For}}{HS_{it}^{For,\cancel{Optimal}}} \tag{1}$$

In Eq. 1, HB_{it} represents the home bias in investor i's bond portfolio at time t. HS_{it}^{For} represents the investor's actual foreign bond holdings as share of their total bond holdings. $HS_{it}^{For,Optimal}$ represents the optimal foreign holdings share of investor i at time t, which is merely computed as the outstanding amount of bonds issued by the investors country of domicile, relative to the total outstanding amount of bonds issued by all euro area countries. We use different levels of aggregation throughout our analysis. This means that 'investor' can refer to either all investors, or the banking sector, or individual banking groups in a certain country. When our home bias measure is equal to 1, a country's investors exclusively hold

[4]The choice for this measure of home bias is motivated by its clear and straightforward economic interpretation, which derives directly from mainstream finance theory (the Capital Asset Pricing Model). In addition, this measure is used in a substantial part of the existing home bias literature, such that results in this paper can be easily compared to the existing literature. It should be noted, however, that the conventional home bias measure has been found to yield biased results under certain circumstances, for instance in case of very large or small optimal portfolio weights (see e.g. I. A. Cooper, Sercu, & Vanp´ee, 2013). Since we focus our analysis on euro denominated bonds issued by euro area entities only, we mitigate this issue to a large extent as we do not observe extreme outliers in terms of portfolio weights.

domestic bonds (maximum home bias). When the measure is equal to 0, the portfolio is optimally diversified. Values smaller than 0 indicate a foreign bias. [5]

The aim of our study is to compare home bias in the euro area green bond market against the traditional bond market and to document possible drivers of green home bias, focusing on supply constraints and sustainability preferences as two main driving factors. To this end, we construct the following main explanatory variables: First, *DomesticDevelopment* represents an investor country's green bond market development measured by the outstanding amount of green bonds issued by that country as percentage of the overall outstanding amount of bonds issued (both green and non-green bonds). Second, to assess whether the relation between *DomesticDevelopment* and green bond home bias differs between countries with a well developed versus less developed domestic green bond market, we construct a variable *GreenMarketShare*, which represents a country's total amount of green bonds issued as percent of the total amount outstanding of green bonds issued in the euro area. We use this variable as a weighting factor in our regression analysis. Third, for our study of the relation between investors' sustainability ambition and green bond home bias, we zoom in on the behaviour of the largest euro area banking groups. We proxy banks' sustainability ambition by means of a dummy indicator *ClimateDisclosure*. This variable indicates whether a bank is a supporter of the FSB's TCFD. When a bank becomes a supporter, the bank commits itself to publishing information on its climate risks and opportunities in line with the TCFD's recommendations. Although this is not a direct measure of a banks' sustainability ambition, given that banks self-select to become a TCFD supporter, we consider this a signal of their sustainability goals and in turn are able to test whether supporting the TFCD is actually credible. Specifically, we hypothesise that the banks which deem climate risks relevant and urgent, are also the banks which are frontrunners in addressing these risks and see merit in disclosing climate risks and opportunities. This hypothesis seems to be supported by the FSB, who acknowledges that when the TCFD recommendations were released in 2017, few organizations accepted climate change as a major financial risk. Only in its status report dating September 2021, which coincides with the latest period in our data sample, the FSB argues that the TCFD recommendations have become the market standard (Financial Stabil-

[5]By construction, it is possible that our home bias measure takes on large negative values. This is the case when investors have a strong foreign bias in their bond portfolios. Such distributional properties may complicate any empirical analysis. However, we do not observe such outliers in our data.

ity Board Task Force on Climate-related Financial Disclosures, 2021). Since our data sample matches the early years of the TCFD initiative, we find it reasonable to assume that the supporters are frontrunners in terms of sustainability ambition. Since we observe bond holdings and home bias for all large euro area banks, regardless of whether the banks are a TCFD supporter or not, our analysis does not suffer from self-selection bias.

[Table 1 - Variable description]

3 The euro area green bond market

This section first provides an overview of the development of the euro area green bond market. Second, it compares levels of integration between euro area investors' green and non-green bond portfolios over time.

3.1 Developments in the euro area green bond market

This subsection provides an overview of the development of the euro area green bond market. Three features stand out. First, the euro area green bond market has grown markedly since its inception in 2007. Our data sample shows an increase in the outstanding amount of green bonds issued in the euro area from EUR 2.03 billion in Q4 2013 (EUR 2.78 billion Q1 2014) to EUR 420.27 billion in Q3 2021. Green bonds are predominantly issued by banks, non-financial corporations, and governments. In Q3 2021, these sectors had issued a total outstanding amount of respectively EUR 123.16, 118.68, and 114.77 billion, accounting for 85% of the market. While the growth of the euro area green bond market is substantial, its size remains small compared to the overall euro area bond market. The outstanding amount of green bonds stood at 0.01% of the overall bond market in Q4 2013 and 2.3% in Q3 2021.[6] Second, our data indicate that the extent of green bond market development

[6]Since green bond data providers use varying definitions for 'green', statistics on the overall size of the euro area green bond market will vary depending on the data provider and definitions used. Our statistics on the size of the euro area green bond market should therefore be considered as indicative only. Nevertheless, our data seem to be broadly consistent with estimates provided by other sources (see e.g. Climate Bonds Initiative, 2021).

differs substantially across euro area countries. France, the Netherlands, and Germany are the largest green bond issuers, with an outstanding amount of EUR 124.75, 73.80, 68.23 billion in Q3 2021 respectively. Together, these top 3 issuer countries accounted for 38% of the market in Q3 2021. According to our available data Germany and France had already developed a green bond market in Q1 2014, the Netherlands and Italy in Q2 2014, followed by Spain in Q3 2014. Malta and Cyprus had not developed a green bond market according to our data, retrieved in January 2022.

The countries that invest most in euro area green bonds are France, Germany, and Luxembourg[7], who held 20%, 14%, and 11% of the outstanding amount respectively in Q3 2021. These countries accounted for 26%, 19%, and 15% of total investments in euro area green bonds by euro area investors. Third, investment funds, insurance companies and banks are substantial green bond investors, holding 38%, 31%, and 18% of the outstanding volume at Q3 2021. Across all euro area investors, we observe that the maturity profile of of investors' green bond portfolio is fairly similar to that of their non-green bond portfolio (see Table 2). Naturally, investors' green bond portfolios on average contain fewer bonds than their normal bond portfolios. Due to the structure of the green bond market, the share of government bonds in investors' green portfolios is smaller than in their normal bond portfolios. Compared to other investors, banks on average have a larger share of government bonds in their portfolios (see tables 2 panel II and table 3). This difference is more substantial for the largest banks.

[Table 2 - Descriptive statistics - Bond holdings by euro area investors]

[Table 3 - Descriptive statistics - Bond holdings at the banking group level]

3.2 Comparison of home bias in the green and non-green bond market

We now turn to our main empirical analysis. In a first step, we assess whether financial integration, as measured by our home bias indicator, significantly differs between euro area

[7]For Luxembourg, it does not imply that investors are from Luxembourg given the large investment funds sector in Luxembourg. Many investments are indirect through funds with investors originating from other countries.

investors' green and non-green bond portfolios, and whether this difference is persistent over time.

Figure 1 provides a graphical overview of investors' green versus non-green home bias by country of residence in 2021. The figure shows that green bond home bias is lower or equal to non-green bond home bias, suggesting that the euro area green bond market is more integrated. In other words, green bonds issued in the euro area are more likely to be held cross-border by euro area investors than non-green bonds issued in the euro area. The difference between green and non-green bond home bias seems particularly pronounced for countries with a relatively high level of non-green bond home bias.

[Figure 1 - Map of green versus non-green bond home bias in euro area countries]

Tables 4 and 5 provide more insights into the underlying dynamics of financial integration by providing summary statistics of green and non-green bond home bias over time between 2014 and 2021, across all euro area investors as well as for the banking sectors and largest banking groups.

Our data reveal that the euro area green bond market currently displays a higher degree of financial integration than the conventional bond market. This finding holds true across different types of investors. Table 4 shows that across all investors, we observe an average green bond home bias of 0.155 compared to a non-green bond home bias of 0.492 for the period 2014-2021. We find similar results when zooming in on the euro area banking sectors. While the level of home bias is generally higher for the banking sectors than for other investor types, the average level of green home bias of 0.243 is substantially lower than that of normal bonds at 0.588. A students' two-sided T-test reveals that green bond home bias is statistically significantly lower at a confidence level of 95%, across all investors as well as the banking sectors. Table 5 shows that the results are less pronounced for the largest 25 banking groups, with an average green versus non-green home bias of 0.31 compared to 0.44. Although the difference in home bias is smaller than it is for the aggregate of all investors, green bond home bias for the largest banking groups is still statistically significantly lower than non-green bond home bias at the 5% level.

We also observe that while green bond markets in the euro area are currently more integrated than conventional bond markets, green bond home bias exhibits an upward trend suggesting that green bond markets are generally becoming less integrated over time. Between 2014 and 2021, average green bond home biased increased from 0.066 to 0.233 across all investors, from 0.196 to 0.331 for the banking sectors and from 0.197 to 0.385 for the 25 largest banking groups. Notably, for the 25 largest banking groups, the difference between green and non-green bond home bias is no longer statistically significant for the period 2019 to 2021, as the level of green bond home bias converges to and even superseding levels of the conventional bond market in 2021.

[Table 4 - Home bias in the green bond versus the non-green bond market (all investors and banking sector)]

[Table 5 - Home bias in the green bond versus the non-green bond market (banking groups)]

4 Green bond home bias and supply considerations

In this section, we investigate whether green bond supply shortages impact green bond home bias. In our analysis, we are interested in whether the low yet increasing levels of investors' home bias in euro area green bond markets are driven by the nascent state of these markets given investors' general tendency to allocate a disproportionately large share of their wealth to domestic financial assets. In other words, we explore whether a lack of domestic green bond supply forces investors to look across borders for green bonds. If domestic green bond supply constraints are indeed the underlying driver of the observed home bias dynamics in euro area green bond markets, we expect that investors, whose entire green bond portfolio consists of foreign bonds due to the lack of a domestic green bond market, turn to their home market as soon as domestic green bonds become available. Moreover, we expect investors' green bond home bias to increase further as their domestic green bond market grows in size.

4.1 Methodology

To assess in more detail whether green bond supply constraints could indeed drive lower yet increasing levels of home bias in the green bond markets, we employ a fixed effects panel data model. More specifically, we estimate the following model which we run separately for the aggregate market, i.e. across all euro area investor types, as well as the euro area banking sector:

$$HB_{it} = \beta_0 + \beta_1 DomesticDevelopment + \beta_2 DomesticDevelopment^2 + \gamma_i + \tau_t + \epsilon_{it} \qquad (2)$$

The dependent variable HB_{it} represents investor country i's green bond home bias in quarter t. Our main explanatory *DomesticDevelopment* measures a country's green bond market development expressed by the outstanding amount of green bonds issued by that country as a percentage of the outstanding amount of all bonds issued by that country, an indication how sizable the domestic green bond market is relative to the aggregate domestic bond market.

We first only consider the direct effect of *DomesticDevelopment* on investors' green bond home bias in our baseline estimation because we want to isolate the effect of green bond supply. Second, we also include $DomesticDevelopment^2$, a quadratic term for domestic development in our full model to evaluate whether there are any non-linear trends. The term γ_i represents investor country fixed effects and captures any country specific differences, including differences in the respective tax regime or the extent to which a country hosts financial shell companies belonging to a foreign group.[8] The term τ_t represents quarterly fixed effects and captures any other time-varying macroeconomic developments that could influence investors' portfolio allocation. Standard errors are clustered at the investor country level, to account for any possible unobserved heterogeneity across investors in different counties. ϵ_{it} captures the idiosyncratic error term.

We estimate our regression model for both an unweighted and a weighted sample based on a country's share in the aggregate euro area green bond market. We do so to capture the immediate effects of direct green bond market development as well as the gradual effects as domestic green bond markets develop further over time. More specifically, the unweighted regression models include all country-quarter observations, irrespective of whether individual countries had a domestic green bond market. If no domestic green bond market exists in a certain country but the investors of that country invest in foreign green bond markets, home bias will be zero for the specific country quarter observation. As such, our unweighted regression models predominately capture the impact of initial bond market development - from no market to a market - on home bias. If domestic green bond supply constraints were to play a role, one would expect a positive relation between domestic green bond development and green bond home bias. Given that by construction, the unweighted models place a lot of emphasis on the initial 'jump' effect, a statistically significant positive coefficient would imply that investors turn to their domestic green bond market as soon as this option becomes available. The weighted models, by definition, only capture country-quarter observations for countries that already have a domestic green bond market in a certain quarter and give

[8]The inclusion of country investor fixed effects does, however, not entirely capture bilateral country tax differences in the form of withholding taxes and related bilateral agreements to compensate taxation at source. Given that the taxation of income from securities is not harmonized at the EU-level, this can result in situations where investors from some countries may find it less attractive to invest in non-domestic euro area securities. This could be the case, for instance, when they are confronted with double taxation.

greater prominence to countries with a larger green bond market. The weighted specifications therefore capture home bias dynamics as the countries' domestic green bond market grows in size over time. A statistically significant positive relation between domestic development and home bias would imply that investors increasingly overweight their holdings of domestic green bonds as their domestic green bond market develops further.

4.2 Results

Table 6 shows the results of our regression analysis for all euro area investors in Panel I and all euro area banking sectors in Panel II. For both groups of investors, columns (1)-(2) and (5)-(6) show the results for our unweighted model specifications, which predominately capture the impact of initial green bond market development on green bond home bias. Columns (3)-(4) and (7)-(8) show the results for our weighted model specifications, which highlight home bias dynamics as countries' domestic green bond market grow.

The regression results in Panel I of table 6 reveal that investors in countries entirely invested in foreign green bond markets due to lack of domestic supply turn to their home market as soon as green bonds become available domestically. This is indicated by the positive relationship between domestic green bond market development and home bias in columns 2 and 6, which is statistically significant at the 1% and 5% level, respectively. However, results indicate that a more complex relation emerges once a domestic green bond market has been established. Initially, investors' green bond home bias seems to decline as their domestic green bond market develops further, as indicated by the negative and statistically significant direct relation at the 10% level between domestic green bond development and home bias in columns 4 and 8. However, the positive and significant squared term indicates that this effect diminishes and home bias further increases once the size of the domestic green bond market reaches around 6% of a countries conventional bond market (based on the model represented in column 8), albeit to a lesser extent than the initial jump effect. Given these dynamics, it is expected that average green bond home bias in the euro area will equal investors' home bias in conventional bonds once their domestic green bond markets reach an average size of 6% of their respective conventional bond markets.

Panel II of table 7 zooms in on the relation between domestic green bond market development and green bond home bias by the euro area banking sectors. Similar to our findings for all investors in Panel I, euro area banking sectors turn to their domestic green bond markets once these become available in their jurisdiction (Columns 2 and 6). However, after this initial jump effect, the further development of the domestic green bond market does not seem to affect euro area banking sectors' bias towards domestic green bonds (Columns 4 and 8).

[Table 6 - Green bond home bias and supply constraints - evidence for euro area investors]

5 Green bond home bias and banks' sustainability ambition

In this section we investigate whether next to domestic green bond supply, investors' sustainability ambition may be a driver behind the lower home bias levels observed in green bond markets compared to conventional bond markets. More specifically, we assess whether banks that are a TCFD supporter, committing themselves to disclose climate risks and opportunities, are more inclined to invest in green bond markets abroad and hence whether their green bond portfolios exhibit lower levels of home bias compared to banks that are not TCFD supporters.

5.1 Methodology

Exploiting bond holdings data at the banking group level in combination with information on the banks' FSB TCFD supporter status, using a fixed effects panel data model we assess whether portfolio home bias is smaller for banks with this status compared to banks without this status. We estimate the following model, which we run across different euro area country subsamples for the period Q3 2018 to Q3 2013:

$$HB_{it} = \beta_0 + \beta_1 ClimateDisclosure_{it} + \beta_2 DomesticDevelopment_{it} + \beta_3 ClimateDisclosure_{it} \cdot DomesticDevelopment_{it} + \beta_4 CET1_{it} + \beta_5 ROAE_{it} + \gamma_i + \tau_t + \epsilon_{it} \quad (3)$$

The dependent variable HB_{it} represents a banking group i's green bond home bias in quarter t. Our main explanatory $ClimateDisclosure_{it}$ is a dummy indicator that equals one if a bank is a TCFD supporter in quarter t and zero otherwise. As discussed, we use a bank's climate disclosure status as a proxy for its sustainability ambition[9]. We control for the impact of banks' domestic green bond market development $DomesticDevelopment_{it}$ expressed by the outstanding amount of green bonds issued by the respective country the bank is located in relative to the outstanding amount of all bonds issued by that country. By including $ClimateDisclosure_{it} \cdot DomesticDevelopment_{it}$, we also capture possible interaction of the depth of the domestic market and banks' sustainability ambition. Our full model includes two key bank control variables that are common in the banking literature to capture the risk-return strategy of the respective bank that could impact home bias through specific investment decisions. In particular, we add banks' CET1 ratio, a bank resilience indicator calculated as common equity over risk weighted assets as well as the return on average equity (ROAE), a performance measure calculated as net income as a percent of average total equity, where average total equity excludes hybrid capital. We also include banking group fixed effects represented by γ_i to capture any possible unobserved heterogeneity across banks such as differences in business models. We also include time fixed effects τ_t to filter out any other time-varying macroeconomic developments that could influence banks' green bond portfolio allocation. Standard errors are clustered at the banking group level. ϵ_{it} represents the idiosyncratic error term.

We estimate our model for various data subsamples in order to uncover heterogeneity between banks in countries with various levels of domestic green bond market development. First, we run our model only for banking groups in countries that already have a domestic green

[9]To note that TCFD supporter banks amount to 16 in the third quarter of 2018 (compared to 87 banks that do not carry the TCFD supporter status). This number increases to 35 in the third quarter of 2021 (compared to 71 non-supporters)

bond market. In this estimation, bank-quarter observations are treated as missing when the bank's country of domicile has no green bond market. As such, this estimation filters out any 'jump' effects on green bond home bias that are observed when a country transitions from not having to having a domestic green bond market. More specifically, we estimate our model separately for banking groups in all euro area countries with a domestic green bond market, and for the sample excluding banking groups from Germany and France, as these countries have the largest green bond markets. Second, we use a sample in which we include bank-quarter observations of banks who's country of domicile does not have a green bond market, thus including observations where we could observe 'jump' effects for countries that go from not having to having a domestic green bond market initially. We estimate our model in three different ways. We estimate the model first for banking groups in all euro area countries, then for the banks in the five euro area countries with the largest domestic green bond market development, and finally for banks in the two frontrunner countries Germany and France.

5.2 Results

Table 7 provides our baseline regression results for the various country samples. Our results do not provide general support for the view that banks' elevated sustainability ambition drives cross-border green bond investments and lower levels of home bias. Effects are only significant for banks in countries with a relatively well developed domestic green bond market. Moreover, the beneficial impact of banks' sustainability ambition on green bond home bias dissipates rather quickly, as banks rebalance their portfolio towards domestic green bonds as their domestic market grows further.

We do not find any statistically significant relation between banks' sustainability ambition and green bond home bias when looking at all countries in our sample, regardless of whether we consider all countries with a domestic green bond market (Columns (1) and (2)) or all countries regardless of whether they already have a domestic green bond market (Columns (3) and (4)). We do observe a negative and statistically significant relation between banks' sustainability ambition and green bond home bias when zooming in on the five countries

with the most developed domestic green bond market (Column (7)). For banks that are TCFD supporters and hence more ambitious in terms of sustainability, on average green bond home bias is 14 percentage points smaller (from 0.44 to 0.4 (-0.14)). We find similar results when only considering banks in Germany and France (Column (9) and Column (10)), the front runners in terms of green bond market development. For banks in these countries, we observe a decline in average home bias from 0.23 to 0.06 (-0.17) when banks increase their sustainability ambition. Moreover, we observe additional dynamics (Column (10)): Next to observing a negative and statistically significant relation between banks' sustainability ambition and green bond home bias, we observe a positive and significant interaction effect between banks' sustainability ambition and domestic green bond market development. This result suggests that while an elevated sustainability ambition initially seems to motivate banks to invest in green bonds cross-border, this effect is negated by their preference for domestic assets. In addition, we assess whether the TCFD supporter status is more relevant if linked with banks' share of green bonds irrespective of the place of issuance, estimated relative to total banks' balance sheets. Unreported results reveal no statistically significant effect across all specifications.

[Table 7 - Green home bias, supply constraints and sustainability preferences - Banking groups]

[Table 8 - Green home bias, supply constraints and sustainability preferences - Banking groups (robustness)]

6 Conclusion

Nascent and only slowly developing markets are an ideal set-up to assess how (limited and only gradually evolving) supply of an asset class affects cross-border investment decisions and ultimately country level home bias. Using the European green bond market, a market that is only gradually evolving, we explore how home bias develops over time and more specifically are able disentangle supply from demand effects. More specifically, in a first step we investigate

how green bond supply constraints drive investors' green bond home bias in the euro area. To this end, we compare home bias in green bond versus conventional bond markets, and assess the relation between euro area green bond supply and euro area green bond portfolio home bias for euro area investors. We conduct our analysis across all euro area investor types, the euro are banking sectors, and the largest euro area banking group. Second, zooming in on the largest banking groups, we investigate whether investors' sustainability ambition could in part explain lower levels of green bond home bias.

We document that green bond markets are currently more integrated than conventional bond markets across the euro area, as evidenced by significantly lower levels of investors' home bias in green bond markets. However, green bond markets are generally becoming less integrated over time as domestic green bond markets mature. In the aggregate across all euro area investors, we find that investors who only hold foreign green bonds in the absence of a domestic green bond market, shift their portfolios towards domestic bonds as soon green bonds become available in their home country. After this initial correction, home bias only slowly increases further as the domestic market develops, suggesting that overall positive integration trend (lower home bias) of green bond markets only gradually diminishes as domestic markets continue to gain in size. Similar to our findings across all investors, euro area banking sectors turn to their domestic green bond markets once these become available in their jurisdiction. However, after this initial jump effect, the further development of the domestic green bond market does not seem to affect their bias towards domestic green bonds. Finally, our regression analysis shows that an increase in large banks' sustainability ambition can partly explain cross-border green bond investments and lower levels of home bias for banks in countries with a relatively well developed domestic green bond market. The beneficial impact of banks' sustainability ambition on green bond home bias seems to dissipate quickly, however, as banks rebalance their portfolio towards domestic green bonds as their domestic market grows.

As our findings hint at the presence of barriers to cross-border investments in the euro area[10], from a policy perspective it would be important that EU policy makers and regulators identify and address these barriers in order to mobilise sufficient funds to finance the transition to a sustainable economy, as economies with suboptimal levels of capital market integration and

[10]Barriers could include information asymmetries and lack of transparency, or lack of harmonisation in rules and regulations, e.g. tax regimes.

risk-sharing are less able to finance large innovations. The European Commission has put forward various initiatives to foster green capital market integration, such as the development of a common classification system for sustainable activities, a sustainability risk disclosure framework for non-financial and financial companies, and investment tools such as sustainability benchmarks, standards, and labels (European Commission, 2021). These initiatives aim to reduce barriers to cross-border investments by improving market transparency and promoting harmonisation. Going forward, policy makers and regulators will have to evaluate the effectiveness of these measures to foster green capital market integration and adjust policies where needed.

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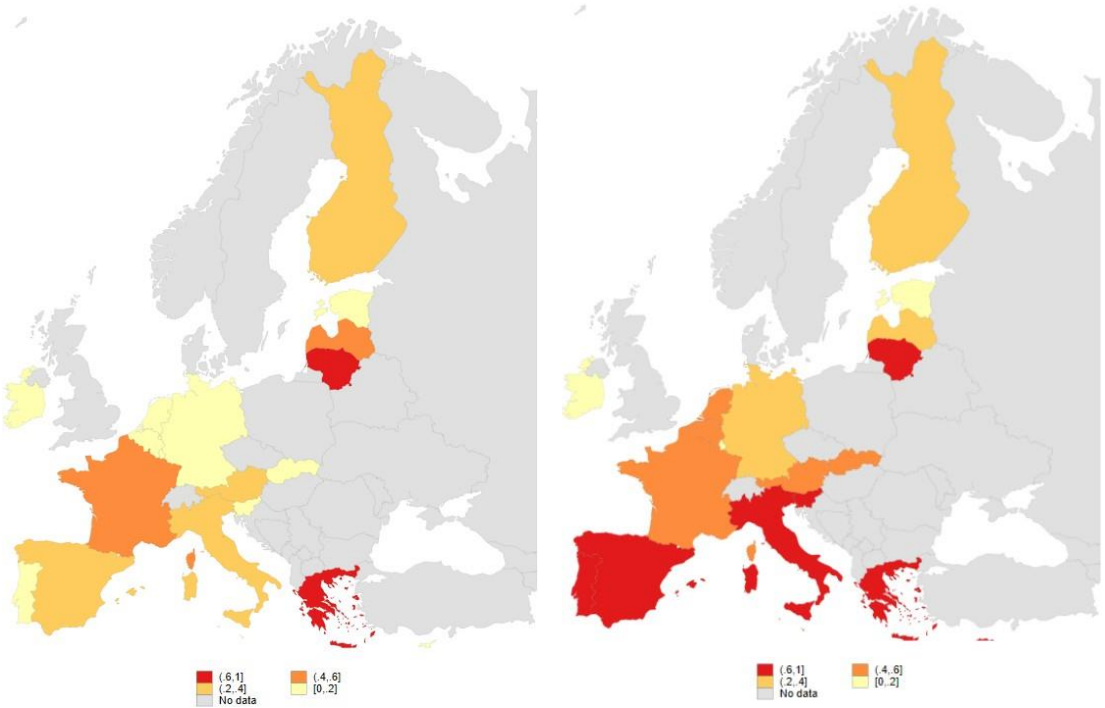
Appendix A: Figures

Figure 1: Map of green versus non-green bond home bias in euro area countries



(a) green bond market (b) non-green bond market

These maps show a comparison between green bond and non-green bond home bias in 2021 acoss all investors per euro area country.

Appendix B: Tables

Table 1: Variable description

This table lists variables used throughout the analyses, and provides an overview of the data sources used, data frequency, and definition of the variables.

Variable name	Data Source	Frequency	Description
		All Euro area investors, and banking sectors	
Home bias	SHS, Bloomberg	Quarterly	**Home bias** in a country-sector's bond portfolio. For the purpose of our analysis, we focus on a country-sector's holdings of bonds that are issued in the euro area and denominated in EUR.
		All Euro area investors, banking sectors, and banking groups	
Domestic Development	SHS, Bloomberg	Quarterly	**Domestic Development** measures a country's green bond market development as expressed by the outstanding amount of green bonds issued by that country as a fraction of the overall bonds issued in terms of outstanding amounts.
Green Market Share	SHS, Bloomberg	Quarterly	**Green Market Share** measures a ca country's total amount of green bonds issued as percent of the total amount outstanding of green bonds issued in the euro area.
		Banking groups	
Home bias	SHS, Bloomberg	Quarterly	**Home bias** Home bias in a banking group's bond portfolio, as detailed in section 2.2.2. For the analysis in our paper, we focus on a bank's holdings of bonds that are issued in the euro area and denominated in EUR. For the construction of a banking group's bond portfolio at group level, we aggregate holdings for all entities belonging to the banking group, while excluding intra-group holdings.
Climate Disclosure	Financial Stability Board	Quarterly	**Climate Disclosures** is a dummy indicator signalling whether a banking group was a supporter of the Financial Stability Board's Task Force of Climate related Financial Disclosures (TCFD) in quarter t.
CET1 Ratio	BvD Bankfocus [85360]	Annually	**Common equity tier 1** as a percentage of risk-weighted assets on a transitional basis as reported by the bank. CET1 on a fully loaded basis is provided in case transitional is not reported.
ROAE	BvD Bankfocus [99480]	Annually	**Return on average equity** measures net income as a percent of average total equity. Average total equity excludes hybrid capital.

Table 2: Descriptive statistics - Bond holdings by euro area investors

This table provides summary statistics on the green bond and non-green bond holdings of euro area investors, both on the aggregate level (across country-sectors) and for the banking sector (across countries). The tables provide details on some key characteristics of the bonds that make up investors' portfolio, i.e. the original and residual maturity of the bonds, and the amount outstanding of the bonds in investors' portfolio. Moreover, the table provides information on the number of bonds held by investors, the share of government bonds in their overall bond portfolios, as well as the home bias of the portfolios.

	(1) green		(2) non-green	
	Mean	SD	Mean	SD
	I. All Euro area investors			
Original maturity (days)	3736.584	4623.925	2963.619	4026.016
Residual maturity (days)	3084.051	4690.335	1784.644	3623.902
Amount outstanding (bond level, in mln. EUR)	892.2415	1898.855	1612.498	4477.576
Number of bonds held	177.6097	150.543	75641.59	104259.6
Government bond holdings share	.2138926	.1728628	.4376069	.2238754
	II. Banking sector			
Original maturity (days)	3328.202	3633.352	3291.38	3912.367
Residual maturity (days)	2681.247	3710.106	1912.688	3431.65
Amount outstanding (bond level, in mln. EUR)	851.4168	1611.367	1459.889	4177.722
Number of bonds held	148.5961	131.7758	16008.28	12026.66
Government bond holdings share	.217098	.1768169	.4588221	.141401

Table 3: Descriptive statistics - Bond holdings at the banking group level

This table provides summary statistics on the green bond and non-green bond holdings of the largest euro area banking groups in our sample. Panel I shows summary statistics for our full sample of banks, which starts out with data on 25 banks in 2013 Q4 and increases up to 126 banks between 2018 Q3 and 2021 Q3. Panel II shows the summary statistics for our restricted sample of the 25 largest banks, for which we observe data during the entire length of our time series. The table provides details on some key characteristics of the bonds that make up the portfolio of the banking groups, i.e. the original and residual maturity of the bonds, and the amount outstanding of the bonds. Moreover, the table provides information on the number of bonds held, the share of government bonds in the overall bond portfolios, as well as the home bias of the portfolio.

	(1) green		(2) non-green	
	Mean	SD	Mean	SD
	I. All Banking Groups			
Original maturity (days)	3336.03	3490.868	4401.991	4368.168
Residual maturity (days)	2653.152	3567.81	2608.675	3943.182
Amount outstanding (bond level, in mln. EUR)	1059.534	2157.716	2497.689	5577.33
Number of bonds held	48.60635	46.08588	2112.079	1530.679
Government bond holdings share	.4010068	.2789339	.6348422	.1792184
	II. 25 Largest Banking Groups			
Original maturity (days)	3527.567	3729.103	4548.554	4526.938
Residual maturity (days)	2863.524	3802.908	2741.151	4120.736
Amount outstanding (bond level, in mln. EUR)	1088.434	2242.027	2372.657	5386.043
Number of bonds held	61.397	49.9385	2488.142	1479.354
Government bond holdings share	.3982715	.2565365	.6283441	.1631442

Table 4: Home bias in the green bond versus the non-green bond market

Panels I and II of this table provides summary statistics for our home bias measure and show whether there is a statistically significant difference in green bond and non-green bond portfolio home bias at the country level (All euro area investors) and for the banking sectors only (Banking sectors).

	(1)-(2)	(1) green			(2)non-green			comparison tests (1) vs (2)
	N	Mean	Median	SD	Mean	Median	SD	T-test
I. All Euro area investors								
2014	60	.065	.000	.183	.472	.482	.274	.000
2015	67	.122	.000	.236	.492	.507	.254	.000
2016	76	.116	.000	.239	.507	.528	.24	.000
2017	76	.135	.000	.218	.509	.523	.238	.000
2018	76	.169	.100	.197	.498	.500	.245	.000
2019	76	.186	.138	.206	.486	.470	.236	.000
2020	76	.208	.149	.211	.483	.467	.22	.000
2021	57	.233	.156	.212	.48	.466	.216	.000
Total	564	.155	.046	.218	.492	.497	.239	.000
II. Banking sectors								
2014	37	.196	.000	.343	.561	.594	.301	.000
2015	50	.191	.018	.275	.573	.593	.269	.000
2016	66	.151	.000	.262	.591	.645	.251	.000
2017	68	.223	.086	.269	.611	.627	.237	.000
2018	69	.262	.210	.263	.605	.595	.241	.000
2019	76	.269	.119	.271	.587	.579	.24	.000
2020	76	.289	.216	.266	.584	.586	.234	.000
2021	57	.331	.278	.276	.583	.613	.236	.000
Total	499	.243	.129	.278	.588	.595	.250	.000

Table 5: Home bias in the green bond versus the non-green bond market

This table provides summary statistics for our home bias measure and shows whether there is a statistically significant difference in green bond and non-green bond portfolio home bias for the largest banking groups, per year between 2014 and 2021 and on average over the entire time series. for our full sample of banks, which starts out with data on 25 banks in 2013 Q4 and increases up to 126 banks between 2018 Q3 and 2021 Q3. Panel II shows the summary statistics for our restricted sample of the 25 largest banks, for which we observe data during the entire length of our time series.

	(1)-(2)	(1) green			(2)non-green			comparison tests (1) vs (2)
	N	Mean	Median	SD	Mean	Median	SD	T-test
I. All Banking Groups								
2019	93	.340	.269	.414	.432	.452	.312	.000
2020	93	.372	.335	.395	.413	.433	.313	.004
2021	69	.404	.371	.389	.415	.419	.309	.191
II. 25 Largest Banking Groups								
2014	57	.197	.000	.54	.491	.491	.302	.001
2015	75	.318	.145	.475	.469	.492	.267	.021
2016	84	.245	.000	.494	.456	.455	.273	.001
2017	89	.269	.129	.406	.451	.438	.278	.001
2018	185	.304	.263	.385	.445	.477	.282	.001
2019	315	.357	.407	.324	.421	.449	.294	.068
2020	328	.366	.422	.289	.387	.397	.276	.317
2021	271	.385	.392	.249	.354	.361	.276	.814
Total	1404	.310	.304	.400	.437	.441	.283	.000

Table 6: Green bond home bias and supply constraints - evidence for euro area investors

This table provides results for regression eq. 2, which indicates the relation between investors' domestic green bond market development and their green bond portfolio home bias. Columns (1)-(2) and (5)-(6) provide the results for our unweighted sample, which includes all investor country-quarter observations irrespective of whether individual countries had a domestic green bond market. If no domestic green bond market exists in a certain country but the investors of that country invest in foreign green bond markets, home bias will be zero for the specific country quarter observation. As such, our unweighted regression models predominately capture the impact of initial bond market development - from no market to a market - on home bias. Columns (3)-(4) and (7)-(8) provide the results for our weighted sample, and only capture investor country-quarter observations for countries that already have a domestic green bond market in a certain quarter, and give greater prominence to countries with a larger green bond market. The weighted specifications therefore capture home bias dynamics as the countries' domestic green bond market grows in size over time. Panel I shows the results for all investors across euro area countries. The number of clusters represent the number of euro area countries (all investors) included in our panel. Our time series ranges from 2013 Q4 to 2021 Q3 (32 quarters). Please note that for 32 country-quarters in our panel data we observe no domestic green market nor foreign investment in green bonds. Panel II shows the results of the euro area banking sectors. The number of clusters represent the number of euro area countries (banking sectors) included in our panel. Our time series ranges from 2013 Q4 to 2021 Q3 (32 quarters).Please note that for 100 country-quarters in our panel data we observe no domestic green market nor foreign investment in green bonds. Standard errors, shown in parentheses, are clustered at the investor country level. The ***, ** and * stand for significant coefficients at the 1%, 5%, and 10% levels, respectively.

Green bond home bias and supply constraints

I. All Euro area investors

	All countries		Countries with GB market		All countries		Countries with GB market	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Development	0.0660***	0.0646***	-0.0322	-0.0646*	0.0784**	0.0779**	-0.1480	-0.1868*
	(0.0202)	(0.0220)	(0.0225)	(0.0345)	(0.0357)	(0.0363)	(0.0955)	(0.0932)
Development^2					-0.0026	-0.0025	0.0249	0.0183*
					(0.0061)	(0.0058)	(0.0163)	(0.0091)
Constant	0.0944***	0.1177*	0.3773***	0.7030***	0.0909***	0.1188*	0.4400***	0.7027***
	(0.0180)	(0.0581)	(0.0308)	(0.0361)	(0.0205)	(0.0581)	(0.0686)	(0.0296)
Observations	576	576	346	346	576	576	346	346
Time FE	No	Yes	No	Yes	No	Yes	No	Yes
Investor Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weighted	No	No	Yes	Yes	No	No	Yes	Yes
Adj. R-squared	0.692	0.678	0.684	0.882	0.692	0.678	0.731	0.890
Nr. Clusters	19	19	17	17	19	19	17	17

II. Banking sectors

	All countries		Countries with GB market		All countries		Countries with GB market	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Development	0.0953***	0.0841***	0.0019	-0.0535	0.1722***	0.1699***	-0.0588	-0.1345
	(0.0207)	(0.0213)	(0.0179)	(0.0379)	(0.0537)	(0.0569)	(0.1124)	(0.1648)
Development^2					-0.0163	-0.0161	0.0131	0.0122
					(0.0097)	(0.0098)	(0.0206)	(0.0205)
Constant	0.1292***	0.2831*	0.3332***	0.7059***	0.1031***	0.2987*	0.3661***	0.7057***
	(0.0215)	(0.1597)	(0.0246)	(0.0079)	(0.0300)	(0.1630)	(0.0750)	(0.0106)
Observations	494	494	346	346	494	494	346	346
Time FE	No	Yes	No	Yes	No	Yes	No	Yes
Investor Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Weighted	No	No	Yes	Yes	No	No	Yes	Yes
Adj. R-squared	0.692	0.678	0.684	0.882	0.692	0.678	0.731	0.890
Nr. Clusters	19	19	17	17	19	19	17	17

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 7: Green home bias, supply constraints and sustainability preferences - Banking groups

This table provides results for regression eq. 3, which indicates the relation between banks'sustainability ambition (as measured by their *ClimateDisclosure* status) and their green bond portfolio home bias. Results are provided for various data samples in order to show heterogeneity between banks in countries with various levels of domestic green bond market development. The number of clusters indicates the number of banking groups included in the regression. The number of observations indicate the number of banking group-quarter observations in our sample. Columns (1) and (2) do not account for observations where a country has no green bond market as these are treated as missing values. In columns (3) and (4), we replace these missings to zero and include observations when a country does not have a domestic green bond market. Columns (5) and (6) are a replication of (3) and (4) but excluding DE and FR. Columns (7) and (8) are a replication of (3) and (4) but only include DE, ES, FR, IT and NL, the largest green bond issuers. Columns (9) and (10) only account for DE and FR. Standard errors, shown in parentheses, are clustered at the banking group level. The ***, ** and * stand for significant coefficients at the 1%, 5%, and 10% levels, respectively.

Banking Groups	All countries with GB market		All countries		All countries with GB market (No DE/FR)		Largest EA countries		Germany and France	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ClimateDisclosure	-0.0586	-0.0935	-0.0407	-0.0729	0.0209	0.0990	-0.1447***	-0.1835**	-0.1657**	-0.4022***
	(0.0722)	(0.0906)	(0.0690)	(0.0899)	(0.0880)	(0.1187)	(0.0494)	(0.0811)	(0.0809)	(0.0732)
Development	0.0192	0.0075	0.0259	0.0154	0.0132	0.0379	-0.0114	-0.0323	0.0918	-0.0033
	(0.0260)	(0.0224)	(0.0243)	(0.0216)	(0.0274)	(0.0258)	(0.0549)	(0.0378)	(0.0870)	(0.0668)
ClimateDisclosurexDevelopment		0.0235		0.0217		-0.0536		0.0316		0.1411***
		(0.0425)		(0.0425)		(0.0535)		(0.0526)		(0.0355)
Constant	0.3647***	0.3753***	0.3196***	0.3283***	0.3486***	0.3316***	0.4439***	0.4626***	0.2264**	0.3332***
	(0.0428)	(0.0361)	(0.0405)	(0.0358)	(0.0477)	(0.0431)	(0.0643)	(0.0482)	(0.1002)	(0.0808)
Observations	992	992	1,040	1,040	732	732	633	633	308	308
No. Clusters	95	95	101	101	70	70	61	61	31	31
Quarterly FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.0157	0.0165	0.0171	0.0177	0.0157	0.0231	0.0164	0.0179	0.0227	0.0901

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Green home bias, supply constraints and sustainability preferences - Banking groups (robustness)

This table zooms in on the relation between banks' sustainability ambition (as measured by their *ClimateDisclosure* status) and their green bond portfolio home bias for two sets of investors: the banking groups of the largest EA countries in terms of green bond issuance (columns (1) to (3)), and the banking groups of Germany and France (columns (4) to (6)). As a robustness check, we include the banking groups' core equity tier 1 (CET1) ratio and return on average equity (ROAE) as controls. The number of observations indicate the number of banking group-quarter observations in our sample. The number of clusters indicate the number of banking groups we observe in our panel data. Our time series ranges from Q3 2018 to Q3 2021 (13 quarters). Standard errors, shown in parentheses, are clustered at the banking group level. The ***, ** and * stand for significant coefficients at the 1%, 5%, and 10% levels, respectively.

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Banking Groups from:	Largest EA countries (1-3)			Germany and France (4-6)		
	(1)	(2)	(3)	(4)	(5)	(6)
ClimateDisclosure	-0.0902	-0.0769	-0.1764*	-0.1899***	-0.1208	-0.3500***
	(0.0545)	(0.0567)	(0.0910)	(0.0655)	(0.0720)	(0.0930)
Development		0.0413	-0.0363		0.1322	-0.0138
		(0.0569)	(0.0525)		(0.0828)	(0.0696)
ClimateDisclosurexDevelopment			0.1148*			0.1759***
			(0.0652)			(0.0583)
CET1 ratio	-0.0138	-0.0145	-0.0092	-0.0325***	-0.0510***	-0.0290**
	(0.0102)	(0.0111)	(0.0093)	(0.0094)	(0.0151)	(0.0137)
ROAE	0.0073**	0.0074**	0.0080***	0.0079***	0.0119***	0.0100***
	(0.0031)	(0.0031)	(0.0030)	(0.0028)	(0.0032)	(0.0027)
Constant	0.6256***	0.5994***	0.5737***	0.7878***	0.9128***	0.7286***
	(0.1547)	(0.1676)	(0.1391)	(0.1422)	(0.1694)	(0.1784)
Observations	403	403	403	199	199	199
No. Clusters	50	50	50	26	26	26
Quarterly FE	Yes	Yes	Yes	Yes	Yes	Yes
Banking Group FE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.0420	0.0734	0.0585	0.0465	0.0635	0.109
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1						