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Why Do Institutional Investors Buy Green Bonds: Evidence from a Survey of European Asset Managers

Ivan Sangiorgi
ICMA Centre, Henley Business School
University of Reading
Reading
United Kingdom
ivan.sangiorgi@icmacentre.ac.uk

Lisa Schopohl
ICMA Centre, Henley Business School
University of Reading
Reading
United Kingdom
l.schopohl@icmacentre.ac.uk

Abstract

Using survey evidence from European asset managers, we provide insights into their green bond investment activities and the factors that affect their investment decisions. We find that the majority of investors are actively invested in the green bond market via a variety of investment channels. Investors prefer green bonds issued from corporate issuers and sovereigns and we find that there is strong unmet investor demand for green bonds from these issuer types, in particular from non-financial corporates in the industrials, automotive and utilities sectors. Competitive pricing and strong green credentials, both pre- and post-issuance, are the most frequently named factors impacting respondents' decision to invest in a green bond, and unclear and poor reporting on how bond proceeds are allocated to green projects induces a majority of investors to not invest in a green bond or to sell a bond if already included in the portfolio. Among policy measures to grow the green bond market, preferential capital treatment for low-carbon assets and minimum standards for green definitions receive the highest investor support, but respondents are divided whether a strict definition of 'green' or a less strict definition would be more beneficial for scaling up the green bond market.

1. Introduction

Mitigating the impact of climate change and managing the transition from a high- to a low-carbon economy present two of the most pressing and complex challenges faced by humankind. Meeting these challenges and ensuring that the global average temperature rise stays below the 1.5ºC target requires vast amounts of capital to be directed towards renewable energy, energy efficiency and green infrastructure projects (OECD, 2017). While developed countries that signed the Paris Agreement committed to making USD 100 billion per year available for green investments between 2020 and 2025 (UNFCCC, 2015), experts agree that these investments will not be sufficient to cover the large investment needs under the 1.5ºC target scenario (OECD, 2017; IEA, 2014).

Hence, a critical step towards limiting the effects of climate change is to mobilise additional capital flows and direct them towards green investments. Both the World Bank (2015) and the OECD (2017) consider the global bond market with a size of around USD 100 trillion as a crucial source for funding this green transition.[1] However, public and private market participants have only just started to exploit the bond market's potential for funding green projects. Therefore, gaining a more in-depth understanding of the enabling environment for tapping into the market for green debt financing and the attractiveness of different green debt instruments to investors is an important prerequisite for growing this market.

One green debt instrument, that has been gaining increased attention among investors and policy makers for its potential to scale up investments in green projects, are green bonds. Green bonds are fixed income securities that raise capital for projects which deliver environmental benefits (OECD, 2016). Green bonds differ from regular – 'plain vanilla' – bonds as the funds raised are earmarked to finance or refinance 'green' projects, assets or business activities. As such, green bonds can support issuers in mitigating the impacts of climate change, funding activities with environmental benefits and even initiating a transition to a greener business model by offering access to low cost debt capital via a well understood and standardised instrument.

The OECD (2016, 2017) considers green bonds as one of the most promising financial debt instruments to finance the transition to a low-carbon economy. In addition, a number of academic studies show that green bonds have attractive features, such as their ability to redistribute the cost of funding climate change mitigation efforts across generations, which make them ideally suited to raise both private and public funding for green investments (Monasterolo and Raberto, 2018; Flaherty et al., 2017; Sachs, 2014), and to attract a broad spectrum of institutional investors (OECD, 2017).

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[1] The Securities Industry and Financial Markets Association (SIFMA) estimates the global bond market outstanding to be around USD 102.8tn at the end of 2018 (SIFMA, 2019).

Since the first green bond was issued by the European Investment Bank (EIB) in 2007,[2] the green bond market has seen strong growth over the following decade, both in terms of volumes issued and with regards to the diversity of issuers. In 2019, new green bond issuances reached the USD 250 billion mark and involved around 500 different issuers from 51 jurisdictions (Climate Bonds Initiative, 2020a). Moreover, green bonds have attracted a variety of issuer types including sovereigns, municipalities, supranational organisations as well as financial and non-financial corporates. The market has also seen an emergence in derivative-based green bond products, primarily issued by the US-based government agency Fannie Mae in the form of green mortgage-backed securities (MBS). Despite the strong year-to-year growth, green bonds still only account for 0.5-1% of the total global bond market, indicating that there is large potential to expand and grow the market.[3] The future of the green bond market relies critically on the capacity and willingness of issuers to issue more green bonds as well as on the confidence of investors in the viability of green bonds to offer both economic value and environmental impact (Park, 2018).

This study focuses on the investor perspective and explores institutional investors' investment activities in the green bond market and the drivers and obstacles for their green bond investments. To ascertain investors' views and attitudes towards green bonds, we use a survey instrument. Using survey data enables us to examine underlying investment motivations and barriers that are not directly observable and testable based on archival data analyses or that could at best only be proxied by variables surrogating for investment intent and attitudes (Dichev et al., 2013; Krueger et al., 2020). Our analysis is based on survey responses by 48 asset managers that are based in Europe and which together account for EUR 13.68tn in assets under management (AUM) and an accumulated fixed income AUM of EUR 4.30tn. European institutional investors are among the most active investors incorporating environmental, social and governance (ESG) factors into their investment processes (Amel-Zadeh and Serafeim, 2018) and the European green bond market accounts for the largest cumulated volume of green bond issuances to date (Climate Bonds Initiative, 2019a). Hence exploring European investors' views on the emerging green bond market offers valuable insights not only for understanding the European green bond investment environment but also for drawing implications for institutional investors and markets outside of Europe.

In our study, we explore four key areas: (1) investors' green bond investment practices; (2) the factors impacting their green bond investment decisions; (3) investors' views on mechanisms and policies to support green bond growth; and (4) the green bond investment environment in emerging markets.

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[2] The bond issued by the European Investment Bank was officially not named green bond but was issued under the name 'climate awareness bond'. But this issuance is widely considered the first green bond issuance (e.g. Tang and Zhang, 2020).

[3] A green bond market weight of 0.5-1% is supported by discussions with Climate Bonds research analysts based on Climate Bonds' proprietary green bond database.

We find that 90% of our sample actively invests in green bonds, using a variety of channels ranging from a preference for green bonds over plain vanilla bonds – the most frequently applied approach - to dedicated green bond funds and explicit green bond targets and mandates. Considering a green bond market weight of 0.5-1% relative to the total bond market, most respondents (60%) are overexposed to the green bond market, i.e. they hold more than 1% of their fixed income AUM in green bonds. Their preferred sectors for green bond investments are renewable energy, clean transport and low carbon buildings, while green bonds targeting climate adaptation are less in demand. However, the majority of investors favour a variety of green bond types, most investing in six or more different areas. In terms of issuers, asset managers prefer to invest in corporate green bonds and have large excess demand for green bonds from this issuer type, especially from non-financial corporates in the industrials, automotive and utilities sectors. In addition, green bonds issued by sovereigns and development banks are preferred channels and exhibit unmet investor demand.

The survey instrument also enables us to identify the factors that impact respondents' green bond investment decisions including the impact of pre- and post-issuance reporting on investment decisions and the role that green bond issuance plays in attracting additional institutional investments. The three main factors that respondents base their green bond investment decision on are satisfactory green credentials at issuance, competitive pricing and satisfactory credentials post issuance. These results suggest that green bonds are both an economic investment proposition for the asset managers, as well as a channel through which to generate positive environmental impact. A particular point of debate in the green bond market relates to disclosures and reporting of the environmental impact of the bonds. Our results show that green bond investors strongly care about the 'green' feature of the bonds, with 79% of respondents stating that they would not buy a bond with unclear use of proceeds (UoP) and 55% indicating that they would sell a green bond if post-issuance reporting was poor. We also show that green bond issuance can have a 'halo effect' on investors' interests for other securities of the same issuer, albeit limited, with 24% of respondents stating that they would be more inclined to buy non-green bonds from green bond issuers, while 72% indicate that they have no preferences towards the purchase of such non-green bonds.

We further collate and analyse investors' views on mechanisms and policies to support green bond growth and on the green bond investment environment in emerging markets. Respondents consider improvement of positive credit fundamentals and international credit ratings with integrated environmental risk analysis as the most promising market tools. Among policy measures, preferential capital treatment for low-carbon assets and minimum standards for green definitions are preferred tools by asset managers. Interestingly, subsidies for green bonds and penalising capital requirements for high-carbon assets receive only limited support by respondents. For growing green bond investment in emerging markets, investors name credit enhancement as the most promising driver, followed by public spending on infrastructure programmes. Overall, we find that respondents' views and assessments differ

by European region and investor size, suggesting that these effects need to be taken into account when designing tools and measures to boost the market to ensure a good fit between investor demands and policy responses. Thus, our findings offer novel and important insights for issuers and policymakers aiming to direct additional institutional investment towards green projects and assets.

The literature on green bonds is a small but rapidly expanding stream in the green finance literature, and our survey evidence allows us to contribute to the existing body of green bond research in multiple ways. Firstly, most research on green bonds has been dedicated to the pricing of these securities, in particular relative to their plain vanilla counterparts (e.g., Bachelet et al., 2019; Baker et al., 2018; Karpf and Mandel, 2017; Larcker and Watts, 2019; Zerbib, 2019). However, the results of these studies are mixed, with some suggesting that green bonds are priced at a discount to matched plain vanilla bonds (Karpf and Mandel, 2017), others showing that there is a price premium for green bonds (Bachelet et al., 2019; Baker et al., 2018; Zerbib, 2019), while again other researchers find no significant pricing differential between green bonds and closely matched conventional bonds (Flammer, 2020; Larcker and Watts, 2019; Tang and Zhang, 2020). All this research is based on archival data analysis that compares the prices of green bonds to those of similar plain vanilla bonds. Our survey analysis contributes to this strand of research by approaching the question of the pricing of green bonds from the perspective of the investor. Potentially not surprisingly, we find that investors rank competitive pricing relative to plain vanilla bonds as one of the most important factors when investing in green bonds, together with satisfactory green bond credentials at issuance. These results suggest that most investors are impacted by their non-pecuniary environmental preferences in their green bond purchasing decisions but, at the same time, are not willing to invest in bonds that are not competitively priced, i.e. carry a large price premium. These findings offer some support that green bond investors might be driven by factors other than financial risk-return considerations, such as bonds' green credentials, which can create higher demand effects for these instruments in line with a green bond pricing premium (see Baker et al., 2018; Zerbib 2019), the so called 'greenium'.[4] But our result of the high consideration for pricing in the green bond investment decision suggests that such a greenium might only be very small, or statistically insignificant. These findings support evidence presented in Zerbib (2019), Flammer (2020), Larcker and Watts (2019) and Tang and Zhang (2020).

Secondly, several studies in the green bond literature explore the wider effects of issuing green bonds for the issuing firm (e.g. Baker et al., 2018; Flammer, 2020; Tang and Zhang, 2020). Both Flammer (2020) and Tang and Zhang (2020) focus on corporate green bonds and find that the stock market responds positively to the announcement of green bond issuances, particularly for independently certified and first-time issuers (Flammer, 2020), and that green bond issuances help to attract

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[4] Larcker and Watts (2020) define the greenium as the 'premium that green assets trade to otherwise identical non-green securities', while Climate Bonds Initiative (2017) states that green bonds can be issued at higher prices (lower yields) than comparable seasoned vanilla bonds, and terms this new issue discount as a 'greenium'.

institutional investors as firms experience an increase in share ownership by long-term, green investors and domestic institutional investors after green bond issuance. Hence, issuing green bonds seems to generate a variety of different benefits for the issuer beyond raising additional debt capital. We contribute to this existing evidence on the 'halo effect' of issuing green bonds by showing that the responses from institutional investors in our sample only provide limited support for a strong 'halo effect' of green bond issuance for further institutional investments. Among our respondents, only less than one quarter state that they are more inclined to buy a plain vanilla bond from an organisation that also issues green bonds, while the vast majority (72%) indicate that they have no preferences towards buying other bonds from green bond issuers. Hence, our findings based on a survey instrument suggest that green bond's 'halo effect' might be more limited – or less explicit – than previously suggested.

From the policy perspective, the drivers and obstacles of green bond market growth have also been explored, most notably by Jun et al. (2016), OECD (2017) and Tolliver et al. (2020).[5] For instance, Tolliver et al. (2020), using structural equation modelling to examine the drivers of green bond growth in different countries, document a link between green bond issuances and a country's nationally determined contributions to the Paris Agreement as well as other macroeconomic and institutional factors. These results suggest that the policy environment and national commitment to mobilising climate finance has a strong real impact on the national green bond markets. We add to this body of research by investigating the views of institutional investors from different European countries on the enabling mechanisms and obstacles to green bond growth.

Finally, our study contributes to the growing body of research that uses surveys to examine corporate managers' choices and investors' decision-making (e.g. Dichev et al., 2013; Graham and Harvey, 2001; McCahery et al., 2016). Survey instruments have proven particularly useful in the area of ESG and green investment which due to the often-qualitative nature of the information used in decision-making limits the ability to use archival data to analyse investment choices. For instance, Berry and Junkus (2013), Valor et a. (2009) and Williams (2007) employ survey data to analyse the determinants and obstacles to ESG investing among private individual investors, while Cumming and Johan (2007), van Duuren et al. (2016), Eccles et al. (2017), Amel-Zadeh and Serafeim (2018) and Krueger et al. (2020) survey institutional investors on the incorporation of ESG criteria into their investment processes. The latter studies point towards institutions' internal organisational structure and degree of internationalisation (Cumming and Johan, 2007), the investors' domicile (van Duuren et al., 2016), demand from investment beneficiaries (Eccles et al., 2017; Amel-Zadeh and Serafeim, 2018), internal initiatives by executives (Eccles et al., 2017), investment performance, product strategy and ethical considerations (Amel-Zadeh and Serafeim, 2018) as the main drivers of institutions' ESG investing. Furthermore, these studies suggest that a lack of common standards as well as missing transparency and

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[5] In addition, Tu et al. (2020) focus on identifying factors for the green bond market expansion in Vietnam.

comparability in ESG reporting by companies are the main obstacles towards further ESG investment (Eccles et al., 2017; Amel-Zadeh and Serafeim, 2018). The study most closely related to ours is by Krueger et al. (2020), who use survey evidence to better understand whether and how institutional investors account for climate change risk in their investment processes. Their respondents cite a variety of motivations for incorporating climate risk considerations into portfolio decisions, such as protecting their reputation, moral and ethical considerations, legal or fiduciary duties as well as financial considerations involving improving returns and reducing portfolio risks. While the studies above focus on a variety of different investment instruments and ESG investment processes in general, they do not address institutional investors' views on green bonds. Hence, our study is the first that directly focuses on green bonds and the role they play in asset managers' fixed income investments.

The remainder of the study is structured as follows: Section 2 develops testable hypotheses based on our survey instrument. Section 3 describes the survey design and data collection and offers an overview of the respondents' sample. Section 4 presents the results of the survey by focusing on four key areas: (1) respondents' green bond investment activities, (2) the factors impacting their green bond investment decisions, (3) investors' views on mechanisms and policies to support green bond growth, and (4) the green bond environment in emerging markets. Section 5 summarises our finding and discusses implications for green bond market participants and policy makers.

2. Hypothesis Development Section

Given the novel nature of green bonds and the limited knowledge regarding asset managers' investment approaches towards green bond investment, our study is predominantly exploratory in nature. This is in line with the approach by similar survey-based studies on ESG investment (see Valor et al., 2009; as well as Eccles et al., 2017; Amel-Zadeh and Serafeim, 2018). Especially the questions and analyses that aim to ascertain investors' current investment holdings in green bonds, their views on the main drivers and obstacles of green bond investment and on tools and mechanisms to boost the green bond market are aimed at establishing current investment practices and exploring investor attitudes. Given the limited knowledge on institutional investors' activities and views on the green bond market, we believe that an exploratory data analysis of these themes provides a valuable contribution to the existing literature.

However, the set-up of our study and the nature of the survey questions allow us to undertake a closer test of several concepts in the literature related to green bond investment using our unique survey instrument. In the following, we develop testable hypotheses regarding the green bond concepts of investors' non-pecuniary preferences and the greenium effect in the pricing of green bond issuances, the greenwashing effect as a driver of green bond investments, the halo effect of green bond issuances, as well as country-specific differences in green bond investments.

2.1   Investors' non-pecuniary preferences and the greenium effect in the pricing of green bond issuances

One of the main areas of research in the green bond literature centres around the pricing of these bonds, in particular relative to comparable bonds that do not have a 'green' label. This research stream was sparked, in part, by anecdotal evidence that green bonds are issued at a premium compared to plain vanilla bonds and as such offer a cheaper form of debt financing to the issuers (see e.g. Allen, 2017). Such a positive green bond pricing premium is known as the 'greenium'. However, the potential existence of a greenium raises the question why investors would accept a lower yield for a bond with a green label compared to an otherwise comparable plain vanilla bond. A suggested explanation for the existence of a greenium is that investors are not only driven by purely financial considerations in their investment choices, but also have non-pecuniary preferences, such as a preference for investments with strong green credentials. These demand effects by certain investor groups for assets with strong green credentials would then be reflected in higher prices and lower yields for such green assets. Zerbib (2019) and Baker et al., (2018) discuss such theoretical models in the context of a green bond pricing premium, which are based on more general models developed by Heinkel et al. (2001) and Fama and French (2007) which focus on the pricing of assets related to investors with non-pecuniary preferences. So far, these concepts have only been tested using archival green bond issuance data by comparing green bond prices to those of similar plain vanilla bonds. The results of this stream of the literature are mixed (see Bachelet et al., 2019; Baker et al., 2018; Flammer, 2020; Karpf and Mandel, 2017; Larcker and Watts, 2019; Tang and Zhang, 2020; Zerbib, 2019), and in particular none of these studies investigates investors' primary motivations and preferences for investing in green bonds. In comparison, we will use our survey data to directly test the presence of investors' non-pecuniary preferences for green credentials which serves as the underlying channel for the greenium effect. If investors' green bond purchases are driven by non-pecuniary preferences, then the green credentials of the bond should feature as important factors in their investment decision and should rank at least as highly, if not higher than, the financial characteristics of the bond. We test the relative importance of the non-pecuniary environmental features of green bonds with respect to their financial characteristics via Question 5 of the survey (see Appendix), in which investors are asked to rank how important different factors are in their green bond investment decisions.[6]

H1: If investors are driven by non-pecuniary preferences, then the green credentials of the bond at issuance and post issuance should be ranked as highly or more highly than the pricing and other financial bond characteristics as drivers of their green bond purchases.

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[6] The survey design is discussed in more detail in the following section and the survey questionnaire is provided in the Appendix.

2.2   Greenwashing effect as driver of green bond investments

Another discussion in the green bond investment literature focuses on the question whether investors use their green bond investments purely as a means of greenwashing. Greenwashing is known as the 'practice of making unsubstantiated or misleading claims about the [investors'] environmental commitment' (Flammer, 2020: 11; see Lyon and Montgomery, 2015, for a review of the literature on greenwashing). In the context of green bond investment, greenwashing can be understood as investors being primarily concerned about bonds having a green label instead of the actual green impact of the bonds and the use of the proceeds of the bond for green investment projects. We test this greenwashing effect in green bond investments using Question 8 and Question 9 in our survey which ask investors whether they would buy a green bond if it was not clear that proceeds were going to be allocated to green projects (Question 8) and whether they would sell a green bond if post-issuance green bond reporting was poor (Question 9).

H2a: If green bond investment was driven by a greenwashing motive, investors would buy a bond labelled as green even if it was unclear whether the proceeds were going to be allocated to green projects.

H2b: If green bond investment was driven by a greenwashing motive, investors would not sell a bond labelled as green if post-issuance reporting on the green aspects of the bond was poor.

2.3   Halo effect of green bond issuances

Several studies in the green bond literature explore the wider effects of issuing green bonds for the issuing firm (e.g. Baker et al., 2018; Flammer, 2020; Tang and Zhang, 2020). This body of literature suggests that issuing green bonds can have a halo effect on issuers' other (non-green) issuances. Green bond issuances might help to attract investors with a preference for green investments that would have otherwise not invested in the issuer. In addition, green bond issuances might signal to investors that the issuer in general has strong green credentials and, hence, create a green halo effect towards issuers' other financing instruments which, despite not being explicitly green, might be considered by those investors as equally suitable investment options. There are some studies in the literature, which suggest that green bond issuers experience an increase in share ownership by long-term, green investors and domestic institutional investors after a green bond issuance (see Baker et al., 2018; Flammer, 2020; Tang and Zhang, 2020). These findings suggest that green bond issuances can attract a new investment clientele. However, they do not allow a direct test of whether the green bond issuance itself has changed the way that investors view other (non-green) instruments by the same issuer. Our survey instrument allows us to directly test for the green halo effect of green bonds on issuers' other non-green investment instruments via Question 7, in which respondents are asked whether they would be more inclined to

buy a plain vanilla bond from an organisation that has issued a green bond, over a plain vanilla bond from an organisation that has not issued green bonds.

H3: If a halo effect in green bond issuances exists, we expect that investors are more inclined to invest in non-green, plain vanilla bonds of organisations that have a record of green bond issuances over investments in plain vanilla bonds of issuers without prior green bond issuances.

2.4   Country-specific differences in green bond investments and attitudes

Finally, several studies in the ESG investment literature suggest that investment practices and preferences are – in part – driven by country-specific differences of the institutional investors. For instance, van Duuren et al. (2016), using survey data on portfolio managers, find that the domicile of the investor is an important determinant of investors' views on responsible investment with US-based managers exhibiting a more sceptical view towards the benefits of responsible investing compared to European managers. In addition, European institutional investors are considered as most prone to incorporating ESG factors into their investment processes and have a more positive view towards ESG investment than investors from other countries (Amel-Zadeh and Serafeim, 2018). In our survey, we only focus on European asset managers. However, our respondents are located in a variety of countries with different ESG and green bond investment practices (Climate Bonds Initiative, 2018a, 2019a), and hence this allows us to test whether their responses and views towards green bond investment differ depending on the region and country in which they are located.

H4: If country-specific differences in investors' attitudes towards responsible investment exist, we expect to find differences in responses regarding green bond investment practices and attitudes depending on the country that the respondents are based in.

We note that these country-specific differences could be due to a variety of factors such as different legal systems, institutional contexts and cultural differences which affect attitudes and practices in responsible investment as well as towards investment more generally. Due to the nature of our survey questionnaire, we are not able to unequivocally distinguish the underlying drivers of potential country differences but leave this question as an interesting avenue for future research.

3.   Methodology and Survey Design

3.1.   Survey development and delivery

Our empirical analysis is based on the responses to a survey of large Europe-based asset managers administered by the Climate Bonds Initiative (Climate Bonds). Climate Bonds is an investor-focused

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not-for-profit organisation with the aim to promote the growth of the green bond market. To this end, Climate Bonds undertakes advocacy on green bond issues, provides market data and analysis, and administers the international Climate Bonds Standard & Certification Scheme.[7]

For the survey, Climate Bonds contacted 92 Europe-based fixed income asset managers. Of these 92 asset managers, 48 responded to the survey, resulting in a response rate of around 52%.[8] Asset managers were contacted independent of whether they were known for their investment and prior engagement with green bonds to ensure a balanced and unbiased evaluation of investors' views on the green bond market and its development. However, we acknowledge a potential response bias to the extent that asset managers that have a more positive attitude towards the green bond market and/or that are invested in green bonds might be more likely to respond to a survey on green bonds. We will discuss the issue of response bias in further detail when we present the characteristics of our respondents in Section 3.2.

European asset managers were chosen as the target group of the survey as Europe has one of the most established pools of dedicated green bond and ESG asset managers and green bond issuers (Amel-Zadeh and Serafeim, 2018; Climate Bonds Initiative, 2018a, 2019a). Hence, understanding European investors' attitudes and views towards drivers and obstacles in the green bond market is likely to provide useful guidance for issuers and policy makers beyond the European investment community on how to grow the market.

To ensure that the survey questions are well understood by participants and appropriate to identify respondents' actions and views on the green bond market, a pilot survey was run in December 2018 and the survey was adjusted based on initial feedback by respondents. The final version of the survey was launched in January 2019 and the last responses were gathered in April 2019. The list of questions of the survey is provided in the Appendix. The survey questionnaire was shared with respondents in advance and the survey responses were collected via a telephone interview. In few cases, where a telephone survey was not possible, respondents sent back their written responses to the questionnaire and Climate Bonds followed up in case of any open questions. The collected responses are also statistically reliable with a Cronbach's alpha equal to 0.75, computed by including all the survey items.[9] Finally, the survey answers were accompanied by data on respondents' profiles, including their AUM and ESG investment activities, which was gathered via Bloomberg and respondents' company websites.

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[7] Further information on the Climate Bonds Initiative is available via their website: https://www.climatebonds.net/about

[8] One response per institutional investor was collected. Each respondent was asked to provide the overall view of the asset management institution.

[9] Cronbach's alpha is commonly used as a measure of the 'reliability' and internal consistency of the items in a survey and can be interpreted as an estimate of how closely related the questions are. The number of questions, the size of the sample, and the way the respondents answer the survey questions determine the overall reliability (see Forman, Money, & Page, 1998). As a rule of thumb, a Cronbanch's alpha greater than or equal to 0.70 indicates acceptable reliability of the questionnaire responses.

Overall, 48 European asset managers responded to the survey who manage an accumulated EUR 13.68tn in AUM and represent EUR 4297.88bn in fixed income AUM. Panel A of Table 1 provides information on the regional distribution of respondents. The largest share of respondents is from Central Europe, representing 38% of the entire sample, followed by UK and Irish asset managers[10] (27%) and asset managers from Benelux countries (19%). Nordic asset managers and asset managers from Southern Europe correspond to the remaining sample share with 10% and 6%, respectively. Comparing these figures to the regional distribution of non-respondents shows that the response rates per region vary, with Nordic and Benelux asset managers having the highest response rates and asset managers from Southern Europe being least responsive to the survey. For asset managers from Central Europe and the UK, the response rate was 50% in both cases.

Panel B of Table 1 offers information on the size of the respondents as measured by their total AUM and their AUM in fixed income investments. The average (median) AUM are EUR 285.00bn (EUR 148.69bn), while the average (median) fixed income AUM are EUR 89.54bn (EUR 33.65bn). Overall, the sample captures a broad variety of asset managers ranging from small investors with EUR 0.15bn in fixed income AUM to those managing EUR 731.22bn of fixed income investments. On average, the respondents have 32% of their AUM allocated to fixed income assets. However, the asset allocation patterns differ widely with some respondents having only 1% of their AUM in fixed income and others representing dedicated fixed income funds (i.e. 100% of AUM in fixed income). Comparing these figures to those of the non-respondents, we find that the asset managers that did not respond to the survey are slightly smaller regarding their fixed income investment (average fixed income AUM of EUR 49.78bn) while they tend to be larger as measured by their total AUM (average total AUM of EUR 351.15bn). Hence, asset managers that have a larger share of their AUM invested in fixed income seem to be more likely to respond to the survey. This seems intuitive as they are more exposed to developments in the fixed income market and might spend more time and resources following these developments, including the rise of green bonds.

We also have information on the degree to which the respondents are active in ESG investing, based on the information provided on their websites and other publicly available sources (Panel C of Table 1). The necessary information could not be gathered for all asset managers. Hence, the number of observations differs from the main sample and percentage figures are based on the share of the sample and non-respondents for which information on the ESG activities could be determined. Overall, our sample of respondents tends to be more active and engaged with different ESG investment activities compared to the non-respondents. For instance, 98% of the sample are signatories to the United Nations

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[10] In this study, we refer to asset managers from UK and Ireland as UK investors for sake of brevity.

Principles for Responsible Investment (UNPRI) and 68% signed up to the Carbon Disclosure Project (CDP), compared to 85% and 55%, respectively, among non-respondents. Respondents are also more likely to have a publicly communicated ESG strategy and to apply more resource-intensive forms of ESG strategies, such as positive screening and impact investing, while they are less likely to follow an exclusionary approach to ESG screening. However, despite some differences in ESG strategies, these do not suggest a completely different ESG profile of respondents and non-respondents. Similarly, while respondents are slightly more prone to disclose their own CO_2 emissions (72%, vs. 64% of non-respondents) and the CO_2 emissions of their AUM (33%, vs. 21%), these differences are again less stark than might have been expected. Overall, the comparison of respondents' and non-respondents' characteristics in terms of their geographical distribution, their AUM and their ESG profile has revealed some differences indicative of a response bias which needs to be taken into account when interpreting the results and drawing implications from the findings. This response pattern is in line with related survey-based research on ESG investing (e.g. Krueger et al., 2020). However, we regard the profile of respondents still sufficiently comparable to non-respondents to deem our respondents as broadly representative of the European asset manager base.

4. Results

4.1. *Green bond investment activities*

The first focus of the survey is gaining an understanding of the asset-managers' green bond investment activities via different investment channels. Table 2 presents the results, which are based on responses to Question 1 of the survey questionnaire (see Appendix). Just over 10% of the sample indicate that they have not taken any action regarding green bond investment, while over 80% of these respondents are planning to incorporate green bonds in future investment activities. Hence, the vast majority of respondents (90%) are actively invested in the green bond market. The most widely used investment approach in our sample is the preference for green bonds over non-green, plain vanilla bonds where available and competitively priced with 63% of respondents indicating that they follow this approach. Just over one third of respondents has dedicated green bond mandates or targets while half of the respondents have specific green bond funds. In Panel B of Table 2, we calculated the number of green bond investment channels that respondents use, ranging from zero for no green bond investments to three when using all three green bond investment channels to evaluate the intensity of green bond investment activity of our sample. Overall, most asset managers follow one of the three investment approaches (48%) while around 17% have comprehensive green bond strategies, involving active preference for green bonds, dedicated mandates/targets as well as specific green bond funds. We also find that Central European and Nordic investors exhibit a stronger green bond investment activity with an average of 1.83 channels compared to UK (on average 1.08 channels) and Southern European asset managers (on average 1.00 channels), with the difference in number of green bond investment channels

between Central Europe and UK investors being significant at the 5% level (Panel C, Table 2). Furthermore, when we divide asset managers into small, medium and large based on the terciles by fixed income AUM, we find that larger investors are more active in the green bond market via more investment channels (on average 1.88 channels) compared to smaller investors (on average 1.063 channels) (Panel D, Table 2). Hence, it appears that large investors take up a pioneering role in green bond investment, which might be seen as a positive development for the growth of the green bond market. However, we acknowledge that the relationship between respondents' size and their green bond investment activities may be driven by a variety of factors, which do not allow us to deduce a causal relationship between both aspects. For instance, investor size will affect how much capital is available for green bond investments and consequently how many investment channels the investor can pursue. At the same time, investors' decision to invest in green bonds can affect their internal budgets for asset allocations.[11]

Another interesting aspect of investors' green bond investment is their actual exposure to green bonds relative to their total fixed income investments. Respondents were asked to state the share of their (fixed income) AUM that is invested in green bonds. Table 3 presents the responses, which are based on Question 2 of the survey questionnaire (see Appendix). Overall, the average (median) proportion of fixed income AUM in green bonds is 4% (2%) – but the green bond exposure varies widely between 0% to 57%. Based on rough market estimates, green bonds make up around 0.5-1% of the entire bond market.[12] Among our respondents, five, or around 12%, hold less than 0.5% of their fixed income assets in green bonds, while twelve, or 28%, hold green bond investments that are roughly equivalent to green bond market weights (i.e. between 0.5% and 1%). However, interestingly, 26 respondents, or 60%, are overexposed to the green bond market as they have more than 1% of their fixed income investment allocated to green bonds.

Comparing respondents' fixed income holdings in green bonds based on their green bond investment channels (as presented in Table 2), provides some assurance about the reliability of the responses. In unreported results, we find that those respondents who stated that they have no current green bond investment policies (i.e. 'no impact' or 'plan to incorporate in the future') have an average green bond exposure of 0.46% in their fixed income portfolio which is just below the market exposure to green bonds and would be achieved if investors just replicated the composition of the fixed income market without active consideration for green bond investments. In comparison, those investors stating that they are using green bond investment channels hold, on average, around 5% of their fixed income AUM

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[11] We thank an anonymous reviewer for highlighting this point.
[12] A green bond market weight of 0.5-1% is supported by discussions with Climate Bonds research analysts based on Climate Bonds' proprietary green bond database.

in green bonds. In addition, investors using a larger number of green bond investment channels have a higher share of their fixed income assets invested in green bonds, in line with our expectations.

To understand what type of investor allocates a larger share of their fixed income assets to green bonds, we look at the distribution of green bond exposure by investor size, region and ESG profile. Interestingly, in unreported results, we find that while larger investors use a higher number of green bond investment channels, they tend to hold a lower share of their fixed income assets in green bonds (2%) compared to smaller asset managers (7%).[13] Looking at regional differences, the largest exposure to green bonds is found among Nordic investors with an average green bond holding of 6%, followed by Benelux investors (more than 5%) and Central European investors (5%). Southern and UK investors hold the lowest proportion of green bonds with 0.05% and 3%, respectively. However, the difference between relative green bond holdings for Central European and UK asset managers is not statistically significant. Moreover, as can be expected, we find that investors without a publicly disclosed ESG strategy have the lowest average green bond exposure with 2% of their fixed income assets in green bonds. The largest relative share of green bonds is found among investors using impact investing. This is not surprising, given that green bonds can be seen as one form of impact investing since the proceeds are clearly linked to projects that are aimed at generating positive environmental impact and/or reducing negative environmental effects (e.g. IMF, 2019). Perhaps more surprisingly, investors that follow exclusionary strategies also show a comparably high green bond exposure with 6% of fixed income assets in green bonds. Interestingly, even among the respondents that do not publish an ESG strategy, the majority (60%) are overexposed to green bonds, i.e. they hold more than the green bond market weight, while only 45% of those using positive screening strategies invest more than 1% of their assets in green bonds. Hence, the link between ESG profiles and green bond investment activities is not as clear cut as might be expected and even investors that do not have a reputation as ESG champions seem to be active in the green bond market.

To account for the interrelated effects of respondents' characteristics on their green bond exposure, we have estimated multivariate regressions explaining relative green bond holdings (*Share of GB over FI AUM_i*, equations 1 and 2; Panel B, columns (1) and (2)) and overexposure to green bonds (*Overexposure*

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[13] The (natural logarithm of) fixed income AUM and the share of fixed income investments in green bonds have a significantly negative correlation equal to -28%.

in GB$_i$, equations 3 and 4; Panel B, columns (3) and (4)).[14,15] The regression models can be expressed as follows:

$$Share\ of\ GB\ over\ FI\ AUM_i = \alpha + \beta_1 LnAUM_i + \gamma_i' \boldsymbol{Region}_i + \epsilon_i \tag{1}$$

$$Share\ of\ GB\ over\ FI\ AUM_i = \alpha + \beta_1 AUM\ Medium\ Tercile_i + \beta_2 AUM\ Largest\ Tercile_i + \gamma_i' \boldsymbol{Region}_i + \epsilon_i \tag{2}$$

$$Overexposure\ in\ GB_i = \alpha + \beta_1 LnAUM_i + \gamma_i' \boldsymbol{Region}_i + \epsilon_i \tag{3}$$

$$Overexposure\ in\ GB_i = \alpha + \beta_1 AUM\ Medium\ Tercile_i + \beta_2 AUM\ Largest\ Tercile_i + \gamma_i' \boldsymbol{Region}_i + \epsilon_i \tag{4}$$

where α is a constant term; ϵ_i is the i.i.d. standard normal error term;[16] *Share of GB over FI AUM$_i$* is measured as the ratio of green bond holdings over fixed income AUM; and *Overexposure in GB$_i$* is a dummy variable which takes the value of 1 if the percentage of fixed income AUM in GB is greater than 1%, and 0 otherwise. To control for possible systematic differences between the responses of investors by region, we use $\boldsymbol{Region}_i$ which is a vector of dummies for each region, and we cluster standard errors by region.[17] We also include proxies for AUM in fixed income securities (*Ln AUM FI*) and dummy variables for investor size (*AUM Medium Tercile* and *AUM Largest Tercile*).[18]

Our regression results presented in Panel B of Table 2 show that there is a negative and significant relation between investor size and green bond investment when the dependent variable are the relative holdings of green bonds to fixed income AUM (columns (1) and (2)). The possible reasons for this are multifold. Firstly, the asset managers in the smallest tercile are likely to be more dedicated fixed income and green bond funds, while the larger investors are probably more diversified and utilise a variety of different (fixed income) investment approaches. In addition, considering that the number of green bonds in the market is still limited (0.5-1% of the fixed income market) and investor demand for new green bond issuances is high (e.g. Nauman, 2019), it is more difficult for a larger investor to increase their relative green bond holdings. Fixed income AUM has also a high economic impact on the share of GB

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[14] Since the questionnaire responses are measured as scores or binary variables, we employ ordered probit or probit estimation techniques in all subsequent tables of regression results. However, the dependent variable in Table 3, columns 1 and 2 is a ratio which can take limited decimal values from 0 to 1. OLS or ordered probit would be inappropriate choices. We therefore use a GLM estimation technique with underlying binomial family and probit link function, and report an ad-hoc R^2 suitable for GLM techniques. See for instance Papke and Wooldridge (1996), Baum (2008) and Zheng and Agresti (2000) for discussions on how to model proportions when used as dependent variables and possible goodness of fit measures in GLM.

[15] Due to the small sample size and to limit over-identification issues, we estimate parsimonious models with key institutional investor characteristics used as explanatory variables. Results are qualitatively similar under different model specifications and are available upon request.

[16] The estimated constant terms are not reported for brevity.

[17] We categorise investors into six regions: Benelux, Central Europe, Nordics, Southern Europe and UK. Central Europe is used as reference category and so this dummy is omitted from the model.

[18] *AUM Smallest Tercile*, *AUM Middle Tercile* and *AUM Largest Terciles* are binary variables equal to 1 if the fixed income AUM is smaller than € 21.06 bn, between EUR 21.06bn and EUR 63.503bn, and greater than EUR 63.503bn, respectively, and 0 otherwise. *AUM Smallest Tercile* is the reference category when dummies for investor size are included in the model.

over fixed income AUM: a one standard deviation increase in *Ln AUM* - equivalent to 7 billion fixed income AUM – is correlated with a 32% decrease in the share of GB holdings (column (1))[19] over fixed income AUM. Additionally, *AUM Medium Tercile* is statistically significant and negatively related to the share of GB holdings (column 2), with an impact of -60% on the share of GB holdings for medium-size investors with respect to investors in the AUM Smallest Tercile.

The link between overexposure in green bonds and investor size is less clear and not statistically significant (columns (3) and (4)), indicating that some large investors are overexposed to green bonds. In comparison, the relevance of investors' regions in explaining their green bond exposure is significant and potentially reflects the different institutional and policy settings regarding green bonds and green finance among different regions in Europe (Climate Bonds Initiative, 2018a, for details on the green bond market environment in different European countries) as well as cultural and legal differences of countries and their financial systems. For investors from Benelux, Nordics and UK, the marginal probability of being overexposed to GB is greater than for Central European investors by 56%, 56% and 5%, respectively. For Southern European investors, the marginal probability is instead smaller by 44%. As such our findings are in line with hypothesis H4 which predicts regional differences in asset managers' green bond investment activities depending on the country that the respondents are based in.

Next, we focus on the type of green bonds that asset managers invest in, regarding investment area preferences, preferred asset classes and issuer type. First, in Table 4, we focus on the area of respondents' green bond investment (Panel A based on Question 3 of the survey in the Appendix) and their preferred asset classes (Panel B based on Question 4 of the survey in the Appendix). Looking at Panel A, we find that the most favoured types of green bonds are those funding renewable energy (96% of respondents invest in these bonds), followed by clean transport (87%) and low carbon buildings (85%). This finding is in line with the views expressed by the OECD (2017) who sees green bonds particularly suitable to finance green infrastructure investments. In contrast, green bonds financing climate change adaptation projects are only preferred by 38% of respondents. In unreported results, we calculated the number of areas that investors invest in and find that the majority (55%) favour at least six of the stated investment areas indicating that asset managers seem to be open to green bonds tackling a wide variety of environmental issues and that issuers with widely differing green bond projects are likely to find high investor demand for their issuances. In addition, we find that investors from the UK seem to have a lower preference for all types of green bonds compared to Central European investors, with the exception of green bonds targeting climate change adaptation projects and mitigation projects

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[19] In Table 3, columns 1 and 2 we compute the economic impact of an independent variable as the product between the estimated coefficient and the standard deviation of that independent variable. This method is used to compute economic impacts for models estimated using GLM. For models estimated using probit or ordered probit, we use marginal effects to assess the economic impact of explanatory variables on the dependent variable.

for the industrial sector. In contrast, there is no clear link between investor size and preferences for specific green bond sectors.

Turning to investors' preferred asset classes for green (bond) investments (Panel B, Table 4), respondents by and large favour green bonds from corporate issuers, with 93% indicating this asset class as a preferred channel. This is in line with anecdotal evidence from corporate green bond issuances for which investor demand frequently outstrips supply (e.g. Temple-West, 2019). In addition, asset managers also favour green bonds from development banks (76%) and sovereign green bonds (57%). The former finding might be related to the pioneering role that development banks played in issuing green bonds and hence the larger supply coupled with the generally high credit ratings of green bond issuing development banks. The latter result is interesting since, so far, only few sovereigns have issued green bonds suggesting that sovereigns can make greater use of the green bond investment channel when financing their transition from a high- to a low-carbon economy.[20] Finally, less liquid and less standardised types of green investments, in the form of private placements of green bonds or green loans, seem to be the least preferred investment channels among respondents. In unreported results, we find that the majority (61%) are invested in at least three of these channels and that a higher exposure to green bonds is associated with a wider variety of green bond asset classes. In addition, overexposure to green bonds has a positive link to preferences for all types of green debt classes, except for green loans, suggesting a potential substitutive effect between investment in (publicly traded) green bonds and (private, non-traded) green loans. Compared to Central European investors, UK investors show less preference for all asset classes, besides pure play bonds which they are more likely to favour.

To get more insights into the issuer types that investors would like to invest more in, and hence for which there is unmet investor demand, Table 5 presents the results of a set of questions where respondents were asked to rate green bond issuer types based on the extent to which they would like to invest more in these issuers, with a rating of one indicating low excess demand and a rating of five indicating very high unmet investor demand. These results are based on Question 10 of the survey questionnaire (see Appendix). In line with results presented in Panel B of Table 4, the strongest excess demand exists for corporate green bonds. Among corporate green bonds, bonds from non-financial corporates exhibit the highest unmet investor demand indicating that there is great untapped potential for corporate issuers to finance their green projects via green bonds. Government-issued green bonds also rank highly in investor excess demand, and interestingly this applies to bonds issued by governments in developed and emerging markets. Given that this is a survey of European investors, these results indicate that green bonds could represent a financing vehicle for emerging countries to attract additional (European) investors. Derivative-type green bond structures, such as MBS and asset

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[20] Until November 2020, the governments of Poland, France, Fiji, Germany, Nigeria, Indonesia, Belgium, Lithuania, Ireland, the Seychelles, the Netherlands, Sweden, Hungary, Luxembourg, Hong Kong, Mexico, South Korea and Chile have issued sovereign green bonds (Climate Bonds, 2018b, 2019b; 2020b; 2020c).

backed securities (ABS), are less in demand by investors. While we can only speculate about the reasons for this, one potential explanation might be the high supply of MBS due to Fannie Mae's large number of green MBS issuances (Climate Bonds Initiative, 2019a, 2020a). In unreported results, we analysed the ratings based on investor characteristics. We find that UK investors have lower demand for government green bonds issued by developed markets compared to Central European investors, while they have stronger preferences for green government bonds from emerging markets. Furthermore, UK investors seem to have stronger demand for green financial and non-financial corporate bonds and show strong demand for green MBS.

To gain further insights into the type of corporate sectors that investors want to invest more in, respondents were asked to name up to three non-financial corporate sectors in which they want to buy more green bonds (see Question 11 of the survey in the Appendix). Based on an analysis of these textual responses, three sectors with high unmet investor demand clearly emerge as the most frequently stated responses: industrials, utilities and automotive. These sectors are also those with a relatively high carbon footprint (World Resources Institute, 2020), suggesting that investors want to focus their investment on sectors were environmental improvements can potentially have a high impact on greening the sector.

Across all analyses of respondents' green bond investment activities presented throughout Tables 2 to 5, we find that the country, in which the investor is located, is one of the most important determinants of their green bond investments. This is strongly in line with hypothesis H4 which predicts country-specific drivers of green bond investment activities. Due to the nature of the survey data, we cannot investigate in more detail what is driving these country-specific effects, i.e. whether they relate to different ESG and green bond related policies and regulations or more general legal and cultural differences between sample countries. We leave these analyses for future research to explore.

4.2.   *Factors in green bond investment decisions*

Next, we focus on the factors that impact investors' decision to invest in green bonds. We also look at specific green bond features, namely the reporting on the UoP to finance green bonds, and the relevance they have for respondents' investment decisions. These analyses allow us to test hypotheses H1 regarding investors' non-pecuniary preferences and the greenium effect as well as H2a and H2b regarding greenwashing as a driver of green bond investments.

Table 6 reports the responses when asset managers were asked to rate the relevance of different factors in their green bond investment decisions on a Likert scale from one (lowest score) to five (highest score) (see Question 5 in the survey questionnaire presented in the Appendix). The most important factors in respondents' decision whether to invest or not invest in green bonds are satisfactory green credentials at issuance (average score of 4.427/5) followed by the pricing of the bond (average score of 4.323/5)

and satisfactory green credentials post issuance (average score of 4.202/5). These three factors are also those that are rated significantly higher than all other factors.

These findings reveal several interesting features about green bond investments. Firstly, the green credentials of the bonds are essential for investors and a lack of green credentials would suggest that investors are not willing to invest in such bonds. This finding is in line with arguments made by Flammer (2020) that green bond issuances are used by issuers as a signal for their green credentials and commitment towards the environment, which is only effective as a signal if issuers live up to their green commitments.

Secondly, competitive pricing of bonds is an (almost) equally important consideration for investors, and their high rating of pricing as an investment factor suggests that investors are not willing to invest in bonds that are not competitively priced – compared to e.g. their plain vanilla counterparts. This result is interesting in light of hypothesis H1 involving the degree to which a green pricing premium exists (Bachelet et al., 2019; Baker et al., 2018; Karpf and Mandel, 2017; Larcker and Watts, 2019; Zerbib, 2019). Based on the responses by our sample, it is difficult to argue that investors would be willing to pay a much higher price for green bonds, which speaks against high green pricing premia.

Overall, these findings provide mixed support for our hypothesis H1. The high ranking of green credentials at issuance and post issuance for respondents' green bond investment decision suggests that investors are driven by their non-pecuniary, environmental preferences in their green bond investments, which is in line with the underlying mechanism suggested by Zerbib (2019) and Baker (2018) for the existence of a green bond pricing premium as well as Heinkel et al. (2001) and Fama and French (2007) for demand effects in ESG investments more generally. However, the equally high ranking of pricing as a factor in the green bond investment decision highlights that investors are unlikely to accept a high green bond pricing premium. In this case, while our findings support the existence of non-pecuniary preferences of investors, the equally high consideration of financial factors would only support the existence of a very small greenium, such as presented in Zerbib (2019), or an insignificant greenium, as shown in Flammer (2020) and Tang and Zhang (2019).

The remaining four options presented in Table 6 reflect general investment factors in the bond market, such as minimum size and liquidity of the bond (3.938/5), credit rating constraints (3.66/5), currency preferences (3.438/5) and issuer or sector constraints (3.128/5). Among these factors, liquidity and minimum issue size are particularly relevant for the green bond market and have received attention by academic research. For instance, both Bachelet et al. (2019) and Febi (2018) find that, contrary to initial expectations, green bonds are more liquid than their plain vanilla counterparts, while results by Febi et al. (2018) also show that liquidity risks of green bonds have diminished over time and are now regarded as negligible. These results suggest that liquidity concerns might be less practically pressing than feared by investors.

Panel B of Table 6 focuses on the relation of investors' characteristics to their ratings of green bond investment factors and reports the results of the following regression models:

$$Factors\ in\ GB\ Investment\ Decision_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i$$
$$+\gamma_i'Region_i + \epsilon_i \qquad (5)$$

$$Factors\ in\ GB\ Investment\ Decision_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i$$
$$+\gamma_i'Region_i + \beta_3\ Overexposure\ in\ GB_i + \epsilon_i \qquad (6)$$

where *Factors in GB Investment Decision$_i$* is a vector of rating scores (from 1 to 5) for each factor influencing green bond investment decisions, and α' is a vector of constant terms estimated in ordered probit models.[21] Again, investor size seems to be driving some of the ratings: larger investors are found to attach less importance to satisfactory green credentials at issuance than smaller investors, with a marginal probability equal to -36%.[22] This result could be interpreted in different ways. On the one hand, larger investors, which are less likely to be dedicated green funds or impact funds, might be less concerned about the actual green impact and credentials at issuance as long as the bond is earmarked as 'green'. This interpretation might suggest that larger investors could themselves be using green bonds as a way of 'green-washing' their portfolio. We will explore the issue of greenwashing in greater detail when discussing the results of test of H2a and H2b. On the other hand, larger investors have more resources to undertake their own analyses and evaluation of the 'greenness' of the bonds and hence rely less on (external) green credentials. In addition to investor size, region also affects the rating of the factors. UK investors seem to attach less importance to satisfactory green credentials at issuance compared to investors from Central Europe with a marginal probability equal to -36%, whereas they value green credentials post issuance and the pricing of the bonds more in their investment decisions, with 20% and 31% marginal probabilities, respectively. In this regard, UK asset managers' investment factors seem to resemble those of Nordic investors. In contrast, Benelux and Southern investors rate all three factors as less relevant for their investment decisions compared to Central European asset managers. Marginal probabilities for Benelux and Southern investors are equal to -51% and -44% for satisfactory green bond credentials at issuance, -13% and -8% for green credentials post issuance, and -14% and 8% for green bond pricing, respectively. Finally, we find that pricing is more important to investors with higher green bond exposure, whereas green bond overexposure is negatively related to the rating of liquidity and minimum size.

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[21] For sake of convenience, in Tables 6, 8, 9, 10 and 12 we report regression results for models estimated using regional dummies, binary variables for fixed income AUM terciles and a dummy for overexposure in green bonds. Results are qualitative similar when using the logarithm of fixed income asset under management (*ln AUM*) and the relative holdings of green bonds on fixed income asset under management (*% GB over FI AUM*).

[22] For ordered probit models, we arbitrarily report the marginal effects of the highest score of the dependent variable. Given the different numbers of categories of the dependent variables, for each model specification we report only the parameter estimates rather than all sets of possible marginal effects.

While the previous table provided an insight into what factors currently affect respondents' investment decisions, Table 7 offers findings on factors which would make green bonds more attractive to investors.[23] These results are based on Question 6 of the survey questionnaire (see Appendix). The three factors that investors rate most highly comprise: positive issuer fundamentals (4.404/5), issuer transparency and disclosure (4.266/5) and post-issuance transparency and detailed UoP disclosure (4.207/5). In addition, two other green bond specific factors rank highly among investors, namely external reviews (3.936/5) and availability of impact reporting (3.946/5). In line with the previous results, the ratings of the factors suggest that green bonds are both an economic investment proposition to investors – as evidenced by investors' desire for issuers to have strong fundamentals and strong disclosure practices – as well as a channel through which investors can employ their capital towards projects with a positive environmental impact, as evident by their high ratings of UoP disclosure, external reviews of greenness and impact reporting. The factors that investors seem to regard as less relevant are the inclusion of the bond in an index (2.883/5) and whether the bond is secured on green assets or projects (2.522/5). The latter finding is interesting as it suggests that investors seem relatively satisfied with the current standard green bond practice where the bond itself is secured by the issuers' entire balance sheet – and not merely the cash flows from the green project it finances.

To further understand the importance that investors attach to pre- and post-issuance reporting on the UoP, two questions specifically address investor responses to poor pre- and post-issuance reporting. These two questions also allow us to test our hypotheses H2a and H2b regarding potential greenwashing motives in investors' green bond investments. Table 8 presents the results of the test of H2a which focuses on the effect on investors' purchasing decision if the UoP towards green investments was unclear (see Question 8 in the survey questionnaire, provided in the Appendix). If greenwashing was a major driver of investors' green bond investments, we would expect that the respondents would not buy a green bond in case of unclear UoP towards green projects. 79% of respondents state that they would not buy a green bond with unclear UoP, highlighting the importance that investors assign to the 'green' aspect of green bonds and suggesting that their green bond investments are not motivated by greenwashing in line with H2a. Only 13% of respondents would still buy a green bond with unclear UoP while around 9% indicate that they would be less likely to purchase such a bond.

In Table 8, Panel B, we estimate the following regression models:

$$Purchase\ if\ Unclear\ UoP_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i + \gamma_i'\boldsymbol{Region}_i + \epsilon_i \quad (7)$$

$$Purchase\ if\ Unclear\ UoP_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i + \gamma_i'\boldsymbol{Region}_i \\ + \beta_3\ Overexposure\ in\ GB_i + \epsilon_i \quad (8)$$

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[23] In unreported results, we also ran multivariate regressions that link investor characteristics to their ratings of factors. These results are available from the authors upon request.

where *Purchase if Unclear UoP$_i$* is a score which takes the value of 0 if the respondent states s/he would not purchase green bonds with unclear UoP, 1 if she would be less likely, and 2 if she would buy green bonds with unclear UoP. We find that regional differences and investors' exposure to green bonds are the main drivers of investors' choice to purchase a bond with unclear UoP. Compared to Central European investors, asset managers in Benelux and Nordic countries as well as the UK seem more likely to purchase a green bond with unclear UoP – with marginal probabilities of purchasing the bond equal to 22%, 24% and 16%, respectively. Investors with higher exposure to green bond holdings are less likely to invest in such a bond, with a marginal effect equal to -8%.

Table 9 presents the results of our test of H2b which is based on investors' response to poor post-issuance reporting by green bond issuers. If greenwashing was a major driver of investors' green bond investments, we would expect that the respondents would not sell a green bond in case of poor post-issuance reporting. We test this hypothesis using the responses to Question 9 of the survey questionnaire (see Appendix). Overall, the majority (55%) of respondents state that they would sell a green bond if post-issuance reporting was poor, while 30% indicate that they are more likely to sell and/or to engage with the issuer on the poor reporting practices. Only 15% of asset managers would not sell a green bond in their portfolio following poor post-issuance reporting. These results show that the investor response to questionable green credentials post-issuance is less clear cut than pre-purchase, which might indicate that some investors use green bonds as a way to greenwash their portfolios so that their investment approach might appear more environmentally focussed through the bonds' green label than it really is. However, there might be a variety of reasons why investors would not divest from green bonds with questionable post-issuance reporting besides greenwashing. The relatively high share of respondents who would engage with issuers is suggestive that investors care about the environmental impact of their investments and are willing to dedicate time and resources towards improving this green impact. The results suggest that investors in green bonds monitor and scrutinise green bond issuers on their green commitments and a majority of them would not content with an unsatisfactory green impact of the bonds. From a governance point of view, these results are encouraging, since they suggest that investor scrutiny may serve as a de facto self-regulatory mechanism that helps to ensure that green bonds only finance projects with clear environmental benefits. This result speaks directly to the literature addressing the governance and regulatory environment of the green bond market and questions around the ability and willingness of investors to regulate the market through their scrutiny practices (Park, 2018).

In Panel B of Table 9 we link investors' characteristics to their decision to sell a green bond with poor post-issuance reporting by estimating the following models:

Sale if Poor Post-Issuance Reporting$_i$ = α′ + β$_1$ AUM Medium Tercile$_i$ + β$_2$ AUM Largest Tercile$_i$

$$+\gamma_i' \boldsymbol{Region_i} + \epsilon_i \tag{9}$$

Sale if Poor Post-Issuance Reporting$_i$ = α′ + β$_1$ AUM Medium Tercile$_i$ + β$_2$ AUM Largest Tercile$_i$

$$+\gamma_i' \textbf{Region}_i + \beta_3 \textit{Overexposure in GB}_i + \epsilon_i \qquad (10)$$

where *Sale if Poor Post-Issuance Reporting$_i$* is a score which takes the value of 0 if the investor would not sell the green bond in case of poor post-issuance reporting, 1 if s/he would be more likely to sell or engage, and 2 if the investor would sell the bond. We find that investors from Benelux, Nordics, Southern Europe and UK are less likely to sell the green bond in case of poor post-issuance reporting than Central European investors, with marginal probabilities equal to -37%, -84%, -75% and -66%, respectively. Investors in the AUM Medium Tercile are more likely to sell the green bond than investors in the AUM Smallest Tercile, with 36% marginal probability. Again, regional effects are the main driver in sale decisions of such a bond. However, what might be surprising is that AUM Largest Tercile and green bond exposure do not seem to drive sale decisions.

An interesting question in the green bond literature is the effect that the issuance of green bonds has on the issuer and specifically the demand for other securities of the same issuer. This 'halo effect' of green bonds (H3) was tested by asking investors whether they are more or less inclined to invest in plain vanilla bonds of issuers that also issue green bonds (Question 7 of the survey, see Appendix). As seen in Table 10, the finding that green bond issuances make investors more interested in purchasing other (non-green) securities by the issuer is only partly supported by our data. Less than one quarter (24%) of respondents state that they are more inclined to buy a plain vanilla bond from an organisation that also issues green bonds, while 72% indicate that they have no preferences towards other non-green bonds of green bond issuers. Two investors (4%) would be less inclined to buy non-green bonds from green bond issuers. Overall, our results suggest that green bond's 'halo effect' might be more limited – or less explicit – for issuers' conventional debt issuances than suggested by studies examining the effect on equity ownership. Hence, our findings underline the usefulness of supplementing archival research with the analysis of primary survey data to investigate motivations and drivers of investment decisions.

Finally, in Table 10, Panel B reports the regression results of the following models:

Buy Plain Vanilla Bond from GB Issuer$_i$ = α′ + β$_1$ AUM Medium Tercile$_i$ + β$_2$ AUM Largest Tercile$_i$

$$+\gamma_i' \textbf{Region}_i + \epsilon_i \qquad (11)$$

Buy Plain Vanilla Bond from GB Issuer$_i$ = α′ + β$_1$ AUM Medium Tercile$_i$ + β$_2$ AUM Largest Tercile$_i$

$$+\gamma_i' \textbf{Region}_i + \beta_3 \textit{Overexposure in GB}_i + \epsilon_i \qquad (12)$$

Plain Vanilla Bond from GB Issuer$_i$ is the dependent variable measured as a score which takes the value of 0 if the respondent is less inclined, 1 if s/he has no preference, and 2 if the respondent is more inclined to purchase a plain vanilla bond from the green bond issuer. We find that larger investors as well as UK investors and investors from Nordic countries are more likely to buy other bonds from green bond issuers, with marginal probabilities equal to 26%, 31% and 37%, respectively.

4.3. Market tools and policies to support green bond growth

Another strength of using a survey tool is that it allows us to explore investors' views on different measures to support the growth of the green bond market, which would not be possible using traditional data analysis based on market data. This section focuses on investors' views on market tools and policy mechanisms for green bond market growth.

Panel A of Table 11 shows the results when respondents were asked to rate different market tools to boost green bonds, on a scale from one to five (least to most preferred tool). These results are based on Question 12 of the survey questionnaire (see Appendix). The two tools that receive the highest investor support are positive credit fundamentals of the issuers (average score 3.787/5) and international credit ratings which integrate environmental risk analysis (3.522/5). In comparison, the least favoured market tool is green funds by international organisations (2.886/5). Tools that receive average scores between 3.047 to 3.395 are full or partial investment guarantees, green sovereign bonds and green bond lists and platforms supported by exchanges. Looking at investor differences in market tool preferences, in unreported results, we find that larger investors assign a higher score to full or partial investment guarantees as well as green sovereign bonds. In addition, regional differences also appear to affect investors' assessment of the effectiveness of the different market tools.

Panel B of Table 11 presents investors' ratings of different policy mechanisms to scale up the green bond market (see Question 13 of the survey questionnaire, provided in the Appendix). The preferred mechanisms are preferential capital treatment for low-carbon assets (average score 3.804/5) and official minimum standards for green definitions and criteria sets (3.813/5). Among the least popular policy mechanisms are subsidies (2.891/5) and penalising capital requirements for high-carbon assets (3.370/5). Other policy mechanisms that received average investor scores between 3.543 and 3.585 include tax incentives, mandatory climate-related financial disclosures and regulatory and legislative trends. An interesting finding is that investors seem to have a more positive view of preferential capital treatments of low-carbon assets, while they show lower support for penalising capital treatment of high-carbon assets, indicating that there is an asymmetric approach towards capital requirements to support green bonds. In other words, investors seem to prefer the 'carrot' over the 'stick' to incentivise green bond investments, especially when it comes to capital requirements. Looking at investor differences, in unreported results, we find that the support for preferential capital treatment of low-carbon assets is lower among larger investors and investors from the UK and Benelux countries relative to Central European asset managers. Investor support for official green standards is stronger among UK asset managers compared to those from Central Europe.

The survey also asked the respondents to name the main drivers that will enhance the growth and scale of the green bond market as well as the main obstacles (see Questions 17 and 18, respectively, of the

survey questionnaire, provided in the Appendix). Among the most frequently stated drivers of green bond market growth, we find the terms 'standardisation', 'regulation', 'definitions', and 'policy'. These findings are in line with the responses presented in Table 11, which suggest that there is scope for policy makers and market organisations to scale the green bond market via providing clear standards and definitions as well as regulation supportive of green bonds. In addition, 'issuer diversity' was named as another driver of green bond growth, reflecting the high unmet demand for green bonds from a diverse range of issuers. Turning to the obstacles for green bond growth, respondents frequently criticised the lack of standardisation, definitions as well as issuer and sector diversity. Hence, in many ways the responses to the question of the main obstacles present a mirror image to those for the main drivers of green bond growth. However, respondents also point towards 'greenwashing' as an obstacle for the green bond market, which speaks to investors' concerns that the green bond instrument might be misused by issuers for raising funding for projects that lack sufficient green credentials or by investors that are more concerned about the green label of bonds than their green impact. These concerns might explain the high importance that investors assign to strong pre-issuance green credentials and clear post-issuance reporting. Overall, our findings are in line with prior survey evidence presented in Eccles et al. (2017) and Amel-Zadeh and Serafeim (2018) who find a lack of common standards and transparency in ESG reporting by companies to be two of the main obstacles of ESG investing more generally.

An interesting feature of Panel B of Table 11 is the relatively high investor support for official green standards, a term that also frequently occurred in the textual responses to the main drivers and obstacles for green bonds. The debate about standardising definitions of 'green' to promote the green bond market has been ongoing with some investors and issuers arguing that clearer standards would prevent greenwashing and enhance investor confidence in green bonds (e.g. WWF, 2016), while others object that too formal and strict standards might hamper green bond market growth by preventing new issuers from entering the market due to concerns that they might not meet the strict requirements (e.g. Gilbert, 2016).

To shed further light on this debate, respondents were explicitly asked whether they prefer a strict definition of 'green' to ensure the green label is only applied to high quality projects, or a less strict definition of 'green' to allow for a greater diversity in issuances (see Question 16 in the survey questionnaire, provided in the Appendix). Table 12 presents the responses to this question. The respondents' attitude towards standardisation of 'green' seems to reflect the variety of opinions represented in the public debate, with 48% of investors opting for a strict definition and 31% preferring a less strict definition of 'green'. The remaining 21% state that they do not have a preference regarding the strictness of green definitions. Turning to the drivers of investors' attitudes towards 'green' standards, in Table 12, Panel B, we estimate the final set of regression models:

$$Less\ Strict\ Definition_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i + \gamma_i'\boldsymbol{Region}_i + \epsilon_i$$

(13)

$$Less\ Strict\ Definition_i = \alpha' + \beta_1\ AUM\ Medium\ Tercile_i + \beta_2\ AUM\ Largest\ Tercile_i + \gamma_i'\boldsymbol{Region}_i \\ + \beta_3\ Overexposure\ in\ GB_i + \epsilon_i$$

(14)

where *Less Strict Definition$_i$* is a score which takes the value of 0 if the investor prefers a strict definition, 1 if s/he has no preference, and 2 if the investor favours a less strict definition. We find that investor size seems to matter little, while the main determinant of investors' preference for a less strict definition seems to be regional differences. UK asset managers and investors from Benelux countries tend to prefer less strict definitions compared to Central European investors, with marginal probabilities equal to 36% and 13%, respectively. These findings are interesting on the backdrop of current EU efforts to establish EU Green Bond Standards (see EU Technical Expert Group (TEG) on Sustainable Finance, 2019). While the proposed EU Green Bond Standards have stringent requirements, the debate on whether their adoption should be mandatory or voluntary – as recommended by EU TEG on Sustainable Finance - is still ongoing.

4.4. Green bond investment in emerging markets

While the previous section focused on tools and policies to grow the green bond market in general, green bonds might be seen as a particularly interesting financial instrument for emerging market economies, both as a way to finance their transition from a high- to a low-carbon environment and as an opportunity to diversify their investor base (International Finance Corporation, 2018). Hence, investors were asked what could drive their investments in green bonds from emerging markets (see Question 23 in the survey questionnaire, Appendix). Table 13 shows that investors view credit enhancements from multilateral or government-related entities as the most promising driver of emerging market green debt (average score 3.545/5), indicating that credit risk and rating constraints seem to be one of the main obstacles for emerging economies' green bond market. In addition, public spending on infrastructure programmes is regarded as a potential driver for emerging market green debt issuances (3.076/5). In contrast, deal-supporting mechanisms and benchmarks for emerging market green bonds receive lower levels of investor support, both achieving average scores of less than three.

Another main obstacle to the growth of the green bond market in emerging countries are constraints faced by asset managers to invest in emerging market debt. 83% of asset managers in our sample are able to buy emerging market debt, showing that around 17% are precluded from investing in such green bonds, or other investments in emerging economies.[24] It appears that in our sample, it is mainly Nordic

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[24] Results of investors' responses on the constraints faced when investing in emerging market debt are not reported to save space but are available from the authors upon request.

asset managers facing constraints to invest in emerging markets with only 40% of them being able to buy emerging market debt. Among investors from other regions, the share that can buy emerging market debt ranges between 75%-100%. Under this light, credit enhancements for green bonds could be a sensible mechanism to reduce the risk for these constrained investors and might enable them to invest in emerging market debt in the future. However, investors also face other emerging market investment restrictions besides credit rating constraints, such as currency constraints (65%), restrictions on deal size (58%), exposure limits by issuer (56%) and general exposure limits to emerging markets (44%). Hence, the green bond market in emerging economies could be enhanced not only by mechanisms and tools specifically targeted to green finance but also by policies that would make emerging market debt in general more investable for asset managers.

To gain further insights into tools and mechanisms that could support emerging market investments, respondents were asked to name factors that could increase investor confidence to invest in emerging market green bonds (see Question 24 in the survey questionnaire, Appendix). The predominant factors named by respondents are certification, transparency, trackability, UoP and reliability. These findings suggest that there is a role to be played by policy makers and market organisations to establish credible certification and trackable UoP reporting to grow emerging market green bonds.

5. Conclusions

This study uses survey responses from 48 European asset managers to gain a deeper understanding of investors' green bond investment activities, the factors that affect their investment decisions and their views on different market tools and policy measures to grow the green bond market.

We find that the vast majority of respondents (90%) is actively invested in the green bond market using a variety of investment channels, including outright investment, green bond funds and green mandates. In addition, most investors (60%) are overexposed to the green bond market as they hold more than the green bond market weight of 0.5-1% in their fixed income portfolios. In terms of preferred green bond investment channels, respondents have a strong preference for investments in green bonds from corporate issuers and in particular non-financial corporates. Our survey evidence suggests strong unmet investor demand for this issuer base, implying untapped potential for issuers to raise additional debt capital in the green bond market. Furthermore, we show that asset managers seem to attach equal importance to competitive pricing of green bonds and to the bonds' green credentials when deciding whether to invest in a green bond. This finding suggests that the 'green' in green bonds is an important investment consideration and issuers need to ensure that their bonds meet the environmental benefits expected by investors. If these benefits are not clear, respondents indicate that they would not invest in such green bonds (79%) and a majority would even sell green bonds if post-issuance reporting was poor (55%). These findings have important implications for green bond issuers who need to ensure that their

reporting on UoP and post-issuance environmental impact is clear and to high standards, as they could otherwise face investor backlash. On the other hand, if issuers can show clear environmental benefits relating to the projects financed via green bonds, the high excess investor demand for this class of bonds can open additional financing channels and might help to diversify their investor base.

Our study also has important implications for policy makers and other market participants who want to grow the green bond market. In terms of market tools, respondents indicate that an improvement of credit fundamentals and investor ratings with integrated environmental risk analysis would encourage additional investments in green bonds. On the policy side, preferential capital treatments of low carbon assets and minimum standards of green definitions receive strong investor support. Some countries have already introduced policy measures for growing the green bond market, such as subsidies in the case of China, Hong Kong, Japan, Malaysia and Singapore, as well as tax incentives for green bond issuance costs in Malaysia (see Sustainable Banking Network, 2018). However, our survey responses suggest that more can be done on the policy side to incentivise investments in green bonds. In terms of growing the green bond market for emerging economies, the most pressing issue that came out of the survey is the need for credit enhancements to incentivise (European) investors to allocate investments to emerging market green bonds.

The question of whether the standardisation of 'green' should be more or less strict divides our sample, with roughly half of the investors preferring a strict definition and slightly less than one third favouring a less strict standard. These results are interesting on the backdrop of current efforts at the EU level to establish an EU standard for green bonds (see EU Technical Expert Group (TEG) on Sustainable Finance, 2019) and the ongoing consultation about the scope and application of these standards. At the time of writing, the EU TEG on Sustainable Finance proposes that the EU Green Bond Standard is implemented on a voluntary, non-legislative basis. However, the definition of green bond provided by EU TEG on Sustainable Finance (EU Green Bond Standard)[25] is more stringent than the requirements set in the Green Bond Principles (GBP) by the International Capital Market Association (2018).[26] Indeed, the EU Green Bond Standard mandates to use only criteria set in the taxonomy regulation. Furthermore, the European Commission is currently considering the possibility of a legislative initiative for the establishment of an EU Green Bond Standard with a decision expected by end of 2020.[27]

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[25] The EU Green Bond Standard consists of the following elements: i) the EU Green Bond Framework, a document in which the issuer is required to confirm the compliance with the EU standard and describes the project and its environmental targets; ii) the exclusive use of green proceeds to finance or refinance new and/or existing EU green projects; and iii) an accredited verifier, which should assess the alignment of the bond with the EU standard.
[26] The Green Bond Principles (GBP) are voluntary guidelines for the issuance of green bonds based on four core principles: i) use of proceeds, ii) project selection and evaluation, iii) management of proceeds, and iv) reporting. Proceeds should finance only green projects with clear and measurable environmental benefits (ICMA, 2018; Deschryver and de Mariz, 2020).
[27] More information on the consultations undertaken by the European Commission are available at: https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-green-bond-standard_en#:~:text=The%20report%20proposes%20that%20the,builds%20on%20best%20market%20practices

The results presented in this study offer new insights to the academic literature on green bonds and green finance and have important implications for issuers and policy makers. However, due to the nature of survey instruments, the study has limitations regarding the generalisability of the results so that more research is needed in the future to understand whether the green bond investment activities and investment attitudes of the respondents extend to other, not sampled, investor groups outside of Europe. In addition, the green bond investment decision is likely to be driven by both the institutional investor characteristics and the characteristics of the target issuer (see Cumming and Johan, 2007). However, the nature of our survey data does not allow us to determine the relative importance of each set of characteristics in the investment decision process. As such, future research could complement our survey analyses with an analysis of archival data of institutional investors' investment allocations in green bonds to determine to what extent green bond investments are driven by the characteristics of the investors and to what extent the target characteristics affect investment allocations. Another promising direction for future research would be to investigate institutional investors' asset allocation across different types of debt and equity investments in the green or ESG investing area to evaluate the interactions of different investment approaches.[28] Finally, while this survey captures the perspective of investors in the green bond market, our findings could be complemented by looking at survey evidence on issuers' views of the benefits and obstacles related to issuing green bonds.

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[28] We thank an anonymous reviewer for this suggestion for future research.

References

Allen, K. (2017). "Green bond issuers are poised to charge a premium". *Financial Times*, 22 November 2017. Available online: https://www.ft.com/content/9396fb28-ca2b-11e7-ab18-7a9fb7d6163e

Amel-Zadeh, A. and Serafeim, G. (2018). "Why and How Investors Use ESG Information: Evidence from a Global Survey". *Financial Analyst Journal*, 74 (3): 87-103.

Bachelet, M. J., Becchetti, L. and Manfredonia, S. (2019). "The Green Bonds Premium Puzzle: The Role of Issuer Characteristics and Third-Party Verification". Sustainability, 11 (4): 1098

Baker, M. P., Bergstresser, D. B., Serafeim ,G. and Wurgler, J. A. (2018). "Financing the response to climate change: the pricing and ownership of U.S. green bonds". *Working paper*, Harvard Business School.

Baum, C. F. (2008). "Stata tip 63: Modeling proportions." *The Stata Journal*, 8(2): 299-303.

Berry, T. C. and Junkus, J. C. (2013). "Socially Responsible Investing: An Investor Perspective". *Journal of Business Ethics*, 112: 707-720.

Climate Bonds Initiative (2017). "Green bond pricing in the primary market". Available online: https://www.climatebonds.net/files/files/CBI-Green-Bond-Pricing-Q2-2017.pdf

Climate Bonds Initiative (2018a). "The Green Bond Market in Europe. 2018". Available online: https://www.climatebonds.net/files/files/The%20Green%20Bond%20Market%20in%20Europe.pdf

Climate Bonds Initiative (2018b). "Sovereign Green Bonds Briefing. 2017". Available online: https://www.climatebonds.net/files/files/Sovereign_Briefing2017.pdf

Climate Bonds Initiative (2019a). "Green bonds: The state of the market 2018". Available online: https://www.climatebonds.net/files/reports/cbi_gbm_final_032019_web.pdf

Climate Bonds Initiative (2019b). "Chile: First Sovereign Green Bond in the Americas: Strong Investor Demand: More to come says Finance Minister Larraín". Available online: https://www.climatebonds.net/2019/06/chile-first-sovereign-green-bond-americas-strong-investor-demand-more-come-says-finance

Climate Bonds Initiative (2020a). "2019 Green Bond Market Summary". Available online: https://www.climatebonds.net/files/reports/2019_annual_highlights-final.pdf

Climate Bonds Initiative (2020b). "Sovereign Green Bonds Club: Mexico, Egypt, Spain set to join: Who else is in the 2020 pipeline: And who else should be?". Available online: https://www.climatebonds.net/2020/02/sovereign-green-bonds-club-mexico-egypt-spain-set-join-who-else-2020-pipeline-and-who-else

Climate Bonds Initiative (2020c). "Sustainable Debt: Global State of the Market. H1 2020". Available online: https://www.climatebonds.net/files/reports/cbi-sustainable-debt-global-sotm-h1-2020.pdf

Cumming, D. and Johan, S. (2007). "Socially Responsible Institutional Investment in Private Equity". *Journal of Business Ethics*, 75: 395–416.

Deschryver, P., and de Mariz, F. (2020). "What Future for the Green Bond Market? How Can Policymakers, Companies, and Investors Unlock the Potential of the Green Bond Market?". *Journal of Risk and Financial Management*, 13(3), 61.

Dichev, I. D., Graham, J. R., Harvey, C. R. and Rajgopal, S. (2013). "Earnings quality: Evidence from the field". *Journal of Accounting and Economics*, 56 (2–3): 1-33.

Eccles, R. G., Kastrapeli, M. D. and Potter, S. J. (2017). "How to Integrate ESG into Investment Decision-Making: Results of a Global Survey of Institutional Investors". *Journal of Applied Corporate Finance*, 23 (4): 125-133.

Fama, E. F. and French, K. R. (2007). "Disagreement, tastes, and asset prices". *Journal of Financial Economics,* 83: 667-689.

Febi, W., Schaefer, D., Stephan, A. and Sun, C. (2018). "The impact of liquidity risk on the yield spread of green bonds". *Finance Research Letters*, 27: 53-59.

Flaherty, M., Gevorkyan, A., Radpour, S. and Semmler, W. (2017). "Financing climate policies through climate bonds – A three stage model and empirics". *Research in International Business and Finance*, 42: 468-479.

Flammer, C. (2020). "Corporate Green Bonds". *Journal of Financial Economics, forthcoming*.

Forman, S., Money, A., and Page, M. J. (1998). "How reliable is reliable? A note on the estimation of Cronbach alpha". *Proceedings of the International Management Conference*, Cape Town, South Africa, May 1998 (pp. 1–26).

Gilbert, K. (2016). "Could Standardization Hurt the Green Bond Market?". *Institutional Investor*. Available online: https://www.institutionalinvestor.com/article/b14z9ndcj086dt/could-standardization-hurt-the-green-bond-market

Graham, J. and Harvey, C. (2001). "The theory and practice of corporate finance: Evidence from the field". *Journal of Financial Economics,* 60: 187–243.

Heinkel, R., Kraus, A. and Zechner, J. (2001). "The effect of green investment on corporate behavior," *Journal of Financial and Quantitative Analysis,* 36: 431-449.

IEA (2014). "World Energy Investment Outlook". OECD/IEA, Paris. Available online: https://www.iea.org/reports/world-energy-investment-outlook

IMF (2019). "A Greener Future for Finance". Finance & Development, December 2019, 56 (4). Available online: https://www.imf.org/external/pubs/ft/fandd/2019/12/pdf/green-bonds-offer-lessons-for-sustainable-finance-beschloss.pdf

International Capital Market Association (2018). "Green Bond Principles". Available online: https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/June-2018/Green-Bond-Principles---June-2018-140618-WEB.pdf

International Finance Corporation (2018). "Emerging Market Green Bonds Report 2018". Available online: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&cad=rja&uact=8&ved=2ahUKEwj6tPDksYHpAhWknVwKHVlCDF8QFjADegQIARAB&url=https%3A%2F%2Fwww.ifc.org%2Fwps%2Fwcm%2Fconnect%2F9e8a7c68-5bec-40d1-8bb4-a0212fa4bfab%2FAmundi-IFC-Research-Paper-2018.pdf%3FMOD%3DAJPERES&usg=AOvVaw2UkoB634Xk6kxOJtoF7qW6

Jun, M., C. Kaminker, C., Kidney, S. and Pfaff, N. (2016). "Green bonds: country experiences, barriers and options". Input paper in support of the G20 finance study group. Available online: http://www.unepinquiry.org/wp-content/uploads/2016/09/6_Green_Bonds_Country_Experiences_Barriers_and_Options.pdf

Karpf, A. and Mandel, A. (2017). "The changing value of the 'green' label on the US municipal bond market". *Nature Climate Change*, 8: 161–165.

Krueger, P., Sautner, Z. and Starks, L. T. (2020). "The Importance of Climate Risks for Institutional Investors". *Review of Financial Studies*, 33 (3): 1067–1111.

Larcker, D. F. and Watts, E. M. (2019). "Where's the greenium?". *Working paper*, Stanford University.

McCahery, J., Sautner, Z. and Starks, L. (2016). "Behind the scenes: The corporate governance preferences of institutional investors*". Journal of Finance*, 71: 2905–32.

Monasterolo, I. and Raberto, M. (2018). "The EIRIN Flow-of-funds Behavioural Model of Green Fiscal Policies and Green Sovereign Bonds". *Ecological Economics*, 144: 228-243.

Lyon, T. P. and Montgomery, A. W. (2015). "The Means and End of Greenwash". *Organization & Environment*, 28 (2): 223-249.

Nauman, B. (2019). "Green bond issuance hits $66.6bn in second quarter". *Financial Times*, 9th August 2019. Available online: https://www.ft.com/content/06ef9174-ba22-11e9-8a88-aa6628ac896c

OECD (2016). "Progress Report on Approaches to Mobilising Institutional Investment for Green Infrastructure". OECD Publishing, Paris, France.

OECD (2017). "Mobilising Bond Markets for a Low-Carbon Transition". OECD Publishing, Paris, France.

Papke, L. E. and Wooldridge, J. M. (1996). "Econometric methods for fractional response variables with an application to 401 (k) plan participation rates." *Journal of Applied Econometrics*, 11(6): 619-632.

Park, S. K. (2018). "Investors as regulators: green bonds and the governance challenges of the sustainable finance revolution". *Stanford Journal of International Law,* 54 (1): 1–47.

Sachs, J. (2014). "Climate change and intergenerational well-being". In: B. Lucas, S. Willi (Eds.), *The Oxford Handbook of the Macroeconomics of Global Warming*, Oxford University Press, Oxford, 248-259.

SIFMA (2019). "Capital Markets Fact Book 2019". Securities Industry and Financial Markets Association, New York. Available online: https://www.sifma.org/wp-content/uploads/2019/09/2019-Capital-Markets-Fact-Book-SIFMA.pdf

Sustainable Banking Network (2018). "Creating Green Bond Markets – Insights, Innovations, and Tools from Emerging Markets". October 2018. Available online: https://www.ifc.org/wps/wcm/connect/37797d8b-c7c1-4361-9183-1e038b225b5a/SBN+Creating+Green+Bond+Markets+Report+2018.pdf?MOD=AJPERES&CVID=mqtaapI

Tang, D. Y. and Zhang, Y. (2020). "Do shareholders benefit from green bonds?". *Journal of Corporate Finance*, 61.

Technical Expert Group on Sustainable Finance (2019). "Report on EU Green Bond Standard". Available online: https://ec.europa.eu/info/sites/info/files/business_economy_euro/banking_and_finance/documents/190618-sustainable-finance-teg-report-green-bond-standard_en.pdf

Temple-West, P. (2019). "Apple raises €2bn in green bonds". Financial Times, 8th November 2019. Available online: https://www.ft.com/content/918c648c-01ae-11ea-b7bc-f3fa4e77dd47

Tolliver, C., Keeley, A. R. and Managi, S. (2020). "Drivers of green bond market growth: The importance of Nationally Determined Contributions to the Paris Agreement and implications for sustainability". *Journal of Cleaner Production*, 244: 1-15.

Tu, C. A., Rasoulinezhad, E. and Sarker, T. (2020). "Investigating solutions for the development of a green bond market: Evidence from analytic hierarchy process". *Finance Research Letters*, *In Press*.

UNFCCC (2015). "Report of the Conference of the Parties on its twentieth session, held in Lima 1 to 14 December 2014: Addendum: Part two: Action taken by the Conference of the Parties at its twentieth session". FCCC/CP/2014/10/Add.1. Available online: https://unfccc.int/resource/docs/2014/cop20/eng/10a01.pdf

Valor, C., de la Cuesta, M. and Fernandez, B. (2009). "Understanding Demand for Retail Socially Responsible Investments: A Survey of Individual Investors and Financial Consultants". *Corporate Social Responsibility and Environmental Management*, 16: 1-14.

van Duuren, E., Plantinga, A. and Scholtens, B. (2016). "ESG Integration and the Investment Management Process: Fundamental Investing Reinvented". *Journal of Business Ethics*, 138: 525-533.

Williams, G. (2007). "Some Determinants of the Socially Responsible Investment Decision: A Cross-Country Study". *Journal of Behavioral Finance*, 8 (1): 43-57.

World Bank (2015). "What are green bonds?". Available online: http://documents.worldbank.org/curated/en/400251468187810398/pdf/99662-REVISED-WB-Green-Bond-Box393208B-PUBLIC.pdf

World Resources Institute (2020). "4 Charts Explain Greenhouse Gas Emissions by Countries and Sectors". Available online: https://www.wri.org/blog/2020/02/greenhouse-gas-emissions-by-country-sector

WWF (2016). "Green bonds must keep the green promise!". Available online: https://d2ouvy59p0dg6k.cloudfront.net/downloads/20160609_green_bonds_hd_report.pdf

Zerbib, O. D. (2019). "The effect of pro-environmental preferences on bond prices: evidence from green bonds". *Journal of Banking and Finance,* 98: 39–60.

Zheng, B. and Agresti, A. (2000). "Summarizing the predictive power of a generalized linear model." *Statistics in Medicine*, 19(13): 1771-1781.

Table 1 – Sample Overview

This table reports summary statistics on the characteristics of the 48 respondents that participated in the survey and of 44 non-respondents. The number of observations used in different parts of tables can be lower than 48 and 44 because information was not provided or available on all characteristics. Panel A reports the number of respondents and non-respondents by region; Panel B shows assets under management in fixed income securities (FI AUM) measured in EUR billions, total asset under management (Total AUM) measured in EUR billions, and the share of asset under management in fixed income over total asset under management (% FI AUM to Total AUM) measured as a ratio from 0 to 1; Panel C reports the sample distribution based on i) whether asset managers are signatories to UNPRI, CDP or neither, ii) their applied ESG strategies (Exclusion/Negative Screening, Positive Screening, Impact Investing or No Public Strategy), and iii) whether they disclose CO_2 information on their institution (Own CO2 Disclosure) and assets under management (AUM CO2 Disclosure).

Panel A: Region	Sample			Non-respondents		
	N	*Freq.*	*Percent*	*N*	*Freq.*	*Percent*
Benelux	48	9	18.75%	44	3	6.82%
Central Europe	48	18	37.5%	44	18	40.91%
Nordics	48	5	10.42%	44	3	6.82%
Southern Europe	48	3	6.25%	44	7	15.91%
UK	48	13	27.08%	44	13	29.55%
Panel B: AUM	**Sample**				**Non-respondents**				
	N	*Mean*	*Median*	*Min*	*Max*	*N*	*Mean*	*Median*	*Min*	*Max*
FI AUM	48	89.54	33.65	0.15	731.22	37	49.78	22.76	0.04	409.65
Total AUM	48	285.00	148.69	0.43	1462.45	44	351.15	121.26	3.87	5315.41
% FI AUM to Total AUM	48	0.32	0.28	0.01	1.00	37	0.29	0.13	0.00	0.93
Panel C: ESG Profile	**Sample**			**Non-respondents**		
	N	*Freq.*	*Percent*	*N*	*Freq.*	*Percent*
Signatories to:						
UNPRI	41	40	97.56%	40	34	85.00%
CDP	41	28	68.29%	40	22	55.00%
Neither	41	1	2.44%	40	6	15.00%
Applying ESG Strategies:						
Exclusion/Negative Screening	40	20	50.00%	40	26	65.00%
Positive Screening	40	13	32.50%	40	3	7.50%
Impact Investing	40	17	42.50%	40	9	22.50%
No Public strategy	40	5	12.50%	40	8	20.00%
CO2 Disclosure:						
Own CO2 Disclosure	39	28	71.79%	38	26	68.42%
AUM CO2 Disclosure	39	13	33.33%	38	8	21.05%

Table 2 – Green Bond Investment Channels

This table presents summary statistics on the green bond investment channels use by investors (Question 1 of the survey in the Appendix). Panel A reports the percentage of investors who indicated their agreement on a set of statements on the impact of green bonds in investment decisions and channels; Panel B shows the number and percentage of respondents by number of green bond investment channels used; Panel C presents the average number of green bond investment channels by region; Panel D shows the number of green bond investment channels by asset under management in fixed income securities (FI AUM terciles).

Panel A: Impact of Green Bonds in Investment Decision	N	% of Responses	
No impact on investment decisions	48	2.08%	
Plans to incorporate but no action taken	48	8.33%	
GB Investment Channels			
Prefer green bonds where available and where competitively priced	48	62.50%	
Mandates or targets	48	35.42%	
Specific green bond funds	48	50.00%	
Panel B: Number of Green Bond Investment Channels	**N**	**% of Responses**	
one GB Investment Channel	23	47.92%	
two GB Investment Channels	12	25.00%	
three GB Investment Channels	8	16.67%	
Panel C: Differences in GB investments channels by Region	**N**	**Mean**	**Median**
Benelux	9	1.444	1
Central Europe	18	1.833	2
Nordics	5	1.600	1
Southern Europe	3	1.000	1
UK	13	1.077	1
Total	48	1.479	1
Difference (Central Europe - UK)		*0.7564***	
Panel D: Differences in GB investments channels by FI AUM	**N**	**Mean**	**Median**
Smallest Tercile (<=€ 21.06 bn)	16	1.063	1
Middle Tercile (>€ 21.06 bn and <=€63.503 bn)	16	1.500	2
Largest Tercile (>€ 63.503 bn)	16	1.875	2
Total	48	1.479	1
Difference (Largest - Smallest)		*0.8125****	

Table 3 – Green Bond Investment Exposure

This table presents summary statistics and regression results on the relative percentage holdings of green bonds to fixed income AUM (**% of FI AUM in GB**) reported by the respondents (Question 2 of the survey in the Appendix). Panel A shows summary statistics. Panel B shows results of GLM (columns 1 and 2) and probit (columns 3 and 4) regressions estimated using standard errors clustered by region. **Share of GB over FI AUM** is the dependent variable in columns 1 and 2, and it is measured as the simple ratio of green bond holdings over fixed income AUM. **Overexposure to GB** is used as dependent variable in columns 3 and 4, and it is measured as a binary variable which takes the value of 1 if % of FI in GB is greater than 1%, and 0 otherwise. **Ln AUM** is the natural logarithm of fixed income asset under management. **AUM Smallest Tercile**, **AUM Middle Tercile** and **AUM Largest Terciles** are a set of dummy variables equal to 1 if the AUM FI is smaller than € 21.06 bn, between EUR 21.06bn and EUR 63.503bn, and greater than EUR 63.503bn, respectively, and 0 otherwise. **Benelux**, **Nordics**, **Southern Europe** and **UK** are binary variables for the region of the respondents. **Central Europe** is the base category in columns 1 and 2. In columns 3 and 4 the reference category includes investors from Central Europe, categorised into AUM Smallest Tercile and with GB exposure below 1%. z-statistics are reported in parentheses. ∗, ∗∗ and ∗∗∗ indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: % of FI AUM in green bonds	N	Mean	Median	SD	Min	Max
	43	4.28%	1.50%	9.21%	0.00%	57.00%
Panel B: Multivariate Regression for GB Exposure	Share of GB over FI AUM				Overexposure in GB	
	(1)	(2)			(3)	(4)
Ln AUM	-0.1646***				-0.1017	
	(-3.38)				(-0.43)	
AUM Medium Tercile		-0.6042***				-0.6706
		(-2.75)				(-0.51)
AUM Largest Tercile		-0.4766				-0.3909
		(-1.50)				(-0.33)
Benelux	0.1398***	0.0468***			5.8830***	5.9193***
	(3.98)	(3.58)			(18.72)	(12.51)
Nordics	0.2315***	0.2873***			5.8330***	6.0343***
	(4.82)	(3.54)			(29.39)	(11.93)
Southern Europe	-1.5836***	-1.7323***			-5.548***	-5.699***
	(-424.54)	(-33.41)			(-16.02)	(-7.55)
UK	-0.2474***	-0.2497***			0.1216*	0.0832
	(-16.52)	(-12.80)			(1.69)	(0.71)
Observations	43	43			43	43
Pseudo R2					0.344	0.354
R2	0.106	0.097				

Table 4 – Focus of Green Bond Investments

This table presents summary statistics and regression results on preferred green bond investment projects (Question 3 of the survey in the Appendix) and preferred asset classes for green fixed income investments (Question 4 of the survey in the Appendix). Panel A reports the percentage of investors who indicated their preference for mitigation (renewable energy, clean transport, sustainable water management, low carbon buildings, waste and pollution control, sustainable land use (agriculture/forestry), industry and ICT) and adaptation projects. Responses are ranked by percentage of positive responses ('Yes'). Panel B reports the number and percentage of respondents who expressed a preference by preferred channel.

Panel A: Investment Projects of GB Investments	N	Freq.	%	Rank
Mitigation				
Renewable energy	47	45	95.74%	1
Clean transport	47	41	87.23%	2
Sustainable water management	47	36	76.60%	4
Low carbon buildings	47	40	85.11%	3
Waste & pollution control	47	32	68.09%	5
Sustainable land use (agriculture/forestry)	47	30	63.83%	6
Industry	47	25	53.19%	7
ICT	47	20	42.55%	8
Adaptation	47	18	38.30%	9
Panel B: Preferred channels for green FI investments	**N**	**Freq.**	**%**	**Rank**
Sovereign green bonds	46	26	56.52%	3
Development bank green bonds	46	35	76.09%	2
Corporate green bonds	46	43	93.48%	1
Pure play bonds (> 75% of revenue generated by clean assets)	46	16	34.78%	4
Private placements of green bonds	46	4	8.70%	5
Green loans	46	2	4.35%	6

Table 5 – Excess demands for Green Bond Issuer Types

This table presents summary statistics of the bonds by issuer types in which investors would like to buy more green bonds (Question 10 of the survey in the Appendix). For each issuer type, respondents expressed the intensity of their demand, measured using a Likert scale according to the intensity of their demand from 1 (the lowest) to 5 (the highest). The fourth column refers to the average score of each respondent across all issuer types. A positive 'Mean Difference' indicates a mean score for a single asset class ('simple mean') that is greater than the respondents' average score across all issuer types ('mean across all issuer types') and suggests higher excess demand for that issuer type. The mean across all issuer types can vary according to the number of observations available by issuer type. ∗, ∗∗ and ∗∗∗ indicate significance at the 10%, 5% and 1% levels, respectively.

Rating of bonds by issuer type in which investors like to buy more GBs	N	Simple Mean	Mean across all issuer types	Mean Difference	Median	SD	Min	Max
Governments DM (e.g. Belgium, France, Ireland)	44	3.432	3.253	0.179	4	1.108	1	5
Governments EM (e.g. Fiji, Indonesia, Nigeria)	43	3.14	3.256	-0.116	3	1.302	1	5
Local governments	43	2.907	3.245	-0.338***	3	1.087	1	5
Development banks	43	3.093	3.236	-0.143	3	1.25	1	5
Financial Corporates	45	3.822	3.281	0.541***	4	1.007	1	5
Non-financial Corporates	45	4.489	3.281	1.208***	5	0.869	1	5
MBS	39	2.282	3.18	-0.898***	2	1.255	1	5
ABS	40	2.55	3.197	-0.647***	2	1.449	1	5

Table 6– Factors in Green Bond Investment Decision

This table presents summary statistics and regression results of factors influencing green bond investment decision (Question 5 of the survey in the Appendix). For each factor, respondents expressed their rating on a Likert scale according to the intensity of their preferences from 1 (the lowest) to 5 (the highest). Panel A shows summary statistics by factor. The fourth column refers to the average score of each respondent across all factors. A positive 'Mean Difference' indicates a mean score for a single factor ('simple mean') that is greater than the respondents' average score across all factors ('mean across all factors') and suggests higher rating for that factor. The mean across all factors can vary according to the number of observations available by factor. Panel B reports results of ordered probit regressions estimated using standard errors clustered by region. Other variable definitions and measurements are explained in the descriptions to Table 3. z-statistics are reported in parentheses. *, ** and *** indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Rating of factors in GB investment decision	N	Simple Mean	Mean across all asset classes	Mean Difference	Median	SD	Min	Max
Credit rating constraints	47	3.660	3.874	-0.214	4	1.238	1	5
Currency preferences	48	3.438	3.876	**-0.439***	3	1.070	1	5
Issuer or sector constraints	47	3.128	3.874	**-0.746***	3	1.209	1	5
Minimum size of issue / liquidity	48	3.938	3.876	0.061	4	1.119	1	5
Satisfactory green credentials at issuance	48	4.427	3.876	**0.551***	5	0.819	2	5
Satisfactory green credentials post issuance	47	4.202	3.874	**0.328**	5	0.971	1	5
Pricing		48	4.323	3.876	**0.446***	5	0.854	2	5

Panel B: Rating of factors in GB investment decision	Credit rating constraints		Currency preferences		Issuer or sector constraints		Minimum size of issue / liquidity		Satisfactory green credentials at issuance		Satisfactory green credentials post issuance		Pricing	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
AUM Medium Tercile	0.018	-0.040	0.478	0.557	-0.120	-0.127	0.261	0.230	-0.367	-0.320	0.066	0.103	-0.014	0.092
	(0.14)	(-0.25)	(0.94)	(1.03)	(-0.40)	(-0.49)	(0.63)	(0.47)	(-1.26)	(-0.83)	(0.25)	(0.40)	(-0.07)	(0.28)
AUM Largest Tercile	0.696***	0.554***	0.179	-0.147	-0.009	-0.289**	0.154	-0.022	-0.980***	-1.014**	-0.150	-0.204	-0.041	0.180
	(4.93)	(2.58)	(0.41)	(-0.29)	(-0.03)	(-2.30)	(0.41)	(-0.06)	(-2.77)	(-2.36)	(-0.30)	(-0.47)	(-0.10)	(0.47)
Benelux	0.265***	0.193**	0.010	-0.195	-0.469***	-0.645***	-1.249***	-1.015***	-1.469***	-1.341***	-0.342***	-0.078	-0.379***	-0.692***
	(9.27)	(2.16)	(0.48)	(-1.43)	(-6.26)	(-3.86)	(-14.99)	(-12.94)	(-9.34)	(-6.20)	(-14.42)	(-1.15)	(-11.20)	(-6.35)
Nordics	0.334***	0.356***	-0.398**	-0.519*	-0.235***	-0.21***	-1.195***	-1.026***	-0.924***	-0.913***	0.342	0.468**	1.020***	0.654**
	(9.18)	(3.51)	(-2.24)	(-1.68)	(-4.26)	(-2.87)	(-4.88)	(-3.74)	(-5.48)	(-2.89)	(1.50)	(2.12)	(6.11)	(2.27)
Southern Europe	0.392***	0.530***	0.050	-0.140	0.31***	-0.339***	0.0661	-0.392*	-1.284***	-0.662*	-0.194**	0.045	-0.242***	-0.594***
	(4.98)	(3.93)	(0.24)	(-0.56)	(3.10)	(-3.68)	(0.44)	(-1.90)	(-7.84)	(-1.65)	(-2.30)	(0.29)	(-3.72)	(-2.84)
UK	0.084***	-0.048	0.144***	0.108**	-0.335***	-0.481***	-0.546***	-0.54***	-1.062***	-0.898***	0.525***	0.779***	0.824***	0.746***
	(5.02)	(-1.57)	(3.12)	(1.98)	(-4.60)	(-5.61)	(-10.84)	(-11.45)	(-8.07)	(-5.50)	(4.54)	(7.50)	(9.59)	(7.77)
Overexposure GB		-0.186		0.084		-0.212		-0.231***		0.172		-0.048		0.687***
		(-1.62)		(0.44)		(-1.32)		(-2.97)		(0.31)		(-0.51)		(4.23)
Observations	47	42	48	43	47	42	48	43	48	43	47	42	48	43
Pseudo R2	0.0311	0.0269	0.0136	0.0278	0.0158	0.0288	0.0775	0.0655	0.124	0.105	0.0320	0.0383	0.0763	0.105

Table 7 – Factors Making Green Bond Investments More Attractive

This table presents summary statistics of factors which make green bond investments more attractive (Question 6 of the survey in the Appendix). For each factor, respondents expressed their rating on a Likert scale according to the intensity of their preferences from 1 (the lowest) to 5 (the highest). The fourth column refers to the average score of each respondent across all factors. A positive 'Mean Difference' indicates a mean score for a single factor ('simple mean') that is greater than the respondents' average score across all factors ('mean across all factors') and suggests higher rating for that factor. The mean across all factors can vary according to the number of observations available by factor. $*$, $**$ and $***$ indicate significance at the 10%, 5% and 1% levels, respectively.

Rating of factors making GB investment more attractive	N	Simple Mean	Mean across all asset classes	Mean Difference	Median	SD	Min	Max
Bond issuer has positive fundamentals	47	4.404	3.628	0.776***	5	0.993	1	5
Bond is included in indices	47	2.883	3.628	-0.745***	3	1.324	1	5
Bond issuer transparency / disclosure overall practice	47	4.266	3.628	0.638***	4	0.943	1	5
External review	47	3.936	3.628	0.308**	4	1.164	1	5
Certification under the Climate Bonds Standard	46	3.217	3.625	-0.408***	3	0.929	1	5
Impact reporting available	46	3.946	3.625	0.320***	4	0.797	2	5
Post issuance transparency and detailed UoP disclosure	46	4.207	3.625	0.581***	4	0.750	2	5
Portfolio diversification	46	3.217	3.625	-0.408**	3	1.191	1	5
Bond is secured on green assets/project	45	2.522	3.631	-1.109***	2	1.305	1	5

Table 8 – Effect of Unclear UoP disclosure on Initial Purchase Decision

This table presents summary statistics and regression results of the effect that unclear use of proceeds (UoP) has on the initial green bond purchase decision of investors (Question 8 of the survey in the Appendix). Panel A presents the number of responses and percentages of investors by types of effect. Panel B reports results of ordered probit regressions estimated using standard errors clustered by region. The dependent variable **Purchase if Unclear UoP** is a score which takes the value of 0 if the investor would not buy GB, 1 if she would be less likely, and 2 if the investor would buy GB. Other variable definitions and measurements are explained in the descriptions to Table 3. z-statistics are reported in parentheses. ∗, ∗∗ and ∗∗∗ indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A	N	%
Purchase of GB if UoP to green investments unclear		
No	37	78.72%
It would be less likely	4	8.51%
Yes	6	12.77%
Total	47	100.00%

Panel B	Purchase if Unclear UoP	
	(1)	(2)
AUM Medium Tercile	-0.2655	-0.6056
	(-0.53)	(-1.14)
AUM Largest Tercile	0.9538***	0.5234
	(4.79)	(1.18)
Benelux	1.6795***	1.8653***
	(18.94)	(6.74)
Nordics	1.7344***	2.1572***
	(4.83)	(4.23)
Southern Europe	-3.8053***	-3.9183***
	(-17.08)	(-14.75)
UK	1.4590***	1.3621***
	(21.44)	(9.38)
Overexposure GB		-0.8766***
		(-3.66)
Observations	47	42
Pseudo R2	0.203	0.178

Table 9 – Effect of Poor Post-Issuance Reporting on Sale Decision

This table presents summary statistics and regression results of the effect that poor post-issuance reporting has on sale decisions (Question 9 of the survey in the Appendix). Panel A presents the number of responses and percentages of investors by types of effect. Panel B reports results of ordered probit regressions estimated using standard errors clustered by region. The dependent variable **Sale if Poor Post-Issuance Reporting** is a score which takes the value of 0 if the investor would not sell GB, 1 if she would be more likely to sell/engage, and 2 if the investor would sell GB. Other variable definitions and measurements are explained in the descriptions to Table 3. z-statistics are reported in parentheses. ∗, ∗∗ and ∗∗∗ indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A	N	%
Sale of GB if poor post-issuance reporting		
No	7	14.89%
More likely to sell/engage	14	29.79%
Yes	26	55.32%
Total	47	

Panel B	Sale if Poor Post-Issuance Reporting	
	(1)	(2)
AUM Medium Tercile	1.2379***	1.4222***
	(3.73)	(3.96)
AUM Largest Tercile	-0.6840	-0.6282
	(-1.04)	(-1.06)
Benelux	-1.4539***	-1.6849***
	(-5.40)	(-3.75)
Nordics	-2.8567***	-3.1978***
	(-5.81)	(-4.94)
Southern Europe	-2.5050***	-1.5073***
	(-5.86)	(-5.17)
UK	-2.1928***	-2.0916***
	(-6.16)	(-6.83)
Overexposure GB		0.5715
		(1.04)
Observations	47	42
Pseudo R2	0.305	0.288

Table 10 – 'Halo' Effect of Green Bond Issuances

This table presents summary statistics and regression results of the asset managers' responses to the question whether they would be more or less inclined to buy plain vanilla bonds from organisations that issued green bonds (Question 7 of the survey in the Appendix). Panel A presents the number of responses and percentages of investors by type of effect. Panel B reports results of ordered probit regressions estimated using standard errors clustered by region. The dependent variable **Buy Plain Vanilla Bond from GB Issuer** is a score which takes the value of 0 if the investor is less inclined, 1 if she has no preference, and 2 if the investor is more inclined. Other variable definitions and measurements are explained in the descriptions to Table 3. z-statistics are reported in parentheses. $*$, $**$ and $***$ indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A	N	%
Buy a plain vanilla bond from an organisation that has issued a green bond		
Less inclined	2	4.35%
No preference	33	71.74%
More inclined	11	23.91%
Total	46	100.00%

Panel B	Buy Plain Vanilla Bond from GB Issuer	
	(1)	(2)
AUM Medium Tercile	0.8773	0.7966
	(1.36)	(1.36)
AUM Largest Tercile	1.0658**	1.0621*
	(1.96)	(1.80)
Benelux	0.2511***	0.2994
	(11.84)	(1.14)
Nordics	1.0819***	1.0269***
	(11.45)	(3.51)
Southern Europe	0.1303	-0.1266
	(0.62)	(-0.53)
UK	1.2410***	1.0228***
	(8.28)	(7.19)
Overexposure GB		-0.0475
		(-0.10)
Observations	46	41
Pseudo R2	0.170	0.144

Table 11 – Market Tools and Policy Mechanisms for Growing the Green Bond Market

This table presents summary statistics and regression results of the market tools for growing the green bond market (Question 12 of the survey in the Appendix) and policy mechanisms for growing the green bond market (Question 13 of the survey in the Appendix). Respondents expressed their rating on a Likert scale according to the intensity of their preferences from 1 (the lowest) to 5 (the highest). Panel A shows summary statistics by market tool. The fourth column refers to the average score of each respondent across all market tools. A positive 'Mean Difference' indicates a mean score for a single market tool ('simple mean') that is greater than the respondents' average score across all market tools ('mean across all factors') and suggests a higher rating for that market tool. The mean across all factors can vary according to the number of observations available by market tool. Panel B shows summary statistics by policy mechanism. The fourth column refers to the average score of each respondent across all market tools. A positive 'Mean Difference' indicates a mean score for a single market tool ('simple mean') that is greater than the respondents' average score across all policy mechanisms ('mean across all mechanisms') and suggests a higher rating for that policy mechanism. The mean across all policy mechanisms can vary according to the number of observations available by policy mechanism.

Panel A: Rating of market tools to support GB investment	N	Simple Mean	Mean Across Market Tools	Mean Diff.	Median	SD	Min	Max
Positive credit fundamentals	47	3.787	3.368	0.419***	4	1.334	1	5
International credit ratings which integrate environmental risk analysis	46	3.522	3.333	0.189*	3	0.96	1	5
Full or partial investment guarantees	43	3.047	3.295	-0.248	3	1.112	1	5
Green sovereign bonds	43	3.395	3.265	0.13	3	0.929	1	5
Green bond list and platforms supported by exchanges	45	3.156	3.303	-0.148	3	1.107	1	5
Green funds set up by international organisations (demonstration of track record)	44	2.886	3.265	-0.378***	3	1.104	1	5
Panel B: Rating of main policy mechanisms	N	Simple Mean	Mean Across All Mechanisms	Mean Diff.	Median	SD	Min	Max
Penalising capital requirements for high-carbon assets	46	3.370	3.498	-0.129	3	1.199	1	5
Preferential capital treatment for low-carbon assets	46	3.804	3.498	**0.306****	4	1.147	1	5
Tax incentives	46	3.543	3.498	0.045	4	1.312	1	5
Subsidies	46	2.891	3.498	**-0.607***	3	1.233	1	5
Mandatory climate-related financial disclosures	47	3.553	3.530	0.023	4	1.085	1	5
Regulatory and legislative trends	47	3.585	3.509	0.076	4	1.065	1	5
Official minimum standards for green definitions and criteria set	48	3.813	3.540	**0.272***	4	1.085	1	5

Table 12 – Standardisation of Definitions of 'Green'

This table presents summary statistics and regression results of the investors' preferences related to the standardisation of definitions of 'green' (Question 16 of the survey in the Appendix). Panel A presents the number of responses and percentages of investors by type of definition (strict definition, no preference, less strict definition). Panel B reports results of ordered probit regressions estimated using standard errors clustered by region. The dependent variable **Less Strict Definition** is a score which takes the value of 0 if the investor prefers a strict definition, 1 if she has no preference, and 2 if the investor favours a less strict definition. Other variable definitions and measurements are explained in the descriptions to Table 3. z-statistics are reported in parentheses. $*$, $**$ and $***$ indicate significance at the 10%, 5% and 1% levels, respectively.

Panel A: Standardisation of 'Green'	N	%
Strict definition of green to ensure green label is only applied to high quality projects?	23	47.92%
No preference	10	20.83%
Less strict definition of green to allow for diversity in issuance and to scale up the market?	15	31.25%
Total responses	48	100.00%

Panel B	Less Strict Definition	
	(1)	(2)
AUM Medium Tercile	0.1539	0.1873
	(0.41)	(0.48)
AUM Largest Tercile	0.2142	0.2960*
	(0.91)	(1.90)
Benelux	0.4095***	0.5577***
	(15.81)	(3.41)
Nordics	0.0859	0.2632**
	(1.11)	(2.32)
Southern Europe	-0.3005*	-4.7122***
	(-1.72)	(-17.30)
UK	0.9954***	1.1123***
	(19.11)	(10.36)
Overexposure GB		-0.1769
		(-0.78)
Observations	48	43
Pseudo R2	0.0668	0.103

Table 13 – Drivers of Emerging Markets Investments

This table presents summary statistics and regression results of the drivers of emerging markets investments (Question 24 of the survey in the Appendix). For each of the drivers, respondents expressed their rating on a Likert scale according to the intensity of their preferences from 1 (the lowest) to 5 (the highest). The fourth column refers to the average score of each respondent across all drivers. A positive 'Mean Difference' indicates a mean score for a single driver ('simple mean') that is greater than the respondents' average score across all drivers ('mean across all answers') and suggests a higher rating for that driver. The mean across all answers can vary according to the number of observations available by driver. ∗, ∗∗ and ∗∗∗ indicate significance at the 10%, 5% and 1% levels, respectively.

Rating of drivers of EM investments	N	Simple Mean	Mean across all answers	Mean Diff.	Median	SD	Min	Max
Public spending infrastructure programmes	33	3.076	3.083	-0.008	3	1.288	1	5
Credit enhancements available from multilaterals or government-related entities	33	3.545	3.083	0.462***	4	1.221	1	5
Deal-supporting mechanisms	33	2.818	3.083	-0.265**	3	1.151	1	5
Benchmarks for EM green bonds	33	2.894	3.083	-0.189	3	1.21	1	5

Appendix – Survey Questionnaire

Note: Questions marked with an asterisk (*) are featured and analysed in this study.

*1. To what extent have green bonds impacted your investment decisions? (tick applicable)

  a. No impact on investment decisions
  b. Plans to incorporate but no action taken
  c. Prefer green bonds where available and where competitively priced
  d. Mandates or targets
  e. Specific green bond funds

*2. What % of your fixed income AuM is currently invested in green bonds?

*3. What sectors do the bonds you have invested in / intend to invest in finance? (Y/N)

  a. Mitigation
        i. Renewable energy
       ii. Clean transport
      iii. Sustainable water management
       iv. Low carbon buildings
        v. Waste & pollution control
       vi. Sustainable land use (agriculture and forestry)
      vii. Industry
     viii. ICT
  b. Adaptation / Resilience
        i. Which sector:

*4. What are your preferred channels for green fixed income investments? (tick applicable)

  a. Sovereign green bonds
  b. Development bank green bonds
  c. Corporate green bonds
  d. Pure play bonds (where more than 75% of revenue is generated by clean assets)
  e. Private placements of green bonds
  f. Green loans
  g. Other:_____

*5. If you invest or intend to invest in green bonds, how important are the following factors in making an investment decision? (Rank each option individually 1-5, where 1 is not important, 5 is very important)

  a. Credit rating constraints
  b. Currency preferences
  c. Issuer or sector constraints
  d. Minimum size of issue / liquidity
  e. Satisfactory green credentials at issuance
  f. Satisfactory green credentials post issuance
  g. Pricing
  h. Other:_____

*6. Rank the following issues that could make investing in green bonds more attractive: (Rank each option individually 1-5, where 1 is not important, 5 is very important)

  a. Bond issuer has positive fundamentals
  b. Bond is included in indices
  c. Bond issuer transparency / disclosure overall practice
  d. External review
  e. Certification under the Climate Bonds Standard
  f. Impact reporting available
  g. Post issuance transparency and detailed Uop disclosure
  h. Portfolio diversification
  i. Bond is secured on green assets/project

*7. Would you be more inclined to buy a vanilla bond from an organisation that has issued a green bond, over a vanilla bond from an organisation that hasn't? (Tick which applies best)

    a. Less inclined
    b. No preference
    c. More inclined

*8. Would you buy a green bond if it was not clear that proceeds were going to be allocated to green projects?

    a. No
    b. It would be less likely
    c. Yes

*9. Would you sell a green bond if post-issuance green bond reporting is poor?

    a. No
    b. More likely/engage
    c. Yes

*10. Rank the asset classes in which would you like to buy more green bonds: (rank each 1-5, from no preference to high preference)

    a. Governments DM (e.g. Belgium, France, Ireland)
    b. Governments EM (e.g. Fiji, Indonesia, Nigeria)
    c. Local governments
    d. Development banks
    e. Financial Corporates
    f. Non-financial Corporates
    g. MBS (e.g. Sustainable housing such as PACE and other property upgrades to improve energy efficiency)
    h. ABS (e.g. solar, emulating private equity, community solar and similar)
    i. Other, please specify:_____

*11. Please name the three non-financial corporate sectors you would most like to buy green bonds in. (Text-based answer)

*12. Rank the main market tools and mechanisms that in your opinion could be developed or leveraged to support investment in green bonds: (rank each 1-5, where 1 is not important, 5 is very important)

    a. Positive credit fundamentals
    b. International credit ratings which integrate environmental risk analysis
    c. Full or partial investment guarantees [i.e. non-financial obligations, contract breaches, currency]
    d. Green sovereign bonds
    e. Green bond list and platforms supported by exchanges
    f. Green funds set up by international organisations (demonstration of track record)
    g. Others:_____

*13. Rank the main policy mechanisms that would enable you to invest, or increase your investment in green bonds: (rank each 1-5, where 1 is not important, 5 is very important)

    a. Penalising capital requirements for high-carbon assets
    b. Preferential capital treatment for low-carbon assets
    c. Tax incentives
    d. Subsidies
    e. Mandatory climate-related financial disclosures (e.g. adoption of TCFD)
    f. Regulatory and legislative trends
    g. Official minimum standards for green definitions and criteria set

14. What is your approach to the recommendations of the Task Force on Climate Related Financial Disclosures (TCFD)? (tick one)

    a. I am not aware of any of the actions taken regarding the TCFD
    b. We do not plan to implement this
    c. We are committed to implementing, but waiting for further guidance or regulation

d.   It is in place for some of our portfolios
e.   It is in place for all our portfolios

15. If implementation of the TCFD recommendations is planned or in place do you envisage that you will buy more green bonds as a result? (Y/N)

*16. In terms of strictness of definitions, would you prefer: (tick one)

a.   Strict definition of green to ensure green label is only applied to high quality projects
b.   Less strict definition of green to allow for diversity in issuance and to scale up the market
c.   No preference

*17. In your opinion, what is the main driver that will enhance growth and scale of the green bond market? (Name one) (Text-based answer)

*18. What is the main obstacle? (Name one) (Text-based answer)

19. How do you keep abreast of opportunities in the green bond market? (Tick any that apply)

a.   Direct contact from underwriters or brokers
b.   Individually using Bloomberg or Thomson Reuters / EIKON
c.   Specialised analyst (web and data providers sources)
d.   Climate Bonds market blogs and research reports
e.   Internal communication (colleagues, word of mouth and similar)
j.   Other, please specify:_____

20. Are you able to buy EM debt? (Y/N)

21. What is your credit rating floor for doing so? (Specify rating) (Text-based answer)

22. What other EM investment restrictions do you have? (Tick any that apply)

a.   Currency (specify allowed currencies)
b.   Deal Size (specify minimum threshold)
c.   Exposure limits to EM
d.   Exposure limits by issuer
k.   Other, please specify:_____

*23. What could drive your investment in EM markets? (rank each 1-5, where 1 is not important, 5 is very important)

a.   Public spending infrastructure programmes
b.   Credit enhancements available from multilaterals or government-related entities
c.   Deal-supporting mechanisms
d.   Benchmarks for EM green bonds
l.   Other, please specify 2 solutions that would increase your level of comfort:_____

*24. Which green bond features would give you more confidence in investing in EM via the green bond format (for example certification, trackable use of proceeds etc)? (Text-based answer)

25. Do you invest in private placements?

a) Could you describe your private placement investments terms of: currencies, size, tenor, sectors? (Text-based answer)

b) If not, what prevents you from investing? (Name 2-3 key reasons)

c) If yes, what other factors would increase your exposure to private placements? (Name 2-3 solutions that would get you comfortable)

26. How could rising interest rates alter your appetite for green bonds? (Tick one)

a.   No change
b.   Increase
c.   Decrease
d.   Cannot say

27. Have you bought any other types of ethical bond? (Tick all applicable)

a.   Social
b.   Sustainability
c.   Mixed use of proceeds
d.   Other (please name):_____

28. If yes, briefly describe how you categorise these instruments: (Text-based answer)