ZEW policy brief

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Catalysts for change: Can green bonds accelerate Europe's transition to a green economy?

Nearly two decades of green bond issues have ignited various research questions and fields surrounding the topic. It is therefore time to take stock. Green bonds were launched with the goal of greening the financial sector by investing the generated funds into sustainable projects that support the transition to a resilient, climate-neutral economy. But are green bonds living up to their promise? In this policy brief, we provide evidence on the role that green bonds can play in the green transition. Our findings are based on a recent project funded by the German Federal Ministry of Research, Technology and Space (BMFTR). When examining the potential distortionary effects of policy interventions (such as green government bond issues) in the green bond market, we only find small effects on average, even though those are stronger for large and specific interventions. Looking at green bond auction design from a theoretical perspective, it can be seen that strategic bidding behaviour can incentivise investors to shift their portfolios towards green investments in general. When banks issue green bonds, they increase the financing of green firms in the form of sustainability-linked loans. As a result, environmental benefits materialise as recipient firms reduce their emissions. These effects are only evident for firms that are already greener than others, however, so more targeted incentives seem needed to channel financial flows more effectively into sustainable transition projects.

KEY MESSAGES

- While public interventions relying on green bond issuances (e.g. green sovereign debt programmes) or purchases (e.g. green Quantitative Easing) may not lead to market distortions on average, governments willing to issue green bonds should avoid massive issuance programmes and central banks need to take into account the tool they use when deciding to green their policy.
- Governments can use green bond issuances not only to finance green projects directly, but also to increase the demand for other green financial investments by generating such incentives with a suitable auction design.
- Green bonds can encourage banks to grant loans with a positive climate impact, but effects only materialise for firms that are already greener than others, so that more targeted incentives seem needed to channel financial flows more effectively into sustainable transition projects.
- As the way ahead, policymakers need to support transition and adaptation finance.

GREEN BONDS AS A WAY TO MOBILISE PRIVATE CAPITAL FOR THE GREEN TRANSITION

Green bonds generate funds to finance green projects

The greening of the European economy will require large sums of money to flow into green projects in the upcoming years. Green bonds are financial instruments that aim to support the green transition: They offer a way to mobilise capital for sustainable projects while enabling investors to put their funds in projects that align with their sustainability goals.

Price reactions on the green bond market may differ from the conventional bond market

Since the first green bond issuance in 2007 by the European Investment Bank, the green bond market has experienced a rapid growth, accounting for approximately $2.9 trillion in terms of market capitalisation in the spring of 2025 (Demski et al., 2025). At the same time, the green bond market is still small in relative terms, with a share of roughly 7 per cent of the total EU bond market and 13 per cent of the EU corporate bond market in 2024 (European Environment Agency, 2025) and is characterized by unique features, including investor preferences for environmental attributes and potential differences in liquidity and pricing dynamics. These characteristics suggest that green bond prices could be particularly sensitive to fluctuations in supply and demand. Understanding how supply and demand shocks affect the spread between green and otherwise equivalent conventional bonds is therefore crucial for both assessing the maturity of the green bond market and evaluating the effectiveness of policy initiatives aimed at promoting green finance (Bun and Cézanne, 2025).

Design of government green bond auctions matters for greenness of institutional investors' portfolios

European issuers have been at the forefront of developing the green bond market. The first corporate green bond was issued by a Swedish firm in 2013 and European governments were the first to use green bonds to finance sustainable government expenditure and support the market for green financial products: Poland's government issued a green bond in 2016, followed by France in 2017 and Germany in 2020. At the EU level, with its first green bond issuance in the frame of NextGenerationEU in the autumn of 2021, the European Commission set out to become the largest green bond issuer worldwide (European Commission, 2025). As government bond issues follow a specific auction process in which designated institutional investors bid for shares, the auction design can be crucial in incentivising the bidders to invest sustainably even beyond the actual sovereign green bond issuance (Zilke, 2025).

It is unclear whether green bonds fulfil the promise that comes with their green label

Almost 20 years of green bond issuance beg the question of whether green bonds live up to their promise. The green label indicates that the issuer must use the proceeds for specific purposes which are outlined in the accompanying bond prospectuses. However, the stated uses of proceeds often relate to crude project categories and are not limited to new projects. Issuers can thus deploy these funds to finance projects with varying levels of environmental impact or "additionality". Additionality represents the degree of positive environmental impact that would not otherwise have occurred without additional resources. Yet, little is known so far on the real environmental effects in terms of additionality of green bonds (Lam and Wurgler, 2024; Brückbauer et al., 2025).

In this policy brief, we provide and synthesise insights from a recent project funded by the German Federal Ministry of Research, Technology and Space (BMFTR) on the role that green bonds can play in the green transition. Our analysis shines the light on the three aspects outlined above: the response of the green spread to supply and demand shocks, government green bond auction design and the additionality of green bond funding.

THE IMPACT OF SUPPLY AND DEMAND SHOCKS ON GREEN SPREADS

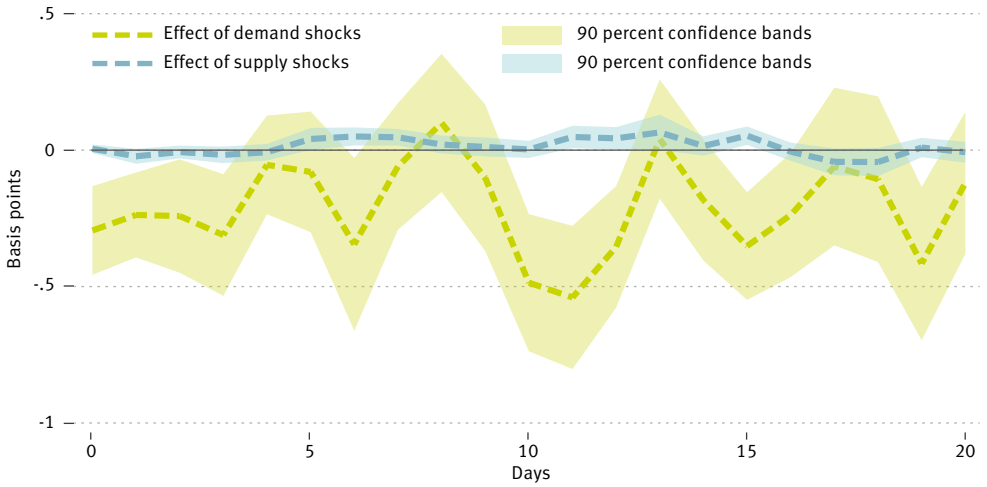
Evidence on the green spread/greenium is mixed

The aspect most frequently covered by studies on green bonds surrounds their pricing and the existence of a green spread (the yield differential between green and otherwise equivalent conventional bonds) or the greenium (that part of the green spread that arises from green investor preferences). The results are mixed, however, with some studies showing a negative green spread/greenium of a couple of basis points, while others find no evidence for or even a positive green spread/greenium (e.g., Wu, 2022; Dorfleitner et al., 2022; Fatica et al., 2021; MacAskill et al., 2021; Kapraun et al., 2021; Hyun et al., 2020; Larcker and Watts, 2020; Gianfrate and Peri, 2019; Zerbib, 2019; Baker et al., 2018; Hachenberg and Schiereck, 2018; Karpf and Mandel, 2018).

On average, demand and supply shocks have limited effect on the green spread

In our research, we provide evidence on how supply and demand shocks affect the green spread. We study a sample of green bonds issued between 2007 and 2022 by all types of European issuers, i.e. corporates, central and local governments, agencies and other supranational entities (Bun and Cézanne, 2025). Our results, summarised in Figure 1, show that supply shocks, i.e. the amount of green bonds to be issued when first announced publicly, have a very small and temporary impact on the green spread. Demand shocks, i.e. ECB announcements mentioning the incorporation of climate considerations in its different policy tools, have a negative and more persistent effect, although economically it is also rather limited.

FIGURE 1: RESPONSE OF THE GREEN SPREAD (BPS) TO GREEN BOND SUPPLY AND DEMAND



Note: In this figure, we plot the effect of a one-standard deviation positive supply shock vs a one-unit positive green bond demand shock occurring on day t on the green spread over different time horizons h, where h = 0, 1, ..., 20 business days. The blue dashed line represents the coefficient for the supply shock on day t for each horizon h. The light blue area represents the 90 per cent confidence bands of the coefficient for each horizon. The green dashed line represents the coefficient for the demand shock on day t for each horizon h. The light green area represents the 90 per cent confidence bands of the coefficient for each horizon.

Policymakers should take into account the size and tool of intervention

Overall, our results suggest that, on average, supply and demand shocks stemming from policy interventions would not create market distortions. Noticeably, on the supply side, we find stronger effects on bonds issued in the same country as the origin of the shock, and for large supply shocks. Therefore, governments willing to issue green bonds should avoid massive issuance programmes and rather split the issuances in smaller programmes to avoid a strong short-term increase in the green spread of already existing green bonds, in particular for local bonds.

At the same time, central banks need to take into account the tool they use when deciding to green their policy. Our results show that official ECB statements that do not refer to any specific instrument, or that mention asset purchase programmes or collateral framework have the strongest impact.

WHAT ROLE CAN AUCTION DESIGN PLAY IN INCENTIVISING INVESTORS TO SHIFT THEIR PORTFOLIOS TOWARDS GREEN INVESTMENTS?

Proper auction design can enhance additional commitment to greener portfolios

As outlined above, when governments decide to issue green bonds, they increase the supply of green financial instruments which may have an effect on bond yields. Taking a step back, since these green bonds are usually issued through auctions to designated groups of institutional investors, the question arises of what role the auction design plays. Our analysis of specific auction design and strategic bidding behaviour by investors shows the auction design to have a subsequent effect on the demand for green financial instruments in general (Zilke, 2025). More specifically, we can show that investors have the incentive to commit themselves to a greener portfolio before bidding for a green bond in such an auction. This result is driven by the fact that the investors' optimal bidding strategies take into account their competitors' general demand for green financial instruments – which can be observed by all the commitments to greenness made before. It is therefore crucial that the auction design allows for such kind of strategic bidding behaviour.

Opportunity costs for green portfolios can be traded off with a strategic advantage in green bond auctions

In our model, each investor faces a trade-off when deciding whether to make a commitment for a greener portfolio. On the one hand, investors incur an opportunity cost for excluding non-green investments from the portfolio. On the other hand, a prior commitment enables the investor to bid more aggressively in the auction. This commitment increases the investor's demand – and thus their willingness-to-pay – for the green bond. This behaviour can be observed by all the other investors, motivating them to bid less aggressively in turn. Hence, the auction mechanism allocates more shares to all the investors who made the commitment – yielding them a higher profit. We show that this positive part of the trade-off is the smaller the higher the number of other investors that make such prior commitment as well. Hence, the model suggests that some but not necessarily all investors will commit to a greener portfolio in equilibrium.

Green bonds reduce opportunity costs and can be issued with a green spread

Taking the perspective of the issuer, our model identifies green bonds as an instrument for governments to enhance the green transition. In a sense, sovereigns can decrease the opportunity cost of commitments to greener portfolios by issuing new green bonds which are otherwise equivalent to existing conventional bonds. Moreover, the final auction price which clears the market is increasing in the number of investors who make these commitments. This suggests that there is a green spread for government bonds. Consequently, sovereigns should finance all their green projects by green bonds to profit from the lower yield and maximise the number of investors willing to shift their portfolios more towards green investments.

THE IMPACT OF BANKS' GREEN BOND FUNDING ON THEIR CORPORATE LENDING AND THE ENVIRONMENTAL PERFORMANCE OF THEIR BORROWERS

Role of green bank bonds unclear so far

Green bonds are a popular financial instrument intended to support the financing of environmentally beneficial projects. Yet, little is known about how banks use the funds generated from these bonds. Fatica et al. (2021) and Bedendo et al. (2023) provide evidence suggesting that green-bond-issuing banks reduce lending to the most polluting industries.

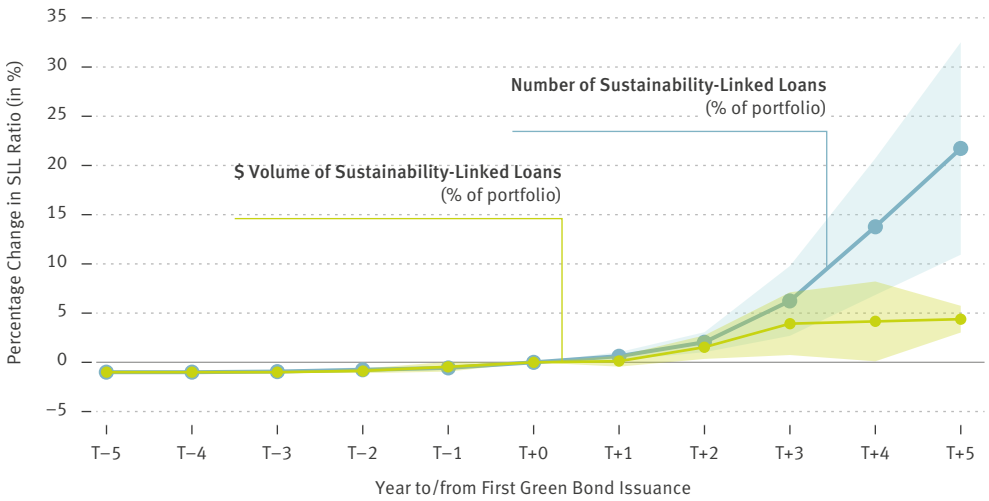
And there is some evidence that banks committing to voluntary sustainability initiatives, such as the Net-Zero Banking Alliance or the Science-Based Targets Initiative, decrease their lending or charge higher interest rates to CO_2-intensive borrowers (Delis et al., 2024; Ye, 2024; Degryse et al., 2023). However, the effects on the borrowers' environmental performance seem negligible (Berg et al., 2025; Sastry et al., 2024; Kacperczyk and Peydro, 2024). In contrast, Hasan et al. (2023) find that banks' commitment to more climate-related disclosure has a positive effect on their borrowers' sustainability. Issuing green bonds can be seen as a way for banks to self-commit to both becoming greener and increasing sustainability-related disclosure.

Green bonds can induce some positive environmental impact but are not sufficient to finance transition projects

In our research, we examine how banks' green bond funding affects their corporate lending and the environmental performance of their borrowers using granular data on European banks' green bond issues and their syndicated lending matched with carbon emissions information of the borrowing firms (Brückbauer et al., 2025). In general, the green label indicates that banks must use the proceeds for specific purposes which are outlined in the respective accompanying bond prospectuses. However, the stated uses of proceeds often relate to crude project categories (e.g. renewable energy, waste management, pollution reduction) and may also be used for the refinancing of existing loans. Banks can thus deploy these funds to finance projects with varying levels of "additionality" – the degree of positive impact that would not otherwise have occurred without the additional resources.

Our results show that banks channel more capital into green firms in the form of sustainability-linked loans after issuing green bonds (see Figure 2). This effect is particularly strong for new bank clients, suggesting a high degree of additionality. We also find "green spillovers" as banks not directly involved in the green bond market co-engage in the increasing green financing in the corporate loan market. Environmental benefits materialise as recipient firms reduce their emissions. However, these effects are only evident for firms that are already greener than others and receive sustainability-linked loans from green-bond-issuing banks. More targeted incentives seem therefore necessary so ensure that financial flows are channelled into sustainable transition projects.

FIGURE 2: SUSTAINABILITY-LINKED LOANS (SLLS) AROUND BANKS' FIRST GREEN BOND ISSUES



Notes: The graph shows the percentage change in the Number of SLLs as a share of banks' loan portfolios (blue line) and in the volume of SLLs as a share of banks' loan portfolios (green line) between five years before and five years after banks' first green bond issues. The loan data comes from Refinitiv Dealscan and covers loans from banks headquartered in Europe that issued at least one green bond during the observation period 2012–2022. Bond data comes from LSEG.

DEVELOPING INSTRUMENTS FOR TRANSITION AND ADAPTATION FINANCE AS THE WAY AHEAD

Climate change is not slowing down and policymakers need to support transition and adaptation finance

Although political momentum on climate change-related policies is weakening, climate change itself is not slowing down. This reinforces the need for climate-related investments and affordable green solutions. Policymakers need to ensure that sufficient funds flow into relevant sustainable projects. The green bond market is one way to mobilise capital for these projects, offering investors the opportunity to put their funds in projects that align with their sustainability goals. To maintain its competitive edge, the green bond market must deliver on its promises. At the same time, EU policymakers should focus on ways to help CO2-intensive firms and industries transition to more sustainable business models. Green bonds do not seem to be the right instrument for achieving this goal. Although transition finance is certainly more complex than financing firms that are already green, policymakers should focus on creating enabling environments and avoid overly detailed regulations that could undermine acceptance from the beginning.

Additionally, the adaptation to climate change and the related investments are becoming increasingly urgent in a warming world. While private funds are of paramount importance for funding adaptation projects, private investors seem to lack the necessary experience and awareness. Public funds may therefore be more necessary in this domain compared to the financing of mitigation efforts, as they could serve as a catalyst. Besides, adaptation projects are often seen as public goods because their positive externalities do not accrue to investors (UNEP FI, 2019). EU frameworks will need to provide more guidance for the financial sector on how to consider adaptation efforts.

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