

Green Bond Pricing, Greenwashing, and Carbon Taxation under Asymmetric Information

Yun Gao Jochen M. Schmittmann

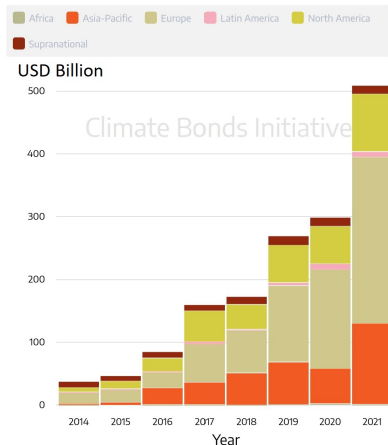
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Discussion by Darwin Choi

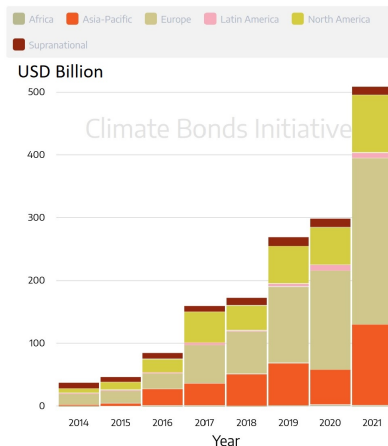


The Green Bond Market



Source: Climate Bonds Initiative (<https://www.climatebonds.net/>)

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Europe was the most prolific issuance region, while Asia-Pacific experienced the strongest annual growth (129%)

Green Bond Pricing, Greenwashing, and Carbon Tax

- Green bond premium
 - Yes: Baker et al. (2018), Zerbib (2019), Kapraun et al. (2021)
 - No premium: IMF (2019), Larcker and Watts (2020), Flammer (2021)
 - Green bond discount: Karpf and Mandel (2017)

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- This paper can theoretically explain a positive green premium or zero premium
 - There are transition risks: carbon tax in the future
 - Greenwashing is costly
 - Does not require a preference for green bonds

Main Findings

- A simple one-period adverse selection model
 - Information asymmetry regarding firms' emissions exists between firms and bond buyers
- Green bonds provide a signal of firms' green credentials
- The value of the signal depends on
 - Transition risk: uncertainty over the introduction of carbon tax
 - The extent of greenwashing
 - The cost of issuing green bonds
 - The costs associated with greenwashing
- An extension into a three-period model provides policy implications
 - Quick introduction of carbon tax

#1: Who Issues Green Bonds?

- Firms' emission level per unit of production e_i
 - Green firms: $e_i = 0$
 - Brown firms: $e_i \sim U(0, 1]$
- The paper assumes that brown firms which issue green bonds are greenwashing

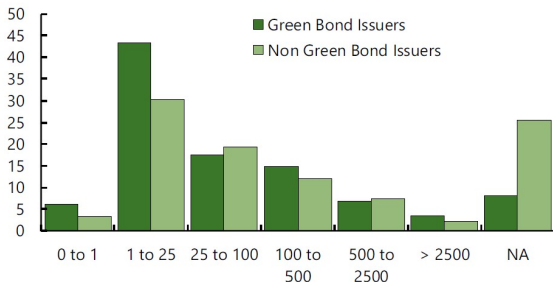
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Figure 11. Green Bond Issuers vs Non-issuers: Share of Firms by CO₂/Revenue Buckets

%, Financial Year 2019, Scope 1+2 emissions

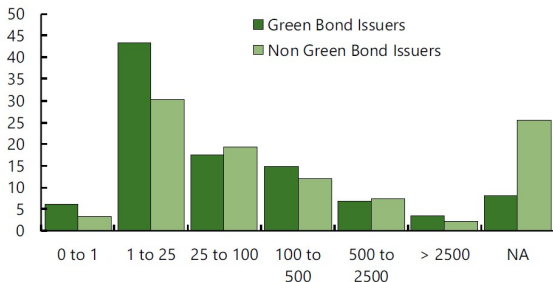


Schmittmann and Chua (2021)

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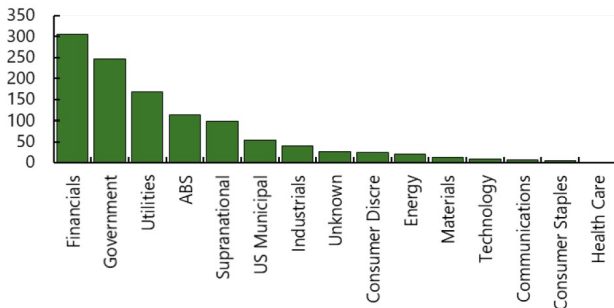


Schmittmann and Chua (2021)

Bolton and Kacperczyk (2021): median Scopes 1+2 carbon intensity = 33
 While it is true that green bond issuers are usually greener, a lot of brown firms issue green bonds

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Figure 6. Green Bond Issuance by Industry
(Billions of US Dollars; cumulative since 2007)



Some green bond issuers come from high-emission industries

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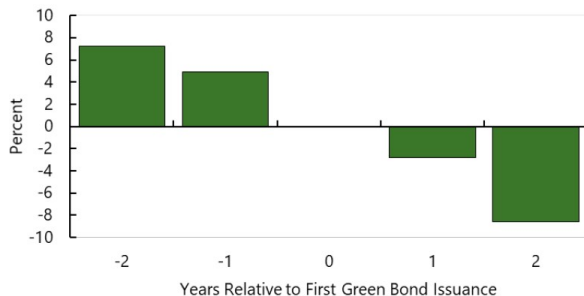
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 - Energy; Buildings; Transport; Water management; Waste management & pollution control; Nature-based assets including land use, agriculture and forestry; Industry & energy-intensive commercial; Information technology & communications (ICT)
- If a brown energy firm issues a green bond to make their production process cleaner, it should not be classified as “greenwashing”

#1: Changes in Emissions

Figure 15. Change in CO₂/Revenue around Green Bond Issuance

(CO₂ Scope 1+2 emissions; adjusted for overall firm level emission intensity trend)



Green bond issuers become “greener” after issuance

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- Perhaps assume a non-zero carbon emission quota in Period 0
- Carbon tax is applied on emissions above the quota; this makes firms with large positive changes in emissions go bankrupt

#2: Three-Period Model

- In Section VI, the authors develop a 3-period model to analyze the timing of carbon tax
- But after a carbon tax is imposed in Period 1, all firms' emission levels become public information and there is no asymmetric information
- They currently assume old (brown) firms drop out, and then an equal number new firms, whose emission levels are private, enter the market

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- **Classifying firms based on changes in emissions has an advantage**
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- **The authors can also consider banning greenwashing firms in Period 1 from issuing green bonds in future periods**

- Very interesting paper and results!
 - Does not require a preference for green assets
- Classfying firms based on *changes* in emissions
 - 1 Better match the data
 - Emission levels are public
 - Brown firms are not greenwashing when they use green bond proceeds to reduce emission levels
 - 2 In the 3-period model, firms can switch types
 - Publicizing the previous period's change in emissions does not reveal the next period's change