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Policy support in promoting green bonds in Asia

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POLICY SUPPORT IN PROMOTING GREEN BONDS IN ASIA

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Abstract

Private green finance is imperative for climate change mitigation and adaptation, but the share of private green finance remains small, and the studies that have tackled the efficacy of policy instruments in promoting green finance are limited. Many economies, especially in Asia, have implemented different policies to incentivize the private sector to issue green bonds. However, there is a lack of empirical evidence on the effectiveness of such policies. To date, this is the first study to provide empirical evidence on the effectiveness of a broad range of green bond policies on the issuance of green bonds. Given the nascent nature of green bonds, this paper documents the effects of several policy instruments supporting green bonds on the private sector's issuance of green bonds in 58 green-bond-issuing economies, including 11 economies in Asia, over the period January 2010–June 2020. Using the difference-in-difference specification within the multilevel longitudinal model, the paper finds that some green bond policies, such as green bond grants and tax incentives, as well as cooperation and policy signals, are effective in promoting the issuance of green bonds in the private sector in Asia. Regional cooperation and standardization have incentivized private green bond issuance in the European Union but not in the Association of Southeast Asian Nations region. Global cooperation and international standardization have had a positive impact on the issuance of private green bonds.

Keywords: green bonds, green finance, policy support, Asia

JEL Classification: Q28, Q42, Q48, G23

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1. INTRODUCTION

Limiting the global average surface temperature rise to “well below 2 °C” by 2100 requires substantial investment in green projects. The International Renewable Energy Agency (IRENA) (2019) estimated that the cumulative renewable energy investment should reach \$27 trillion in 2016–2050. Financial instruments, such as green bonds, could play a large role in unlocking investment in renewable energy. The European Investment Bank first issued green bonds in 2007 as “climate awareness bonds,” representing fixed-income products, the proceeds of which finance projects in climate change mitigation and adaptation. The issuers of green bonds commit to using the bond proceeds only for environmentally friendly projects.

The Green Bond Principles (GBPs) of the International Capital Markets Association (ICMA) provide key guidelines regarding the use of bond proceeds to fund green projects and involve a four-stage process. The first stage—the use of proceeds—differentiates green bonds from other bonds. Green bonds are ones that invest their proceeds in projects that promote climate change mitigation, climate change adaptation, natural resource conservation, and so on. The second stage, project evaluation and selection, identifies the investment, economic, environmental, and social risks and rewards associated with the project. To make the project evaluation more credible, economies’ green bond guidelines usually recommend that external expert agencies conduct reviews. This validation enhances the potential investor base as some investors, such as pension funds, may not have the mandate to invest in bonds that have not undergone external evaluation. External evaluation in accordance with a standard benchmark also helps when comparing risks and rewards across different bonds. The third stage is the management of the proceeds. Since the proceeds from green bonds must fulfill only specific purposes, it is vital to keep track of their use from the time of their receipt to their full utilization for the project. Further, the revenues that the project generates and the investors’ returns may undergo tracking and monitoring to ensure complete transparency. During the fourth stage, reporting, buyers of green bonds receive a guarantee that the proceeds from their green bonds will only fund green projects. To ensure transparency, the guidelines suggest true, fair, and standardized reporting of all project parameters (ICMA 2018).

Green bonds are gaining popularity in both developed and developing economies. The global issuance of green bonds increased from \$4 bn in 2010 to \$240 bn in 2019 (Bloomberg 2020). The People’s Republic of China (PRC), Germany, the US, the Netherlands, and France represent 50% of the global issuance in 2019, with individual contributions ranging from \$22 bn to \$27 bn (Bloomberg 2020). However, despite the boom in the green bond market, the share of green bonds constitutes less than 2% of the global bond market and only 17% of unlabeled climate-aligned bonds (KPMG 2016; Mihálovits and Tapaszi 2018; Reboredo 2018). Though the PRC remains one of the largest green bond issuers, the Asian region (excluding the PRC) exhibits limited participation. Given that the development of the green bond market reduces negative externalities from pollution and redirects resources to sustainable projects, the efficiency perspective justifies the policies. However, little is known about the role of the policies and their effectiveness in terms of the corporate sector’s promotion of green bond issuance.

The study pursues three objectives. First, it provides an overview of the green bond market development globally and focuses specifically on the green bond markets in Asia. Second, using economy-level data on green bonds, it examines the effectiveness of policy support in promoting green bond issuance globally and in Asia. We distinguish

between three types of policy instruments aiming to promote green bonds: (i) national, (ii) regional, and (iii) global. National policies include (i) national standardization of green bonds, that is, green bond guidelines, standards, frameworks, and principles; (ii) policies reducing the cost of labeling bonds as “green,” that is, green bond grants and tax incentives; (iii) and other national policies, such as cooperation and policy signals. Regional policies are policies that affect several economies, such as EU policies and ASEAN policies. Regional green bond policies include regional cooperation and regional standardization. Global instruments represent global cooperation and international standards and guidelines, such as the ICMA’s Green Bond Principles. National policies are binary variables, while regional and national variables count the number of policies implemented. The full list of policies is available from the Climate Bond Initiative’s Green Bond Policy Dataset.

The study draws policy recommendations for promoting green bonds. Governments realize the importance of raising private finance in the green energy sector through the provision of policy support. The literature has not determined the extent to which these policies have a positive effect on the issuance of green bonds, to the best of the authors’ knowledge. Hence, this study attempts to fill this void in the literature.

The costs associated with green bond issuance can be significant; therefore, some economies provide subsidies, grants, and so on (Azhgaliyeva 2020). In particular, they tailor such policies to reduce the costs of external review, the costs of credit rating, credit costs, and other costs related to green bond issuance or provide a tax deduction for issuance costs (Azhgaliyeva and Liddle 2020). For instance, Singapore launched the Green Bond Grant Scheme in June 2017 (Azhgaliyeva, Kapoor, and Liu 2020). The scheme reimburses the external review expenses up to SGD0.1 million (USD0.075 million) for green bonds that companies issue in Singapore and list on the Singapore stock exchange with a minimum issue size of SGD200 million (USD150 million) and with a minimum tenure of 3 years. Japan’s Financial Support Programme for Green Bond Issuance provides a subsidy for expenses that companies incur in external reviews for an amount of up to JPY50 million (USD0.5 million). Malaysia introduced a grant for Sustainable and Responsible Investment Sukuk in July 2017 (Azhgaliyeva, Kapoor, and Liu 2020). The grant partially covers the costs of external reviews (90% of the costs of independent reviews up to a maximum of MYR300,000). The Pilot Bond Grant Scheme of Hong Kong, China also covers legal fees, arrangement fees, and so on, which it reimburses similarly to the costs of external reviews. We find that such policies play a significant role in the uptake of the green bond market.

We further investigate how the issuance of sovereign green bonds might affect the private sector’s issuance of green bonds. The green bond market, due to the limited supply of green bonds, lack of a credit risk profile, high transaction costs,¹ and adverse selection costs, has low liquidity (Lin, You, and Huang 2012; Febi et al. 2018). To increase the liquidity of the market, it is necessary to attract institutional investors to provide finance for green projects (Campiglio 2016), especially given that the share of institutional investors that have contributed to the total climate finance is 0.45%. International financial institutions can leverage private investment for projects in the renewable energy sector (Ng and Tao 2016). We test this proposition by including the issuance of sovereign green bonds in our regression model. We find that sovereign bond issuance does not have a significant effect on the private sector’s issuance of green bonds.

¹ The transaction costs range from \$10 to \$100,000 dollars, including the costs of green label certification and other documents related to verification and monitoring (Berensmann et al. 2016).

The paper is structured as follows. The second section describes the data that we use for the study. The third section discusses the methodology. The fourth section presents the key findings, and the fifth section concludes.

2. GREEN BOND MARKET OVERVIEW

2.1 Data

We use cross-economy data from 58 green bond-issuing economies, including 11 economies from Asia, over the period January 2010–June 2020 (Appendix A). We collect the data from several sources, including Bloomberg (2020), the International Energy Agency and International Renewable Energy Agency (IEA and IRENA 2017), and other sources (Table 1). We obtain data on policies supporting green bonds and promoting renewable energy from numerous sources. We structure the data across three levels: economy, sector, and period (months) (Figure 1). The sectors follow the classification of the Bloomberg Industry Classification System for Fixed Income (Table A1 in Appendix A).

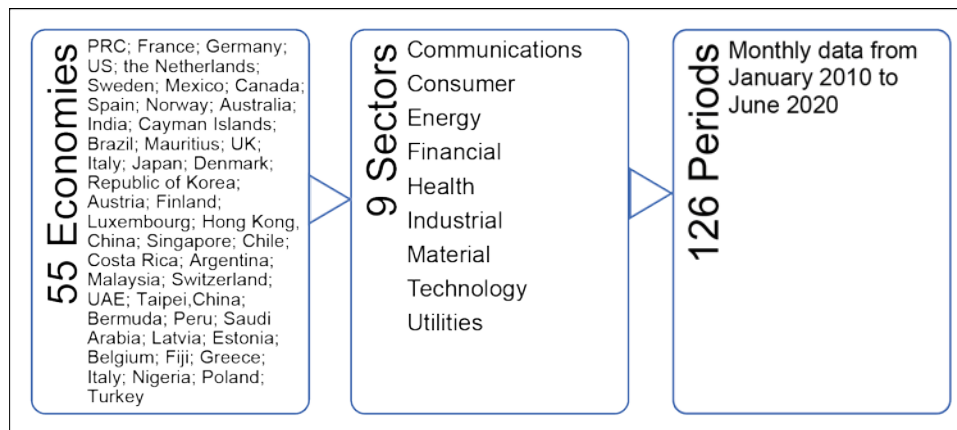
Table 1: Data Description and Sources

Variable	Description	Level	Source
<i>green_bonds</i>	The dollar value of green bond issuance over the dollar value of all bond issuance	Economy Month Industry	Bloomberg (2020)
<i>conventional_bonds</i>	The dollar value of all bond (excluding green) issuance over the dollar value of all bond issuance	Economy Month Industry	Bloomberg (2020)
<i>sovereign_bonds</i>	The dollar value of green bond issuance by sovereigns over the dollar value of all bond issuance	Economy Month Industry	Bloomberg (2020)
Green bond policies National: <i>Grants and taxes</i> <i>Guidelines</i> <i>Monetary</i> <i>Cooperation and policy</i> <i>signal</i>	A binary variable that equals one if a policy exists and zero if no policy exists	Economy Month	Climate Bond Initiative Green Bond Policy Data Set www.climatebonds.net/policy/data
Regional	The number of policies implemented equals zero if no policy exists	Economy Months	
<i>Global green bond policies</i>	The number of policies implemented equals zero if no policy exists	Month	

Source: Authors' own elaboration.

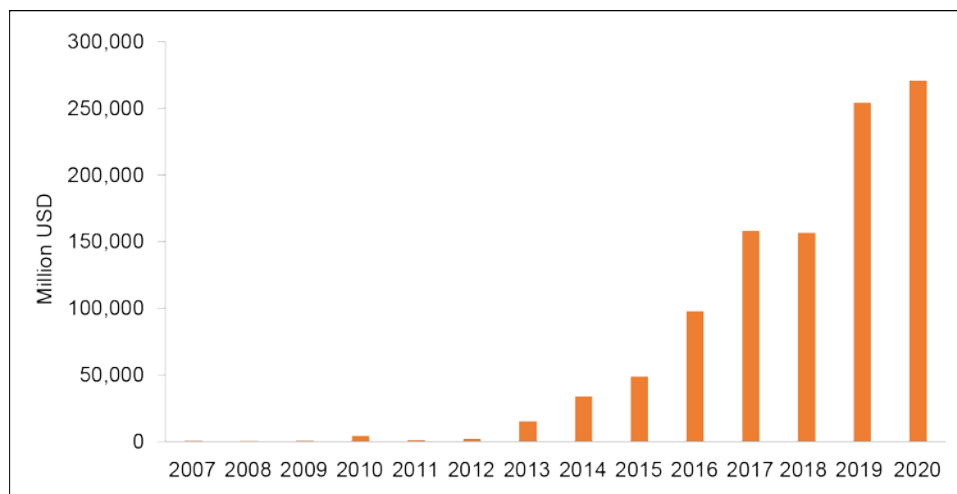
2.2 Overview of the Green Bond Market

The issuance of green bonds has been very rapid (Figure 2). The boom in the green bond market is especially remarkable from 2013, when bond issuance increased 45 times, mostly because France and Norway scaled up their green bond issuance significantly. In the following years, up to 2020, the issuance of green bonds continued to grow primarily due to the major bond-issuing economies' soaring green bond issuance and the growing number of new green-bond-issuing economies.

Figure 1: Multi-level Data Structure

PRC = People's Republic of China, UK = United Kingdom, US = United States, UAE = United Arab Emirates.

Source: Authors' own elaboration using data from Bloomberg (2020).

Figure 2: Global Green Bond Issuance over Time

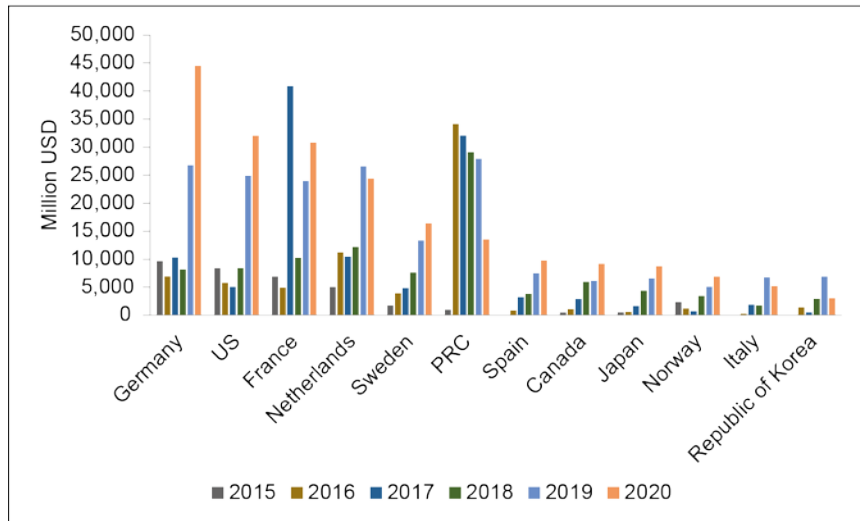
USD = United States dollar.

Source: Authors' own elaboration using data from Bloomberg (2020).

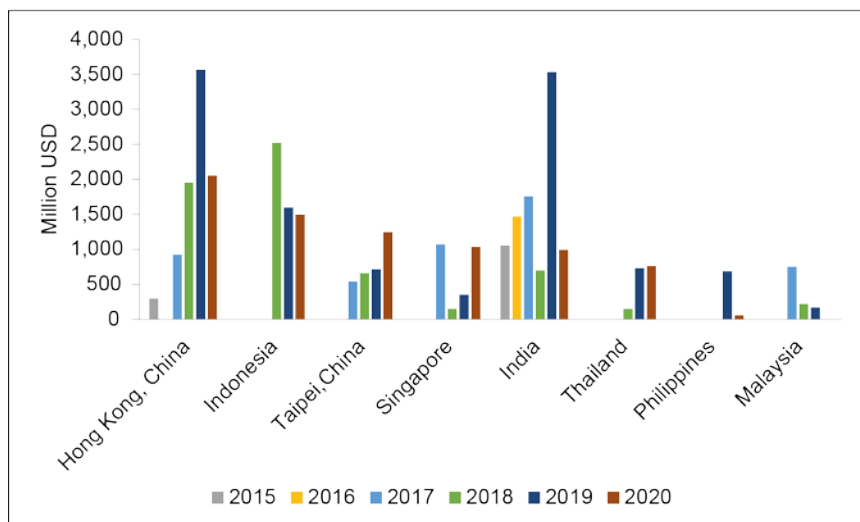
Figure 3 shows the major trends in the geographical representations of the global green bond market across the major green-bond-issuing economies (Figure 3a) and the rest of Asia (Figure 3b). The PRC, France, Germany, the Netherlands, and the US are the largest green-bond-issuing nations, followed mainly by the European economies and two Asian economies, specifically Japan and the Republic of Korea. In the rest of Asia, India; Indonesia; Hong Kong, China; Malaysia; and Singapore are the regional leaders. Given its vast territory and growing population, the Asian region has the potential to accelerate its green bond issuance.

Figure 3: Green Bond Issuance by Economies and by Years

(a) Green bond issuance by major green-bond-issuing economies and by years



(b) Green bond issuance in Asia and by years (excluding the PRC, Japan, and the Republic of Korea)

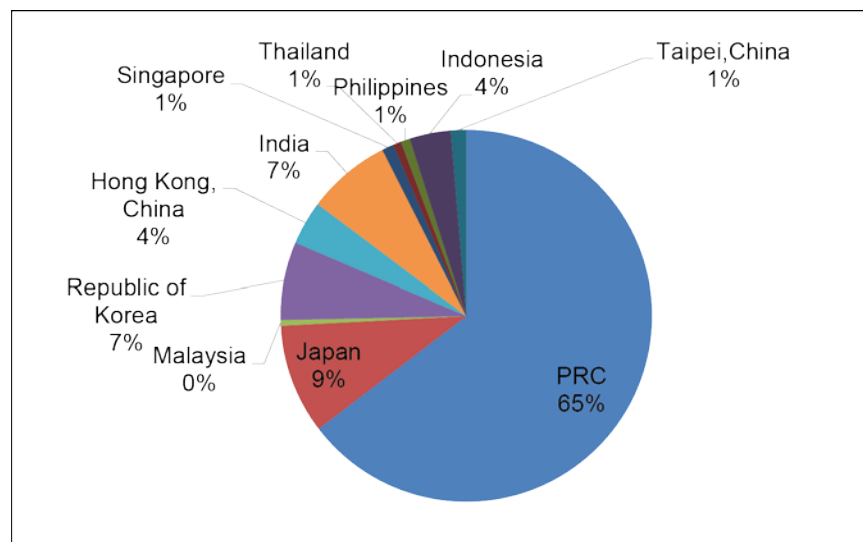


PRC = People's Republic of China, US = United States, USD = United States dollar.

Note: Sorted into descending order of the issuance of green bonds in 2020.

Source: Authors' own elaboration using data from Bloomberg (2020).

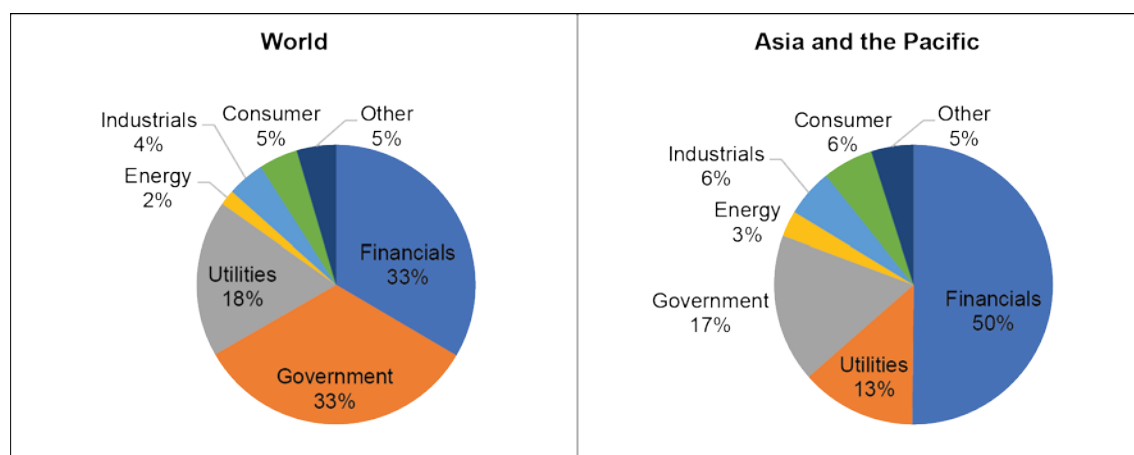
Figure 4 complements Figure 3, displaying the shares of green bond issuance across Asia. The leader of green bond issuance in Asia is the PRC, followed by Japan; the Republic of Korea; India; Indonesia; Hong Kong, China; and other economies.

Figure 4: Issuance of Green Bonds in Asia (2015–2020)

PRC = People's Republic of China.

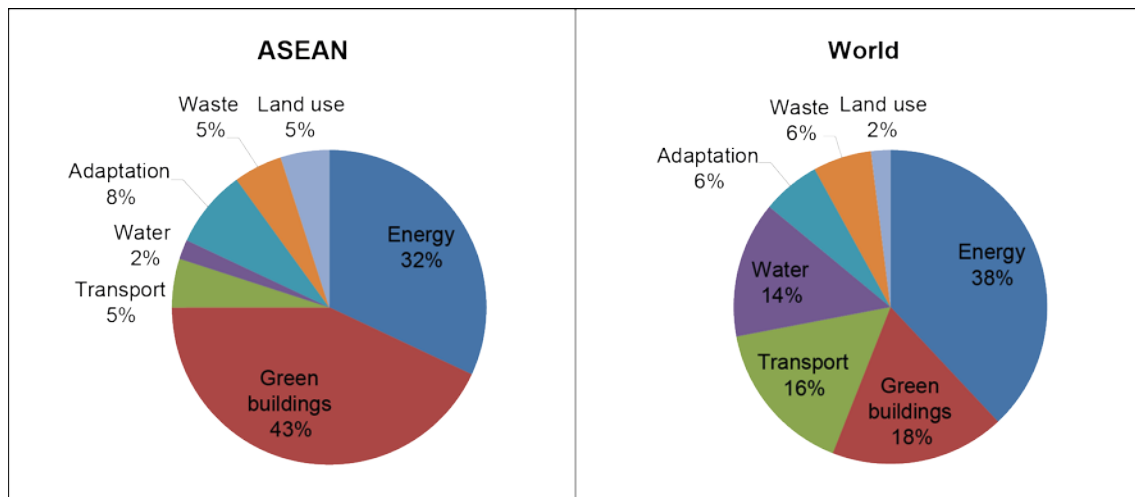
Source: Authors' own elaboration using data from Bloomberg (2020).

Figure 5 shows the sectoral distribution of green bond issuance globally and in the Asia and Pacific region. Globally, the major issuers are governments (33%), financial entities (33%), and utilities (18%). Surprisingly, the energy sector has issued only 2% of green bonds. This sectoral structure has not changed significantly over the years. In Asia and the Pacific, financial entities are the main issuers (50%), then governments (17%) and utilities (3%). Similarly, the share of the energy sector in the issuance of green bonds is relatively small (3%).

Figure 5: Issuance of Green Bonds by Industry (2018–2020)

Source: Authors' own elaboration using data from Bloomberg (2020).

Globally, green bond proceeds mainly support environmental projects in the energy sector (38%), then green buildings (18%), transport (16%), and water (14%) (Figure 6). In ASEAN, the use of green bonds' proceeds is less diversified, and economies allocate them mainly to projects involving green buildings (43%) and energy (32%) (Figure 6) (Kapoor et al. 2020).

Figure 6: Allocation of the Proceeds of Green Bonds

ASEAN = Association of Southeast Asian Nations.

Source: Authors' own elaboration using data from Filkova et al. (2018).

Table 2 provides summary statistics for the variables that the study uses. Though the expansion of the green bond market is remarkable, the share of green bonds issued remains small, specifically 1.45%. The amount of sovereign green bonds averages at \$0.03 billion compared with the \$1.20 billion average of conventional bonds. Of the national green bond policies, guidelines show the widest use (9%), followed by monetary incentives (5%) and grants and taxes (4%). Regional green bond policies include the ASEAN green bond standards and the European Commission's green bond policies. Regional green bond policies count the number of regional green bond policies applicable in the region where an economy is located (ASEAN or EU).

Table 2: Summary Statistics

Variable	Obs.	Mean	S.D.	Min.	Max.
Green bonds issued, share of all bonds (%)	21,013	1.45	10.88	0	100
Conventional bonds issued, billion US\$	58,706	1.20	10.50	0	461
Sovereign green bonds, billion US\$	58,706	0.03	0.42	0	27
Asia	58,706	0.18	0.38	0	1
National green bond policies					
Grants and taxes	58,706	0.04	0.21	0	1
Guidelines	58,706	0.09	0.28	0	1
Monetary	58,706	0.05	0.22	0	1
Cooperation and policy signal	58,706	0.08	0.28	0	1
Regional green bond policy	58,706	0.37	1.05	0	4
Global green bond policy	58,706	2.80	3.13	0	8

Source: Authors' own elaboration.

3. METHODOLOGY

3.1 Estimation Strategy

We select the estimation model according to the data properties. Our data consist of three levels, with 58 economies at the first level and eleven sectors at the second level, and vary across 126 months over the period January 2010–June 2020. Given that our data are longitudinal multilevel data, we apply a multilevel model (Laird and Fitzmaurice 2013) to account for cross-economy/-sector and longitudinal effects (Skrondal and Rabe-Hesketh 2008). To estimate the effects of the policies, we use a difference-in-difference specification:

$$\begin{aligned} \frac{GB^p}{B}_{ijt} = & \mu_j + \beta_1 NGB_{ijt} + \beta_2 GB_{it}^s + \beta_3 Asia_i + \gamma_k \sum_{k=1}^6 \gamma_k Policy_{it} \\ & + \delta_k \sum_{k=1}^6 Asia_i \times Policy_{it} + \theta \sum_{j=2}^9 J_j + \lambda \sum_{j=2}^{57} I_j + \varepsilon_{ijt} \end{aligned}$$

where $j = 1, \dots, 58$ indexes economies, $i = 1, \dots, 11$ indexes sectors, and $t = Jan2010, \dots, Jun2020$ indexes months.

3.2 Dependent Variable

The dependent variable, $\frac{GB^p}{B}_{ijt}$, is a share value of the private sector's issued green bonds (GB^p) of all bonds issued (B). Green bonds are bonds that have the label "green." Labeled green bonds are bonds that use their proceeds for green projects (Climate Bonds Initiative (CBI) 2016). We use Bloomberg's (2020) definition of green bonds, "instruments for which the proceeds are exclusively applied (either by specifying Use of Proceeds, Direct Project Exposure, or Securitization) towards new and existing Green Projects, defined as projects and activities that promote climate or other environmental sustainability purposes." This list includes four types of green bonds: the Green Use of Proceeds Bond, the Green Use of Proceeds Revenue Bond, the Green Project Bond, and the Green Securitized Bond.

3.3 Independent Variables

Our main focus is the interaction term, $Asia_i \times Policy_{it}$, where $Asia_i$ equals 1 if economy i is located in Asia (if economy i belongs to a treatment group) and 0 (if economy i belongs to the control group) otherwise. Appendix A provides a list of economies in Asia that we include in this paper. $Policy_{it}$ consists of six green bond policy variables, including four national green bond policies: (i) grants and taxes, (ii) guidelines, (iii) monetary policy, and (iv) coordination. National green bond policies are binary variables that equal 1 if an economy implemented respective green bond policies in year t and 0 otherwise. Regional green bond policies are a count variable that equals the number of regional green policies in force in a region where an economy is located in year t . Regional green bond policies include policies such as regional standardization, coordination, and cooperation. These regional green bond policies affect economies located in two regions: the EU and the ASEAN. Global green bond policies are a count variable that measures the number of policies implemented globally. Global green bond policies include internationally recognized standardization,

coordination, and cooperation. δ_k measures the effect of six green bond policies in Asia. J consists of a set of sector control variables, and I is a set of economy control variables.

We also include variables such as conventional bond issuance (excluding green bonds) and sovereign green bond issuance in the model. We measure the issuance of conventional bonds, *conventional bonds*, as a value of all bonds excluding green bonds that governments have issued per month across sectors and economies. We measure the issuance of sovereign green bonds, *sovereign bonds*, as the value of green bonds that governments have issued per month across economies. Sovereign green bonds are green bonds that central and regional governments have issued.

We test for the presence of (i) random intercepts versus fixed intercepts and (ii) random coefficients (or slopes) versus fixed coefficients (Rabe-Hesketh and Skrondal 2012). We test for the presence of random intercepts using the Hausman (1978) test. The Hausman test suggests that the random intercept model is preferable to the fixed intercept model as we cannot reject the null hypothesis that the models are systematically different ($\chi^2(4) = 0.64$ with prob. $> \chi^2 = 0.9588$).

We test for the presence of random coefficients using the likelihood-ratio (LR) test (Greene 2012). The LR test determines whether two models, the random intercept and the random intercept with random coefficient models, are systematically different (the null hypothesis). It suggests that the random intercept model is preferable to the random intercept and random coefficient model as we cannot reject the null hypothesis ($\chi^2(1) = -1.50$ with prob. $> \chi^2 = 1.00$).

4. EMPIRICAL RESULTS

Table 3 provides the empirical results from (1) random intercepts and random coefficients; (2) random intercepts; and (3) random intercept and random coefficients with unstructured covariance using a difference-in-difference approach. The results are consistent across all the models, pointing toward the robustness of the results.

As is apparent, the coefficient of *policy_granttax#1.asia* is positive and significant, which suggests that, if an economy in Asia introduces green bond grants and tax incentives, it increases the share of green bonds issued. In contrast, cooperation and policy signals do not have a significant impact on the issuance of green bonds. Overall, green bond grants and tax incentives have a positive and significant effect on the issuance of green bonds across all the sampled economies. In addition, global, regional, and national cooperation and policy signals have a positive and significant effect on the issuance of green bonds. Surprisingly, policy guidelines have a negative and significant effect on the issuance of green bonds.

The issuance of sovereign green bonds does not have a significant impact on the issuance of green bonds. However, conventional green bond issuance reduces the issuance of green bonds. That might be due to the competition between the issuance of green bonds and the issuance of conventional bonds; hence, the issuance of the latter might lead to a reduction of the issuance of the former.

The empirical evidence suggests that governments should consider green bond policies, that is, the provision of grants and tax incentives as well as cooperation and policy signals that reduce the cost of green bond issuance, policies that boost the supply of bonds at the regional and global levels, to incentivize green bond issuance in the private sector. Further development of green bond policies is necessary to promote green bond issuance.

Table 3: Results

Variables	RIRC	RI	RIRC UC
Conventional bonds, bln \$	−0.05*** (0.01)	−0.05*** (0.01)	−0.05*** (0.01)
Sovereign green bonds, bln \$	0.12 (0.13)	0.11 (0.13)	0.12 (0.13)
Asia (1 if Asia)	−3.52 (3.04)	−3.57* (2.06)	−3.52 (3.04)
policy_granttax#1.asia	5.33*** (1.62)	3.71*** (1.44)	5.33*** (1.62)
policy_guidelines#1.asia	−0.46 (0.77)	−0.54 (0.75)	−0.46 (0.77)
policy_monetary#1.asia	−1.54 (1.26)	−1.69 (1.24)	−1.54 (1.26)
policy_cooperation#1.asia	1.05 (0.75)	1.11 (0.75)	1.05 (0.75)
asia#c.policy_regional	−2.36*** (0.67)	−2.33*** (0.66)	−2.36*** (0.67)
asia#c.policy_global	−0.04 (0.08)	−0.04 (0.07)	−0.04 (0.08)
policy_granttax	7.15*** (1.49)	5.55*** (1.30)	7.15*** (1.49)
policy_guidelines	−0.86* (0.45)	−0.87** (0.44)	−0.86* (0.45)
policy_monetary	−0.75 (0.80)	−0.82 (0.77)	−0.75 (0.80)
policy_cooperation	0.78* (0.41)	0.82** (0.41)	0.78* (0.41)
policy_regional	0.96*** (0.11)	0.96*** (0.11)	0.96*** (0.11)
policy_global	0.42*** (0.04)	0.42*** (0.04)	0.42*** (0.04)
Economy control	Yes		Yes
Sector controls			
Consumer	0.08 (0.97)		0.08 (0.97)
Energy	3.14*** (1.00)		3.14*** (1.00)
Financial	0.61 (0.94)		0.61 (0.94)
Health	−0.32 (1.07)		−0.32 (1.07)
Industrial	1.80* (0.98)		1.80* (0.98)
Materials	0.25 (1.00)		0.25 (1.00)
Technology	−0.72 (1.10)		−0.72 (1.10)
Utilities	6.64*** (0.98)		6.64*** (0.98)
Constant	−2.67 (1.71)	0.82* (0.44)	−2.67 (1.71)
Observations	21,013	21,013	21,013
Number of groups	55	55	55

Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. RI – random intercept; RC – random coefficient; UC – unstructured covariance. The dependent variable is the share of green bond issuance in the total bond issuance.

Sectors that are less experienced in issuing generic bonds need more support in issuing green bonds than sectors that are more experienced in issuing generic bonds. This is because the empirical results suggest that sectors that have more experience in issuing generic bonds are more likely to issue green bonds. For example, the renewable energy sector is less experienced in issuing generic bonds in many, but not all, economies and has a smaller share of green bond issuance. Thus, in many economies, the renewable energy sector requires more support in issuing green bonds than more experienced sectors, such as banks.

5. CONCLUSION AND POLICY RECOMMENDATIONS

The green bond market is surging; however, its share in the total bond market remains small. This study sheds light on the determinants of the issuance of green bonds and uncovers the extent to which the policies that economies have launched have been effective. Some governments promote green bonds using green bond policies. Recently, green bond policies, such as national green bond guidelines/standards and green bond grant schemes, have become popular. The impact of these policies has not been studied empirically across economies, and our study sheds light on this issue.

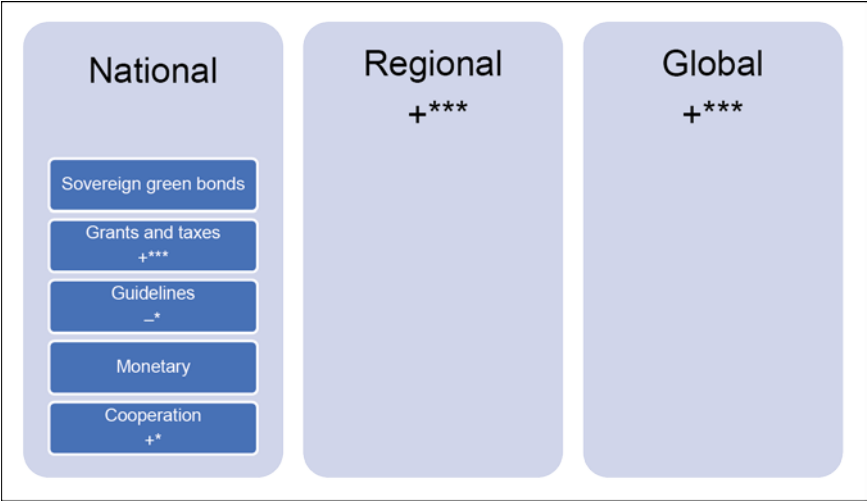
For our study, we used monthly multilevel data on green bond issuance from 58 economies over the period January 2010–May 2020 and applied multilevel models with a difference-in-difference specification to estimate the impact of green bond policies on green bond issuance in the private sector. Knowing that some sectors are less experienced in issuing generic bonds and issue fewer green bonds, governments can offer greater green bond policy support to sectors that are less experienced in bond issuance and thus have higher costs and risks. Such sectors include renewable energy generators and industries. Governments can incentivize the issuance of green bonds using green bond grants and tax incentives; cooperation; and regional and global policies. Figure 7 illustrates the impacts of national, regional, and global policies on the private issuance of green bonds, based on the results from Table 3.

Some national green bond policies, such as green bond grants and tax incentives, have a positive and significant effect on green bond issuance in the private sector. This shows the importance of government support and the need for policies that reduce the costs and risks of green bond issuance, especially for first-time issuers and specific sectors.

The study found that regional cooperation and standardization of green bonds in the EU were effective in promoting green bonds in the private sector. However, such regional policies in Asia, that is, the ASEAN Green Bond Standards, did not show effectiveness in promoting private green bonds.

Global cooperation and internationally recognized standardization of green bonds are also effective in promoting private green bonds. However, such global policies are less effective in promoting private green bonds than regional policies and did not demonstrate effectiveness in Asia.

Figure 7: Summary of the Impact of National, Regional, and Global Green Bond Policies on Private Green Bond Issuance



Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

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APPENDIX A

List of 58 green-bond-issuing economies: Argentina; Australia; Austria; Belgium; Bermuda; Brazil; Canada; Cayman Islands; Chile; Colombia; Costa Rica; Denmark; Estonia; Fiji; Finland; France; Germany; Greece; Hong Kong, China; Hungary; India; Indonesia; Ireland; Italy; Japan; Jersey; Kenya; Korea (the Republic of); Latvia; Lithuania; Luxembourg; Malaysia; Marshall Islands; Mauritius; Mexico; Namibia; Netherlands; New Zealand; Nigeria; Norway; People's Republic of China; Peru; Philippines; Poland; Portugal; Singapore; Slovenia; South Africa; Spain; Sweden; Switzerland; Taipei, China; Thailand; Turkey; United Arab Emirates; United Kingdom of Great Britain and Northern Ireland; United States; and Virgin Islands (British).

List of 11 green-bond-issuing economies in Asia: Hong Kong, China; India; Indonesia; Japan; Korea (the Republic of); Malaysia; People's Republic of China; Philippines; Singapore; Taipei, China; and Thailand.

Table A1: Sectors and Subsectors

Sector	Subsector
Communications	Advertising and Marketing; Cable and Satellite; Entertainment Content; Internet Media; Publishing and Broadcasting; and Wireless Telecommunications Service and Wireline Telecommunications Service.
Consumer Discretionary	Airlines; Apparel and Textile Products; Auto Parts Manufacturing; Automobile Manufacturing; Casinos and Gaming; Consumer Services; Department Stores; Distributors—Consumer Discretionary; Educational Services; Entertainment Resources; Home and Office Product Manufacturing; Home Improvement; Homebuilders; Leisure Product Manufacturing; Restaurants; Retail—Consumer Discretionary; and Travel and Lodging.
Consumer Staples	Consumer Products; Food and Beverages; Mass Merchants; Retail—Consumer Staples; Supermarkets and Pharmacies; and Tobacco.
Energy	Coal Operations, Exploration, and Production; Integrated Oils; Oil and Gas Services and Equipment; Pipelines; Refining and Marketing; and Renewable Energy.
Financials	Banks; Commercial Finance; Diversified Banks; Financial Services; Funds and Trusts; Life Insurance; Property and Casualty Insurance; and Real Estate.
Healthcare	Biotechnology; Health Care Facilities and Services; Managed Care; Medical Equipment and Devices; Management; and Pharmaceuticals.
Industrials	Aerospace and Defence; Electrical Equipment Manufacturing; Manufactured Goods; Railroads; Transportation and Logistics; Waste and Environment; and Services and Equipment.
Materials	Chemicals; Construction Material Manufacturing; Containers and Packaging; Forest and Paper Product Manufacturing; and Metals and Mining.
Technology	Communication Equipment, Design, Manufacturing, and Distribution; Hardware; Semiconductors; and Software and Services.
Utilities	Power Generation; and Utilities.
Government	Sovereigns; Government Agencies; Government Regional; Supranationals; Government Development Banks; Winding Up Agencies; Central Banks; and Government Local.

Source: Authors' own elaboration using Bloomberg (2020).