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Green bond and economic development: Evidence from Asian and European Countries

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Abstract

This study aims to determine the influence of green bonds on economies in Asian and European countries in 2018-2021. Samples in this study, as many as 37 countries in Asian and European, were determined using the purposive sampling method. This study uses data from various sources such as the World Bank, International Monetary Fund, and United Nations Development Programme. This study is a quantitative study whose analysis uses a regression data panel to test the hypothesis of the use of green bonds on the economies of countries in Asian and European in 2018-2021 using Stata. The results showed that the green bond has a positive and significant impact on the economies of countries in Asian and European as measured by Gross Domestic Product. A country's level of well-being can be compared to the dynamic economic impact of an increase that drives growth in Gross Domestic Product. This study implies that the development of green bonds in Asian and European countries can be allocated to implement projects related to the environment and can help countries transform resources to improve the country's economy. Therefore, it is expected that countries in the Asian and European continents are making progress to develop green bonds further to increase the country's Gross Domestic Product.

Keywords: Green bond; gross domestic product; economy; Asian; European

1. Introduction

The global situation is now an increasing number of demands because of exploitation that destroys nature. This makes humans aware of the significance of making a sustainable environment. The emergence of green bonds which might be synergistic with environmental, social, and governance (ESG) is an answer for society a good way to put money into sustainable environmentally primarily based projects. The rising trend of green bonds additionally inspires groups to exchange environmentally pleasant approaches to operating (Pereira *et al.*, 2022). According to International Finance Corporation (IFC) facts as of June 30, 2021, the whole green bond issued reached $10,553 billion with 178 bonds unfolding throughout 20 currencies inside the world (IFC, 2021). This improvement is genuinely very fast thinking about green bonds that have been delivered in much less than decades. Gianfrate and Peri (2019) observed that green bonds are greater suited in comparison to different bonds in monetary terms. This is supported by the aid of studies with the aid of using Argandoña *et al.* (2022) who analyzed that green bonds had an effective effect on the economies of nations inside the Latin America and Caribbean (LAC) region. On the other hand, global climate change and the need to reduce carbon emissions have pushed many countries to switch to clean and environmentally friendly energy. One way is to fund green projects through green bonds.

Corporate environmentally pleasant bonds (green bonds) are bonds whose finances are used to finance environmental and weather-pleasant projects, including renewable energy, environmentally pleasant buildings, or aid conservation (Flammer, 2021). In the ASEAN context, green bonds have

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become an increasingly popular instrument in supporting economic growth in Asian and European and maintaining environmental sustainability.

In general, Asia's per capita income is still behind the United States and Europe, but in terms of growth, the region is still ahead of the global economy, with more than 60% of the world's economic growth, and expect another to grow 5.6 years of expectation percent in 2018 and 5.4 percent in 2019 (International Monetary Fund, 2018). However, there are signs that the global economic recovery has been weakening in recent years and risks to the Asian and global outlook are receding, reflecting rising financial markets, rising trade tensions, and China's sluggish growth (International Monetary Fund, 2018).

In addition to these short and medium-term risks, Asia faces significant challenges to its long-term prospects. One of them is related to marketing. While it's hard to predict how the situation will play out, policymakers are looking ahead to what could be a long-term trade slump. According to the International Monetary Fund (2019), global growth will be severely affected if interest rates rise and countries move towards economic independence, as Asia has based its growth model on trade due to weak medium-term prospects for developing countries.

There are many previous studies that the authors can use as a research area in this study, namely that green bonds have a positive and significant effect on economic growth in Latin America and the Caribbean measured as % of GDP (Argandoña *et al.*, 2022). A study by Lebelle *et al.* (2020) found that green bond issuance in developed countries has a negative impact on the green bond market. Currently, in European countries, green bonds are better than traditional bonds (Gianfrate and Peri, 2019). Green bonds are being developed in Asia to support investments in environmental, social, governance, and sustainable development (Azhgaliyeva *et al.*, 2020). Asian green bonds offer higher yields (Taghizadeh-Hesary *et al.*, 2021). In addition, issuing green bonds can bring many benefits to China's green bond market (Wang *et al.*, 2020).

From the explanation of the research gap above, this research can directly contribute to sustainable development. Even though green bonds are still focused on climate change issues, the contribution of green bonds to sustainable development can be seen from the contribution of green bonds in funding government green projects. Research on this topic needs to be researched and can even be developed because the author, while compiling from scratch and collecting journals and other supporting data, did not find relevant and similar research, especially on a scale on the Asian and European continents. Further research could help understand the market potential and economic benefits of green bonds in Asian and European. In addition, further research can help identify the potential and benefits of green bonds in supporting sustainable development in Asian and European.

From the background explanation above, the researcher hopes that this research can provide insights that can benefit the development of the green bond market in Indonesia by comprehensively analyzing the influence of green bonds on the economies in Asian and European and using valid and actual data. In addition, it is hoped that this research can also provide a better understanding of the influence of green bonds on Asian and European economies, as well as provide insight to policymakers and financial practitioners regarding the importance of sustainable financing in achieving inclusive and environmentally friendly economic growth. Therefore, researchers are interested in researching "Green Bond and Economic Development: Evidence from Asian and European Countries".

2. Literature review and hypothesis development

A green bond is a bond instrument whose exclusive use of funds is intended to fund a portion or the entirety of new or existing sustainable green projects (Pereira et al., 2022). Green bonds have a set of recommended guidelines to guide the issuance of bonds aimed at financing environmental and social-related projects. The green bond principle aims to promote transparency and integrity in the issuance of bonds aimed at financing environmental and social-related projects. This principle also helps ensure that funds are obtained from the issuance of green bonds used for their intended purpose and have a positive environmental and social impact (International Capital Market Association, 2022).

Bonds are one of the securities listed on the stock exchange apart from other securities such as shares, sukuk, asset-backed securities, and real estate investment funds. Bonds can be grouped as debt securities alongside sukuk. Bonds can be described as transferable medium to long-term debt securities that contain a promise from the issuing party to pay compensation in the form of interest within a certain

period and pay off the principal debt at a predetermined time to the party purchasing the bond (IDX, 2021). Bonds can be issued by corporations or countries.

One example of implementing green bonds is the existence of Government Debt Securities (SUN) issued by the government. SUN is used by the government to finance government budget needs, such as to cover the State Revenue and Expenditure Budget (*Anggaran Pendapatan dan Belanja Negara-APBN*) deficit. From the government's perspective, SUN is useful for seeking funds to finance the APBN. Meanwhile, from the buyer's or investor's perspective, SUN is a financial product that offers profits and is relatively free of risk of default because it is guaranteed by the SUN Law, with interest or coupon payments and the potential for price increases (capital gains). In layman's language, this SUN is proof that the government owes investors a debt within a certain period. The government guarantees interest and principal payments on SUN according to the validity period (Bareksa, 2018).

Green bond is an answer to the challenge of financing renewable energy in developing countries in Asia (Ng & Tao, 2016). On the other hand, DuPont et al. (2015), states that to prove whether green bonds have a significant influence on land conservation financing, it is necessary to prove that green bonds are successful by creating market momentum. The existence of the ASEAN green bond fund expands investment opportunities for central banks in Asia and outside the region by placing securities with investment grade criteria and meeting international green standards. The funding focus is aimed at supporting environmentally friendly projects in various sectors, for example, renewable energy and energy efficiency in the Asian and Pacific region. According to the Macroprudential Policy Department of Bank Indonesia (2021), the presence of this instrument will add alternative green financial instruments in managing foreign exchange reserves.

Overall, green bonds are still considered a potential financial instrument to support sustainable development in Asian and European countries. However, efforts are needed to increase understanding and knowledge about green bonds and strengthen green standards and certifications that apply in Asian and European. In a country's economy, there is an indicator that is used to assess whether the economy is going well or bad (Santoso, 2011). Indicator In assessing the economy it must be used to find out the total income earned by everyone in the economy. An indicator that can be used and suitable for carrying out these measurements is Gross Domestic Product (GDP).

The Human Development Index (HDI) is a statistical tool used to measure the overall achievements of a country in its social and economic dimensions. The United Nations Development Program (UNDP) uses a composite index to measure the process of human development which is generally represented by life expectancy at birth, literacy rate of the population at adulthood, and average years of schooling, in addition to indicators that measure the level of social welfare as well as the level of poverty in a country with purchasing power figures.

HDI standards are used to measure and determine whether a country can be identified as a developed country, developing country, or underdeveloped country. This standard can also be used to measure the impact of economic policies in each country on improving the quality of life for all members of society. In the Human Development Report (2008) it is explained that the Human Development Index is a measurement construction based on the concept of a rights-based approach to human development. HDI measures the average achievements of each country regarding three basic dimensions of human quality development. Regardless of whether there are views that support or criticize the use of HDI figures, in practice to date, HDI has become an indicator for measuring the success of development in addition to GDP, economic growth, poverty rates, and per capita income.

According to Hady (2009), Foreign Direct Investment (FDI) is an investment in the form of foreign investors directly participating in a company to establish a company, build a factory, buy jewelry, land, real estate, and property management and control of capital investments. Foreign direct investment begins with the formation of a group or the purchase of a majority of shares in a company. In the global context, this type of investment is usually managed by many companies working in the manufacturing, processing industry, and processing extraction sectors, extraction of natural resources, service industries, etc. Foreign Direct Investment refers to the direct supervision of assets invested in capital-importing countries by companies in the investing country. Foreign Direct Investment takes many forms. That is, setting up a branch of the company in the capital importing country. Establish a company in an importing country only with income from a company in the country of manufacture, establish a corporation in the country of manufacture to conduct business in another country or have assets (stability of assets) in the other country by the government, a company in the country of

production, position (Jhingan, 2010). Asiamah *et al.* (2019) GDP, energy production, and telecommunications use have positive effects on FDI inflows. Finally, a study by Kumari and Sharma, (2017) found that market size, trade openness, interest rates, and human capital are predictors of FDI inflows. Asiamah *et al.* (2019) found more positive evidence that inflation, exchange rates, and interest rates are negatively related to FDI inflows. Singhania and Gupta (2011) also found that scientific research has a negative effect on FDI flows into a country.

International trade is the buying and selling of goods and services across national boundaries (Rifai & Tarumun, 2005). According to the Regional and Bilateral Policy Center of the Ministry of Finance of the Republic of Indonesia, trade in Asian and European countries involves several free trade agreements (FTA) and Economic Partnership Agreements (EPA). The FTA aims to eliminate tariffs and address non-tariff barriers in trade in goods, maintain market access ensure conducive conditions for providers of service products to develop in services trade, and protect and encourage investment in Indonesia in terms of investment. The WTO is an enterprise that regulates change troubles among nations and objectives to inspire orderly and truthful unfastened change inside the international. The WTO additionally collaborates with worldwide establishments on topics of change, overseeing change guidelines of member nations and offering technical help to growing nations, in addition to facilitating the decision of change disputes among member nations. Free Change Agreements (FTA) can offer advantages for European nations, along with growing marketplace access, growing the competitiveness of merchandise from European nations in worldwide markets, growing investment, growing efficiency, and growing worldwide cooperation. Export and import sports are a shape of establishing the economic system. The United States has an open economic system is a rustic that actively trades among nations through exports and imports and participates in the international capital marketplace (Mankiw *et al.*, 2008).

Several previous studies have discussed the influence of trade openness and other economic variables on economic growth. The results show that the effect of trade openness on economic growth is still uncertain. One of them is research by Vehapi et al. (2015) in South East Europe using the variables GDP per capita, trade openness, labor, education, GFCF, and FDI. The results show that trade openness will be more affect economic growth in countries that have high GDP per capita, GFCF, and FDI. In line with this research, Makun (2017) researched using the variables GDP, trade openness, human capital, and the interaction of trade openness and human capital. The result is that there is a positive and significant influence between trade openness, human capital, and the interaction variable between human capital and trade openness and economic growth. In contrast to the results above, Musila and Yiheyis (2015) examined the growth of open trade in Kenya using the variables real GDP per capita, capital stock per capita, secondary school enrollment, inflation, government score, trade openness, the interaction between capital stock and trade openness and free trade as a dummy variable. The results show that changes in the level of trade openness resulting from government policy have a negative effect on economic growth. Trade openness has a positive effect on investment levels but the coefficient is not large enough to affect economic growth.

So it can be concluded that trade between countries and GDP have a close relationship in a country's economy. The level of trade openness, international trade growth, investment, and trade patterns can influence a country's GDP growth. Therefore, a country needs to pay attention to these factors to increase economic growth and social welfare. The higher the growth of international trade, the greater its contribution to GDP growth. There is a positive relationship between Trade openness (level of trade openness) and GDP. The higher the level of trade openness of a country, the greater its contribution to GDP.

Population is a generalization area consisting of objects or subjects that have certain qualities and characteristics determined by researchers to be studied and then draw conclusions (Sugiyono, 2018). According to data obtained via databoks, as of November 2022, the world population reached a total of 8 billion people. This shows that the economic potential in Asia is very large (International Monetary Fund, 2018). According to data from trading economics, Europe is the second smallest continent in the world and has a population of around 750 million people. European countries also have very diverse populations, from countries with the largest populations such as Russia and Germany to small countries such as San Marino and Andorra. These two continents differ in terms of size and population, but both have an important role in trade and global economic relations. The European Union

and Asian countries have significant trade relations, with Asia accounting for around 35% of EU exports and 45% of EU imports.

In general, inflation can be defined as a continuous increase in the prices of goods and services over a specific period. When it comes to inflation, experts have many explanations. Low and stable inflation is a requirement for sustainable economic growth that benefits the population and improves the quality of life. The importance of inflation control takes into account the negative impact of high and unsustainable inflation on the socio-economic conditions of society. First, high inflation will keep people and their income low, people and their standard of living will go down, and eventually, everyone will be poor, especially the poor. Second, unstable inflation creates uncertainty when consumers make economic decisions. Empirical experience shows that unsustainable inflation distorts people's decisions about consumption, investment, and production, ultimately reducing economic growth. Third, high domestic inflation compared to neighboring countries may make domestic interest rates less competitive, depressing the value of the rupee. Fourth, price stability is important to support efforts to maintain the stability of the financial system (Bank Indonesia, 2021)

From the explanation above, it can be concluded that inflation is a situation where there is excess demand for goods in the economy as a whole. Excess demand for these goods can be interpreted as an excess level of spending on final commodities compared to the maximum level of output that can be achieved in the long term with certain production sources.

Hypothesis development

A green bond is a new financial instrument whose aim is to collect funds for use in protecting the environment and mitigating climate change in a country (Nguyen et al., 2023). Green bonds are part of the financial system in the capital market. Meanwhile, the capital market can support the implementation of national development to increase equitable growth and stability of the national economy (Hadi et al., 2022). Funds obtained from green bonds can be allocated to carry out projects that contribute to environmental sustainability, for example, renewable energy, energy efficiency, waste management, or pollution (Azhgaliyeva et al., 2020). Investment in the project can create jobs and encourage the growth of related economic sectors. So that it can increase the income and economic growth of the country.

Now green bond has developed in Asian countries to build investment channels to support environmental, social, governance, and sustainable development investments (Azhgaliyeva et al., 2020). According to the research results of Taghizadeh et al. (2021), green bonds in Asia tend to provide higher returns even though they have high risks. This is supported by research by Wang et al. (2020) who stated that the issuance of green bonds could provide many benefits for the green bond market in China.

Meanwhile, based on research by Argandoña et al. (2022), green bonds can positively and significantly influence economic growth in Latin American and Caribbean countries as measured by the percentage of the country's GDP. However, on the contrary, Lebelle et al. (2020) stated that the issuance of green bonds in developed countries has a more negative impact on the green bond market. Meanwhile, in European countries, green bonds are more financially profitable than conventional bonds by analyzing 121 types of environmentally friendly bonds in the region (Gianfrate and Peri, 2019).

Green bond issuance can encourage financial sector growth. Banks as financial institutions that issue and trade green bonds can experience an increase in their business activities. That way, a country can increase green bond issuance, and sustainable development, create jobs in the financial sector, and have the potential to improve the country's economy (Banga, 2019).

On the other hand, green bonds can also attract more investors who are interested in sustainable investment. Sangiorgi and Schopohl (2021) found that the majority of investors actively invest in the green bond market through various investment channels. Investors usually tend to choose green bonds issued by a company or country, however, investor demand for green bonds has not been fully met, especially from non-financial companies.

Based on this discussion, countries that are active in issuing green bonds can build a more positive image regarding environmental sustainability. This can increase attractiveness for investors, encourage the inflow of foreign capital, and increase the country's economic growth. However, the effect of green bonds on Gross Domestic Product (GDP) depends on the effectiveness of implementing green or sustainable projects supported by green bonds as well as policies that support the development

of green investment. From this explanation, the hypotheses that can be put forward in this research are ”Green Bonds have a positive and significant effect on the economies of countries in Asia and European”.

3. Method

Panel regression test

The panel regression test aims to find out the relationship between the variables studied, namely the dependent variable of the economy of countries on the Asian and European continents with the independent variable green bond and the control variables Trade, HDI, FDI, population, and inflation. Regression tests are used to test the pattern of influence of independent variables on the research dependent variable. The goal is to combine time series data and cross-section data by estimating error terms that are related to individual and time dimensions. The regression test model in this research is:

$$\text{Economy } (GDP_{it}) = a + \beta_1 GreenBond_{it} + \beta_2 Trade_{it} + \beta_3 HDI_{it} + \beta_4 FDI_{it} + \beta_5 Population_{it} + \beta_6 Inflation_{it} + \varepsilon \ldots(1)$$

Information:

Y	= GDP
$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$	= regression coefficients
ε	= error (influence of other factors)
$_i$	= country
$_t$	= time

Hypothesis testing

The Hausman test is needed to find and determine the optimal path between fixed effects and random effects. The Hausman test is defined as a test to choose the best model between a fixed effects model and a random effects model. The Hausman test is a test used to determine the mean between fixed effects and random effects. In the floor data reduction. The Hausman test aims to determine the most appropriate model between random effects and fixed methods used in group data sampling (Meiryani, 2021).

4. Results and discussion

Data analysis

This research uses secondary data. Green Bond data was obtained from the International Monetary Fund website, namely climatedata.imf.org from 2018-2021. Meanwhile, data on GDP, Trade, FDI, population, and inflation were obtained from the World Bank and HDI data was sourced from the United Nations Development Program from 2018-2021. In collecting this data, a sample of 37 countries was obtained. Sampling was carried out using the purposive sampling method namely the technique of determining samples with certain considerations or indicators determined by the author so that the data obtained is the final data that will be used as research data processing material (Sugiyono, 2018).

Table 1. Number of research observation sample countries

Year	Number of Countries		
	Asian	European	Total
2018	12	25	37
2019	12	25	37
2020	12	25	37
2021	12	25	37

Table 1. shows the number of country data on the Asian and European continents that will be used as observation data. The total data used is 37 countries that have reports on green bonds, GDP, trade, HDI, FDI, population, and inflation from 2018-2021. So, 148 data were obtained. This amount of data was used in the research observations described previously.

Descriptive statistics

Descriptive statistical tests are used to find out how the data is distributed in a study, namely each variable seen from the mean, standard deviation value, minimum value, and maximum value of the data.

Table 2. The distribution of data

No	Country Names	Mean						
		GDP	GB	Trade	HDI	FDI	Log population	Inflation
1	Austria	453.8583	1.779	106.814	0.91625	-2.2975	16.00136	1.9195
2	Belgium	549.6818	4.0905	165.1107	0.9335	-3.05975	16.25888	1.66775
3	Canada	1779.528	9.653	64.0605	0.93425	2.5885	17.44576	2.08225
4	China	15201.07	0.9415	36.378	0.76225	1.66475	21.06578	2.0935
5	Denmark	364.2165	5.92925	108.223	0.94575	1.2505	15.5775	0.9615
6	Filipina	369.8755	0.32725	65.665	0.70925	2.524	18.52718	3.50525
7	Finland	278.1578	2.41775	77.07725	0.93825	2.2795	15.52514	1.1485
8	France	2778.684	34.132	61.57075	0.90175	2.07125	18.02714	1.26925
9	Germany	4003.556	36.281	86.33675	0.94475	3.122	18.23542	1.5975
10	Greece	205.304	0.54875	80.7915	0.887	2.23425	16.18562	0.21375
11	Hong Kong	359.6678	8.114	370.9565	0.9505	28.53025	15.82554	1.77725
12	Hungary	165.8935	0.7415	159.924	0.84925	35.73	16.09295	3.65675
13	Iceland	24.50775	0.412	79.073	0.95875	-2.0695	12.80214	3.24725
14	India	2840.11	2.4105	41.7485	0.64125	1.793	21.05181	4.85575
15	Indonesia	1103.107	2.0265	38.468	0.71	1.9115	19.41598	2.4275
16	Ireland	428.8262	4.9645	236.6343	0.94175	7.5055	15.41584	0.8625
17	Italy	2028.965	9.5175	59.64125	0.8935	0.84875	17.90439	0.871
18	Japan	5053.301	8.81425	35.03375	0.92375	0.804	18.65453	0.3
19	South Korea	1708.109	10.26575	76.068	0.92225	0.76	17.7616	1.2235
20	Lithuania	57.956	0.112	147.8678	0.8795	5.27	14.84436	2.72925
21	Luxemborg	75.0905	4.46475	373.4007	0.92575	27.319	13.3447	1.6545
22	Malaysia	358.7307	0.2665	125.2078	0.8065	2.75275	17.31176	0.72175
23	Mauritius	13.01275	2.3655	94.62375	0.8085	2.5945	14.05136	2.558
24	Netherlands	936.8345	24.563	154.1042	0.8085	-18.937	16.67126	2.07125
25	Norway	426.6145	7.02875	69.19975	0.96075	1.12075	15.49481	2.426
26	Poland	615.9385	1.17575	104.7272	0.8775	3.71875	17.45037	3.11725
27	Portugal	241.3592	1.5005	83.83775	0.864	3.093	16.14747	0.6465
28	Russian Federation	1668.37	0.732	49.33375	0.8345	1.314	18.78603	4.356
29	Singapore	381.474	2.48	328.2535	0.94025	26.17125	15.54176	0.78175
30	Spain	1380.273	10.8415	65.7435	0.90325	2.98125	17.66944	1.28625
31	Sweden	568.3113	12.51675	87.972	0.9445	3.636	16.14818	1.5995
32	Switzerland	746.5807	1.64	125.3935	0.95975	-17.5968	15.96815	0.28875
33	Thailand	514.1295	0.5625	111.3938	0.80025	1.40875	18.0835	0.53875
34	Turkiye	769.1905	0.521	64.2585	0.838	1.388	18.24391	15.846
35	UAE	402.3835	0.1865	163.0778	0.913	4.3445	16.04021	2.54675
36	UK	2892.586	17.93425	61.28025	0.92925	1.2275	18.01797	1.8845
37	Vietnam	339.3062	0.05	169.7705	0.70325	4.6635	18.38191	2.848

Table 3. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
GDP	148	1407.691	2592.971	11.401	17759.31
GB	148	6.278588	11.25475	0	74.386
Trade	148	117.0006	84.78379	31.368	402.509
HDI	148	0.8746216	0.0827806	0.633	0.962
FDI	148	3.90975	18.01614	-40.086	138.215
Population	148	116818384.42	312194708.59	352721	1412360000
Inflation	148	2.258946	2.722691	-1.248	19.596
Logpopulation	148	16.91815	1.812848	12.77343	21.06853

The table shows that the dependent variable, namely the Asian and European economies, which is proxied by GDP, shows an average of 1407.691, with a standard deviation of 2592.971. The GDP variable also has a minimum value of 11.401 and a maximum value of 17759.31. Green bond (GB) is the independent variable. Based on this table, green bond has a mean of 6.278588 billion US dollars with a standard deviation of 11.25475 billion US dollars and has a minimum value of 0 and a maximum value of 74.386 billion US dollars. The results of the descriptive statistical test for the control variable consist of five variables, namely trade, Human Development Index (HDI), Foreign Direct Investment (FDI), population, and inflation.

Correlation matrix

Table 4. Correlation matrix

	GDP	GB	Trade	HDI	FDI	Logpopulation	Inflation
GDP	1.0000						
GB	0.1502	1.0000					
Trade	-0.3247	-0.0779	1.0000				
HDI	-0.1932	0.2144	0.2709	1.0000			
FDI	-0.0689	-0.0501	0.3500	0.0547	1.0000		
Logpopulation	0.5964	0.1141	-0.5187	-0.6081	-0.1277	1.0000	
Inflation	-0.0337	-0.0882	-0.1368	-0.2665	0.0039	0.1803	1.0000

In the correlation test, it is known that the independent variables and control variables with the dependent variable show that green bond, Trade, HDI, FDI, population, and inflation have a significant correlation with GDP. Correlation is considered high between variables if it reaches more than 0.5. This means that if it is tested it will cause bias. However, in this study, most of the correlation values were low, namely less than 0.5. So that the variables in this study do not have multicollinearity.

Regression test

The results of the regression test in the table show that the green bond variable has a positive and significant value for the GDP variable. This means that green bonds have a positive relationship with the economies of Asian and European countries, that is, the greater the number of green bonds, the greater the GDP of Asian and European countries, which indicates that green bonds influence the GDP of Asian and European countries.

In addition, the trade variable has a positive value but is not significant for the GDP. This means that the greater the trade in a country, the GDP of a country will also increase, although not significantly. For the research control variable, HDI has a positive and significant effect on the economic variables of Asian and European countries by looking at the GDP. The third control variable is FDI which has a negative and insignificant effect on GDP. This means that the greater the FDI, the smaller the GDP of Asian and European countries. The next control variable is population which has a positive and significant effect on the economic variables of Asian and European countries as measured using GDP. This means that the greater the population growth, the greater the GDP of Asian and European countries. The final control variable is inflation which has a negative and insignificant effect on the economies of Asian and European countries. This means that inflation has an inverse relationship with GDP, that is,

the greater the inflation, the smaller the GDP of Asian and European countries, which indicates that the economy is getting weaker.

Table 5. Gross Domestic Product (GDP) variable regression test

	(1) GDP
GB	**4.925***** **(7.37)**
Trade	0.799 (0.43)
HDI	**9639.2*** **(1.85)**
FDI	-0.129 (-0.92)
Logpopulation	**1,142.8**** **(2.01)**
Inflation	-4.866 (-0.17)
_cons	**-26470.6*** **(-1.90)**
N	148
N _g	37
r2	
r2_w	0.0508
r2_o	0.400

t statistics in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

Statistical test t

Table 6. Hausman test results

	---- Coefficients ----			
	(b) Fe	(B) re	(bB) Difference	sqrt(diag(V_b-V_B)) S.E.
GB	4.766934	4.924627	-0.1576922	0.8330604
Trade	1.007272	0.7987758	0.2084966	2.824152
HDI	11925.81	9639.162	2286.652	5609.506
FDI	-0.2105631	-0.1288035	-0.0817595	0.3881618
Logpopulation	2242.108	1142.845	109.263	2838.445
Inflation	-1.648312	-4.866384	3.218072	8.849694

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg
Test: Ho: difference in coefficients not systematic
chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 0.62
Prob>chi2 = 0.9869

Based on Table 6., the green bond variable has an individual influence at the 1% level with an average p-value of less than 0.01 level of significance, so the hypothesis is accepted. This means that individual independent variables have a significant influence on the research dependent variable.

Discussion

This research aims to test whether the issuance of green bonds has a positive and significant influence on the economic development of countries in Asian and European. The hypothesis put forward is that green bonds can be an effective instrument in encouraging sustainable economic growth on both

continents. The hypothesis in this research states that green bonds have a significant positive influence on GDP in Asian and European. This hypothesis is based on the belief that the existence of green bonds not only raises funds for sustainable projects but also creates incentives for the private sector to invest in environmentally friendly initiatives.

The results of this research have the potential to provide strong evidence regarding the important role of green bonds in driving economic growth in Asian and European. If the research results support the hypothesis, then the implication is that green bonds can be an effective tool in supporting climate change mitigation efforts and environmentally friendly sustainable economic development. These results can provide a basis for policymakers to design further incentives and will be additional evidence that green bonds are not just a financial instrument, but also a powerful tool to drive positive change in a sustainability-focused economy that encourages green bond issuance and sustainable investment in these two continents. Funds obtained from green bonds can be allocated to carry out projects that contribute to environmental sustainability, for example, renewable energy, energy efficiency, waste management, or pollution (Azhgaliyeva et al., 2020). On the other hand, if the research does not find evidence to support the hypothesis, this will trigger further debate regarding the effectiveness of green bonds as an instrument for achieving sustainable development goals in Asian and European.

In a global context that is increasingly concerned about environmental issues, this research has the potential to pave the way for economic development that is more sustainable and responsive to the challenges of climate change on these two continents and provides valuable insights for countries around the world. In both scenarios, this research has the potential to make a valuable contribution to global efforts to confront climate change and support a sustainable economy. That way, a country can increase green bond issuance, and sustainable development, create jobs in the financial sector, and have the potential to improve the country's economy (Banga, 2019).

5. Conclusion

This study aims to determine the impact of green bonds on the economies of Asian and European countries between 2018 and 2021. The sample of this study is 37 Asian and European countries. The results of this study show that green bonds have a positive and significant impact on the countries's GDP and can be used as an effective tool to encourage economic growth in Asian and European countries. The results of this study can also serve as a basis for policymakers to encourage countries to issue green bonds. Because green bonds are not just a financial instrument, they can also be used to improve the economy and focus on environmental sustainability. As this study focuses more on the impact of green bonds on the GDP of Asian and European countries, specific policy measures such as policy changes, and financial or regulatory impact on the impact of green bonds are not considered.

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