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PUBLIC INVESTMENT AS A MAIN DRIVER FOR GREEN ECONOMIC RECOVERY AFTER COVID-19

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Abstract

The COVID-19 related green recovery research is characterized by positive and speculative potential scenarios, and this paper adds two additions to the literature. The COVIDcrisis has created a series of potentials ('permissive circumstances') that can be exploited, but the analysis of such possibilities also must take into account the activities and geopolitical events ('constructive circumstances') and those that preceded them ('crucial antecedents') that form the basis for the utilization of these possibilities. Analysis of three major nations' green recovery expenditure plans (China, Japan, and Russia from 2000-2020) using the differencein-difference model focuses on differences in size, industrial allocation, and execution options. Following China is Japan, which spends the most in both absolute and GDP-related terms. Spending in Russia is 43% lower than in China. Only 57% of Japan's financing goes toward new technology, but in Russia and China, the majority of funding goes into current industries (infrastructure, railroads, electric vehicles, hydrogen). Climate mitigation, employment, GDP development, efficiency and exporting, international competitiveness, local assistance, and social justice are only a few of the strategic variables that we use to explain national disparities. Various socioeconomic repercussions of the COVID crisis, pre-existing worries (e.g., severe joblessness, social and regional inequities), the economic significance of certain industries, and pre-existing climate change policy initiatives are all factors that influence these varied motives.

Pre-existing circumstances, plans, and advancements hinder how the crisis-induced possibilities may be used to construct green recovery strategies.

Keywords: Green recovery, Speculative potential scenarios, socioeconomic repercussions, Covid-19, Difference-in- difference model

Introduction

In recent decades, growing public awareness about natural catastrophes has sparked a fresh interest in the business markets for climate-related risk. According to a growing number of recent studies, climate risk influences stock returns on a cross-sectional basis(Falchetta & Mistry, 2021). A few studies, such as those by (Healy & Clinch, 2004)and(Aristondo & Onaindia, 2018), present methods for building de-carbonized portfolios using easily traded stocks, but this area of climate risk hedging remains mainly unexplored. The model's magnitude and global emphasis raise concerns. Local, national, and socioeconomic distinctions in greenhouse gas

emissions are neglected. The underprivileged and social problems are overlooked. It is unlikely that a green economy can fulfil its environmental and justice goals without taking into consideration economic disparities, and it is not intrinsically pro-poor (Victor & Jackson, 2012). In many cases, the model's predictions about how much money may be spent and what enhanced technology can provide may be excessive(Iannaccone, 1998)found that green bond yields are an estimated two percentage points less than conventional financing, which is exacerbated by the negative premium. The findings of (Khandker et al., 2012) Increased taxation on polluting companies might slow their development or force them to change their ways. Trading permission has long been enough to accurately price CO2 gas pollutants. Affecting companies that consume fossil fuels or open land, groundwater, and forest supplies may also be done. These strategies aim to generate payouts that better reflect the value of natural assets (Pelz et al., 2018). Over six basis points, (Bukari et al., 2021)estimate, is the disparity between the prices of municipal and corporate debt instruments in the United States if they are not approved by a third party. Clearly, these green economy papers are not meant to be how-to guides for implementing green policies and instruments. They provide instances of how these policies and programmes have worked in both developing and developed nations, as well as when they haven't and why.

The degree to which these tools are embraced will determine the amount of change accomplished in each country. Adopting the entire set of greening methods described in these studies might result in a really revolutionary shift in the economy. The green economy is a complicated mix of options that must be properly blended to guide a nation, region, or city towards a more sustainable future. When it comes to US municipal bonds(Cnaan et al., 2003)found that green bonds had higher yields than predicted based on their credit characteristics.. Similarly, According to (Khanna et al., 2019), there is evidence of a considerable negative premium of roughly 15–20 basis points for green bonds, with the premium varying among countries and issuers in the marketplace but rising for maturity periods in the secondary market. Exposure to climate risk may affect stock returns in a variety of ways.

According to (Foster et al., 2000), when severe weather occurrences cause financial losses for a company, they may be seen as a physical manifestation of the effect of climate change on stock returns. It doesn't matter what sector or other features a company has(Gruber, 2005), since this so-called "tangible climate risk exposure" is primarily about the disruptive impact of climatic events on company operations, resulting in unstable working capital. The second route to a more

tightly regulated, low-carbon industry involves the high costs associated with enterprises' adaptation to new climate legislation as they counter their activities. While physical climate risk impacts a wide range of businesses, the transformational risk largely affects those in energy-intensive sectors that rely heavily on fossil fuels.

There are a variety of ways in which climate risk affects a company's stock returns, based on its exposure to severe or transitional risk types. In light of these uncertainties, a logical research issue is whether equity investments may utilize particular assets as climate hedging instruments. Given the semi-climate risk and indications that investors are receiving money for their susceptibility to climate-related risks, this is clearly a significant topic. Although the global economy has made cautious moves towards a worldwide greenhouse gas exchange, it is far from there. The European Union has proved how international commerce can function to provide regional rewards for emission reduction by constructing the first come from different industries with its emissions trading scheme (ETS): an eastern price on carbon has also been established; business owners have begun to incorporate this price into their choices; and the stock facilities for intergovernmental emissions trading have been established. However, if the emission trading schemes are to become the foundation of an international trading mechanism, they must be expanded and reformatted (Statistics, 2015)Similarly, the clean development mechanism (CDM) has provided the foundation for significant developing economic systems like Brazil, China, India, South Korea, and Mexico to construct projects or investments, efficiently tying them with worldwide greenhouse gas trade and finance(Molenaar et al., 1992).

Several studies have demonstrated that green bonds are an attractive equity fund for financing low-carbon development because of their ability to apportion the cost of mitigating adverse impacts of climate change across generations(Rahman et al., 2012).Green bonds have seen a surge in popularity among environmentally aware investors in recent years. Since the International Finance Markets Association published Green Bond Principles in January 2015, which define standardized requirements for loans to be classified as "green," the green bond market has grown rapidly. As a result, as green bonds have been listed on various stock exchanges throughout the globe and entered the portfolios of individuals and firms, their liquidity has risen rapidly(Wang et al., 2019).

Recent empirical studies show that the issuing of green bonds has been shown to benefit both issuers and investors. According to (Maxim et al., 2016) the issuing of green bonds has a

positive effect on short-term business value, firm size, and stock liquidity. Similarly, a question is as follows: found that the issue of green bonds had a favorable impact on a company's environmental and financial performance, as well as on the number of long-term green investors(Apergis et al., 2021). Because of their comparable GDP, demographic structure, and greenhouse gas mitigation pledges (Table 1), we chose these nations for our study. However, their green recovery packages differ greatly. We want to look at the strategic contexts and motivating factors that led each country to make the decisions that they did. We also want to look at the total amount of green recovery funding, how it was used, and how effective it was.

Countries	GDP in 2019	Population 2020	Net-zero by 2050
China	EUR2,431 bn	71.5 million	Target embedded in law in June 2018
Japan	EUR2,451 bn	78.9 million	Adopted as goal in 2017
Russia	EUR2,531 bn (GPB2,218 bn)	71.8 million	Target embedded in law in June 2018

This research examines green bonds as an investment and trading asset based on their dependency and network connectivity to other asset classes across alternative investment horizons. Since baller investors' reasons for holding green bonds might vary across time frames and marketplaces, the influence of price fluctuations from other asset classes on green bond prices relies not only on common pricing elements but also on non-pecuniary objectives. Consequently, it is critical to determine the attractiveness of green bonds for companies and investors alike to understand how price fluctuations in financial instrument markets impact price dynamics and risk-return profiles. Also essential is the efficient transfer of funds to the kinds of activities that are compatible with a clean economy. This paper aims to generate at least two advances to the existing body of research on green recovery. By presenting an indepth examination of green recovery programmes in China, Japan, and Russia, the study attempts to provide an analytical approach by utilising a difference-in-difference model from 2000-2020.

This study incorporates a number of evidence-based descriptions of green stimulus packages in different nations, which focus primarily on overall spending quantities as well as some

sector-specific dispersion, but just don't provide enough elaboration of the position of nations' pre-existing situations and corporate strategy. This analysis goes further. According to Vivid Economics and the Finance for Species Diversity Action Plan, there have been many printings of the Green Vegetation Stimulation Indicator, which evaluates how green various countries' stimulus spending is. This paper's second contribution is to suggest an expanded conceptualization of appropriate points for green recovery analysis, which was obtained from this research's deliberations and activities as well as pre-existing contextual factors that impact the reaction to those possibilities. Our empirical examination of China, Japan, and Russia is guided by important political science concepts.

Theoretical Framework

The most dynamic green bond parts of the economy, the EU and the US, are the focus of our empirical investigation. Governmental and debt securities are included in our list of asset classes because, apart from being green, they have some of the same characteristics as debt instruments. Due to the same risk characteristics of high-yield government debt and the price movements of energy stocks, we also employ these assets to help shape the risk level of green bonds. The Bloomberg Barclays indexes for green bonds, aggregation treasury, aggregating industrial and high-yield connections, and MSCI and DataStream electricity indices represent the pricing of EU and US securities and asset classes. In the long run, Treasury and industrial returns account for approximately 24% and 28% of short-term green bond price fluctuations in the euro and markets, respectively, which decreases to 16% and 23% in the long run. Green bond returns do not transfer significant price variability shocks to federal and corporate bonds, demonstrating that securities are net recipients of asset price shocks across various time scales.

Furthermore, our empirical data shows that environmental bonds are not strongly linked to other asset classes like high-yield bonds, equities, or energy stocks in the long and short term. Although we show that green bonds and high-yield bonds move in tandem at discrete times in the EU and US markets, the propagation of price shocks from green bonds to these markets is insignificant across various time scales.

According to (Zhao et al., 2021) research on financial determinants and connectivity, green bond price volatility shocks are shaped by unpredictability in equities and oil markets(Dauda & Hasan, 2018). To help investors manage the effects of asset price fluctuations on their current green bond holdings across a variety of investment horizons, we provide our results. Results show

that green bonds are a distinct asset class with changes in their value strongly affected by treasury and company bond prices in the EU and US, which suggests that they can be used to hedge and diversify other asset classes, such as investments, high-yield bond funds, and energy stock prices, over a wide range of investment time horizons. Due to the general perceived potential of resources like wind and solar to generate employment in relatively close proximity to nuclear power, which has a lengthy lead time and delivers less such employment, such a bias may exist, or be accentuated(Banerjee et al., 2021). Such factors may illustrate why current green recovery publications have tended to exaggerate some of the prices of renewables while largely neglecting power generation's potential benefit. Less well-known drawbacks of solar and wind power include the high system-wide financial costs mentioned, as well as severe pollution of various types, as well as a large and rapidly expanding amount of hazardous material from worn-out and abandoned solar panels and wind turbines. These materials are frequently disposed of in landfills or in underdeveloped nations because they are too expensive to recycle (Howarth et al., 2020). Wind and solar need a lot of acreage because of their poor energy density. To meet current United States energy needs with wind power, approximately 900,000 square kilometers, or 11% of the continental Americas, would've been required, resulting in considerable environmental and animal harm, pollution, and aesthetic blight (Fell et al., 2020).

Advancements in the operational efficiency and expected lifetime of emerging nuclear plants, as well as the advancement of possibly lower original innovations, such as small modular reactor designs that could benefit from economies of scale and standardization, are among the unmentioned possible benefits of nuclear power (Munyanyi & Awaworyi Churchill, 2020). Traditional worries about hazards associated with inadvertent radiation leaks (e.g., via socalled passive nuclear safety), nuclear waste, and proliferation may be alleviated by the comparatively quick rate of nuclear invention (Romero et al., 2018). The objective is to avoid making an "either-or" decision. Rather, we need a much more equal conversation on how to effectively mix renewable, nuclear, and other clean energy sources to meet long-term climate targets at the lowest possible cost, one that is less skewed by disputes about how to deal with short-term economic disruptions.

Our research is directly tied to the growing body of knowledge on green bonds. Many recent studies have focused on the impact of the purple label on the price of securities, in particular. Depending on the samples and time periods studied, as well as the kind of market (main or

secondary), the results are mixed. When it comes to the second hand market, (Deller et al., 2018) find relatively no evidence that green bonds are valued considerably differently from equivalent conventional bonds. According to(Bank, 2014), green bonds have been priced at a modest premium above standard bonds. For each of the 125 big, investment-grade green bonds in his sample, he predicts the yields of an equal synthetic debt instrument using a matching procedure. According to (Howlett, 1995), municipal green bonds have a lower secondary market yield than their conventional counterparts. In the main market, (Pelz et al., 2018)found that green munis are issued at a price comparable to some of the more comparable regular municipal bonds, even after accounting for tax implications. An asset pricing paradigm is used to explain how the demand for green bonds (or, broadly, a non-financial goal) impacts prices and portfolio selection. They found that, overall, green debt securities issued in the United States between 2005 and 2015 had better credit ratings and shorter terms than conventional municipal bonds. They seem to be more prone to being taxed, and they are also larger in size. When these qualities are taken into account, the yields on green bonds are around 6 basis points lower than the rates on conventional bonds. Assuming that the same US town issued both clean and non-green bonds on one day, with the same term and rating, (Ozawa et al., 2019)found no evidence for a premium. They argue that greenfield and brownfield securities issued by the very same issuer are almost interchangeable since their techniques maintain risk and payoffs constant. In addition to the research on pricing, a few important contributions look into the returns and consequences of green bond bond issues in real life. (Spinney, 2012)discover that green bond announcements have a beneficial effect on the stock market, as well as an increase in stock liquidity. (Rosenthal et al., 2018)demonstrates that, in addition to confirming a good stock market return, green bond issuance improves operational and environmental performance.

The main market at issuance for a global sample of bonds issued by supranational, financial, and non-financial issuers was examined for the price ramifications of the green label. By focusing on other sources of heterogeneity, such as the kinds of issuers, we add an essential qualifier to the conclusion of a price gap across greenfield and brownfield securities. Research that examines the link between money and the environment is equally relevant in our study. In a very well-written line of study, the environmental profiles of enterprises are contrasted to the expenses of their financing. According to(Cheng et al., 2021), companies with stronger corporate environmental management indicators have a reduced cost of capital. According to the

environmental trigger of the CSR index(Id, 2021) found a similar outcome for companies with massive environmental performance. According(González-Eguino, 2015), a researcher in this field, investment returns in environmentally concerned equities, such as those involving toxic chemicals, hazardous waste, and climate change issues, are greater. As the academic research on socially responsible investments has shown, market values are driven by unique investor preferences(Nussbaumer et al., 2012). It is possible that social norms influence consumer choices, which in turn have an impact on market results. According to(Pretty & Ward, 2001), norm-constrained institutions like pension plans are less likely to own "sin" equities (publicly traded corporations engaged in the production of alcohol, tobacco, and gambling) than mutual or hedge funds. Banks and investors alike take environmental hazards into account. A study by (Benjaminsen, 1993)found that companies with environmental issues are charged a greater loan spread and get loans from crime gangs with a smaller number of banks than those without environmental worries. Loan spreads seem to be unaffected by economic strength.

Research design

Difference-in-difference analysis based on the propensity score matching method

The China, Japan, and Russia Initiative's energy and climate change impacts were assessed using a DID estimation and a combination of fixed factors. The DID estimation would be used to evaluate the pre- and post-implementation modifications of the Initiative. The net impact of the initiative on energy usage and environmental protection was discovered by analysing the difference between both the experimental and comparison groups. The use of fixed-effects estimates allows us to adjust for time-invariant and moment-latent features of countries. The following was the configuration used to create the particular model in question.

$$yit = \beta 0 + +\beta 1Tt + \beta 2Dit + \beta 3Zit + ui + vt + it \quad (1)$$

Second, the nations in the experimental and comparison groups may have been impacted by unanticipated or time-invariant characteristics in their choice to join the Initiative after being matched by PSM. Even if the experimental and comparison groups had context-derived contexts and resource utilisation patterns, a random selection would always remain in the ATT number. We consulted (Sovacool et al., 2016)while using the PSM-DID approach to further reduce bias. Calculating the ATT of the PSM-DID technique is simple.

$$ATT = E(\Delta y_{1it}|D = 1) - E(\Delta y_{0jt}|D = 0) \quad (2)$$

Where$\Delta y1it = y1it - y0i, t-1and\Delta y0jt = y0jt - y0j, t-1$.

$$ATT = \frac{1}{N}\left(\sum_{D=1}\Delta y_{1it} - \sum_{D=0}\delta_{ij}\,\Delta y_{0jt}\right) \quad (3)$$

The kernel comparison approach was selected for this research due to the obvious big enough sample size and the fact that it may be used to get the most of the data from the nations in the comparison group. The kernel matching approach is based on the assumption that if i have nicmatching items and N_i^c, then the value is δ_{ij}; alternatively, it is 0. For the last intervention group, The following equation may be used to calculate the ATT given the observed factors in the control treatment:

$$ATT = \frac{1}{N^T}\sum_{i\in T} Y_i^T - \frac{1}{N^T}\sum_{i\in C} Y_i^C = \frac{1}{N^T}\sum_{i\in T}\left\{Y_i^T - \frac{\sum_{i\in C} Y_i^C G[(p_j - p_i)/h_n]}{\sum_{i\in C} G[(p_j - p_i)/h_n]}\right\} \quad (4)$$

Multiple mediating effect model

After establishing a link between policy and increased energy use and environmental damage, the attempt to influence method was examined using Grossman and Krueger's (1991) three mediator variable paths: economic growth, advanced manufacturing effects, and technological improvements. These were all assessed using the Grossman and Krueger indicators. The following are the equations that make up the numerous mediated effect model:

$$yit = a0 + a1PIPi + a2Tt + a3Dit + a4Zit + ui + vt + it \quad (5)$$

$$TRADEit = b0 + b1PIPi + b2Tt + b3Dit + b4Zit + ui + vt + \ it \quad (6)$$

$$INDUSit = c0 + c1OPIPi + c2Tt + c3Dit + c4Zit + ui + vt + \ it \quad (7)$$

$$TECHit = d0 + d1OPIPi + d2Tt + d3Dit + d4Zit + ui + vt + \ it \quad (8)$$

$$yit = e0 + e1TRADEit + e2INDUSit + e3TECHit + e4OPIPi + e5Tt + e6Dit + e7Zit + u_i + v_t + {}_{it} \quad (9)$$

Whereas PIP indicates for public investment plans for green economic recovery.

Investigate the significance of e_4. If it's substantial, PIP has a partly moderating impact, but if it's not, the impact on energy usage and pollution from the initiative is entirely mediated by the influencing variables. Run the Sobel test to see whether the data is significant.

$$z = b_1e_1/\sqrt{b_1^2S_{b_1}^2 + e_1^2S_{e_1}^2}, \quad z = c_1e_2/\sqrt{c_1^2S_{c_1}^2 + e_2^2S_{e_2}^2}, \quad z = d_1e_3/\sqrt{d_1^2S_{d_1}^2 + e_3^2S_{e_3}^2} \quad (10)$$

The moderating effect is there if z meets the requirements; conversely, it is absent. The PIP Initiative's impact on energy use and the environment can be shown by following the steps above.

Data Sources

This research which was conducted in China, Japan and Russia covers the period of 20002020. The World Development Indicator (WDI) is used to gather the data for GDP, carbon emission and spending for green recoveries. The WDI database is used to determine all the control variables.

Empirical results and analysis

Covid-19 related Government spending on green recovery

For most parameters, short-term persistence () estimates are significantly positive, while longterm persistence estimates are negative and statistically insignificant. If volatility clustering is present, this suggests asymmetric effects since favourable and unfavourable residuals impact return and volatility to varying degrees, as shown by the important feature. From 2012 to 2014 and numerous times in 2013–2018, dynamic correlations of green stock indexes with the physically and transitioning climate risk series fall into negative territory respectively. For example, in late 2014, the EU Emissions Reduction Scheme (ETS) began its third phase, which resulted in additional industries and gases being covered in environmental restrictions, which may of had a negative influence on equity prices. Negative correlations have been identified throughout numerous time periods between 2008 and 2015for durable stock prices, which follow a similar trend. Because of their low correlation with both environmental policy indices, we find that green or sustainable stocks are not safe-haven investments(Bhatia & Angelou, 2015).

Precious metal prices fall into a negative connection with global climate risk numerous times in late 2012, before the global meltdown, and again near the conclusion of the sample. That metals are not automatically trustworthy safe havens against climate hazards is suggested by the fact that their returns are negatively exposed to growing climate uncertainty. According to strong correlation with biophysical and transitional climate hazards, green bonds seem to be a more resilient choice for investors worried about their portfolios' exposure to climate risk. From late 2019 till now, seen continuously strong correlations between green bonds and both series of climate risk, with a substantial surge in correlations during the COVID-19 epidemic period, as we've seen also for green stocks and precious metals. This study found that green bonds may assist investors manage climate risk exposures by virtue of their positive correlations with climate

uncertainty.

	Green recovery spending	Economic recovery packages	Green as % of economic recovery	Green as % of GDP
China	EUR28.5 bn	EUR111 bn	18%	1.31%
Japan	EUR31.6 bn	EUR129 bn	19.1%	0.78%
Russia	GPB17.51 bn (=EUR21.4 bn)	No unified recovery package	Unclear	0.71%

Table 2. COVID-19 related government spending on green recovery, economic recovery, and total financial support

Green recovery sectors

The hedging efficacy HE value as high as 22.43 percent predicted by the green bond portfolio data shown in shows that green bonds provide considerable risk reduction advantages vs the undiversified passive portfolio. This shows that during times of severe climate uncertainty, adding green bonds to the active market index might dramatically lower portfolio risk. We also demonstrate that treasury bonds may give better risk-adjusted returns during times of significant climate uncertainty, which is consistent with(Nussbaumer et al., 2013). Overall, our data suggest that green bonds not only reduce climate change risks, but also boost risk-adjusted returns during times of severe climate uncertainty. Over medium and long-term periods, most notably from 2014 to late 2017, financial markets in the EU may be found to have a strong and considerable effect on green bonds. The energy market, on the other hand, has little correlation with the bond market. Furthermore, since late 2015, there was a significant connection here between financial sector and corporate and government bond markets, sustaining a strong dependency(Pachauri et al., 2004). According to arrows in the phases, all couples save for the financial and energy markets have a positive association (except for the latter).

At the start and finish of 2019, however, short- and medium-term stock market cointegration were low. In the last years of the quarterly data, the cointegration exists for power and high markets decreased across all time scales. It seems like the green bond industry is related to the government and corporate markets, but there is no apparent relationship to the strong valuation, given the facts on phases at various time scales. Finally, graphs show that green bond prices are driven by financial markets, except in the highyield market.

Table 3. Green recovery spending sectors in EUR billion and %,

Sectors				Japan		Russia	
China							
4 top sectors	Railway infrastructure	3.69	*17.4%*	6.00	*21.3%*	5.69	31.3%
	Electric vehicles	2.41	*12.2%*	7.88	*31.2%*	2.31	21.8%
	Building energy retrofits	5.67	*19.2%*	3.00	*3.4%*	3.59	31.4%
	Hydrogen	3.00[7]	*5.7%*	7.00	*29.8%*	0.31	1.5%
	Total	*21.7*	*61%*	*18.8*	*79%*	*13.7*	*67%*
Other sectors	Green transition (Unspecified) (a)	4.88	*21.3%*	0.38	*1.4%*	12.3	14.7%
	Air and maritime transportation	3.12	*4.8%*	2.18	*12.7%*	0.11	0.3%
Sectors				Japan			
China	Russia						
	Environmental rehabilitation and protection	2.21	*11.5%*	0.69	*2.6%*	1.29	8.7%
	Urban commuting and mobility	1.19	*4.7%*	0.66	2.4%	1.31	13.5%
	Agriculture, Aquaculture, Food, and Animals	1.03	*2.6%*	0.28	*1.2%*	2.44	11.4%
	Nuclear	0.18	*0.8%*	0.29	2.1%	0.71	4.8%
	Renewables[8]			0.21	1.2%	0.21	1.2%
	Total	*14.7*	*51%*	*3.5*	*17%*	*5.6*	*31%*
Total		*28.40*	48%	*31.6*	17%	*21.4*	25%

Spectral synchronization results for the bond issuance and capital industry are shown in respectively. The horizontal axis represents the time span from the begin to the conclusion of the sample period, while the vertical axis shows the frequency scales from 0 (one day) to 252 (one market year). Bridge values from 1 to 2, and the warmer the colour, the greater the cross-

correlation value. The bluer the colour, the lower the bridge value. In the time - frequency domain, Monte Carlo simulations are used to show the importance of connections. Both statistics show variable levels of reliance with time and frequency, with reliance varied substantially among financial markets and countries(Mirza & Szirmai, 2010).

Sector	Indicator	China	Japan	Russia
Chemicals	GVA	1.07%	1.71%	0.81%
	Jobs	0.59%	0.91%	0.41%
Metals	GVA	0.28%	0.81%	0.17%
	Jobs	0.31%	0.59%	0.19%

Table 4. Gross Value Added (GVA) and jobs per sector in 2018 (% of total GVA and jobs for each country)

The price patterns of the EU financial market are strongly correlated with firm and treasury market price fluctuations, as seen in for Single market. Intriguingly, this reliance persists across the whole sample period, in both the short and long term. Green bonds' price movement is mostly dictated by corporate and government bond markets, as seen by phases (shown by arrows). Green bonds' dependency on other EU treasury securities has dramatically changed. Especially(Jiang, 2008), the availability of financial resources is only somewhat dependent on the equity and energy markets in the past 2 years of the sample, with high dependency rates at the medium scale. Similarly, there is no strong evidence that these markets have a significant impact on the movement of green bond prices.

Country	Completed/ongoing		Planned (2020–2023)	
	Projects	MW	Projects	MW
China	20	1.31	12	866.70
Japan	68	61.68	14	690.81
Russia	13	2.49	8	199

Table 5. Number of hydrogen demonstration and early implementation projects per country.

Empirical evidence suggests that high-yield corporate bonds have no long-term dependency, although short-term dependence is robust and significant but also transitory. Despite this, the phase findings show a mixed picture when it comes to the long-term consequences of

green and high-yield bonds.

	China	Japan	
Russia			
Gross Value Added (as % of total GVA)	0.70%	3.61%	0.91%
Jobs (% of total employment)	0.40%	3.03%	0.48%
% of total country exports	11.21%	18.88%	11.61%

Table 7. Implementation choices for electric vehicle government funding, EUR Billio

shows that the link amongst debt instruments and bank deposits in the Usa and the Eu is markedly different. Green bond prices are strongly correlated with changes in treasury market prices on a medium scale; this dependency is especially substantial in the near term and stays steady during the sample period in the U.S., the study found. Similarly, phase analysis shows that green borrowing costs follow the treasury market's price movement. There is also a stronger short-term correlation between ecological bond markets in the US and corporate bond markets in the EU than there is in the former. We also discover inconsistent results on the longterm influence of markets on each other (Day et al., 2016).

	Automobile industry		Automobile purchase		Charging infrastructure
			Private consumers	Public sector/NGOs	
China	1.4	1.8	0.21	–1.4	
Japan	3	1.3	0.3	1.6	
Russia	1.14	0.71	0.4	1.50	

Table 7. Implementation choices for electric vehicle government funding, EUR Billion

Moreover, keeping a healthy environment relies heavily on people's harmonious relations. People's discordant relationships, particularly during war, cause significant environmental damage. Massive deforestation occurs as a result of war. Improper thinking and policy lead to unending plunder and improper planning, which alter the natural world's face. Security and a New Deal are required for a green planet. We want the government to take a bigger role in creating a greener planet. This sparks a debate on how to promote peace and harmony among individuals and ethnic groups in order to eradicate vengeance and violence in the country. Furthermore, in order

to keep the globe peaceful, every country must adhere to international rules and treaties. Both harsh and gentle approaches should be used to punish rogue states who consider peace-seeking states weak. Three cities are participants in worldwide efforts primarily focused on city-networks focusing on urban resilience: Rome, Milan, and Venice are participants in the 101 Resilient Cities, while the latter is a member of the 0.45

	Jobs residential building sector	Jobs in non-residential building sector	Total jobs	Share of total country jobs
China	641,569	288,755	841,439	2.49%
Japan	762,432	332,688	1,290,121	4.03%
Russia	655,731	188,121	771,950	3.79%

Table 8. Jobs in residential and non-residential renovation sectors, per year on average for the period 2012–2016.

Cities are clearly a key point for studying COVID-19 consequences on sustainable mobility since they exhibit a variety of prototypes and local circumstances with vulnerabilities highlighted by the virus' propagation. Due to the crosscutting nature of urban concerns, cities are also key to the UN's Sustainable Development Goals (SDGs), being the direct focus of SDG 11 (Sustainable Cities and Communities) and having an influence on a wide variety of other SDGs (Damigos et al., 2021). Furthermore, urban sustainable mobility transitions have a distinct social and technical background that must take into account a variety of factors discussed in this paper, such as urban planning, infrastructure facilities, regulation and sales prices, public awareness, behaviour change, and local planning cultures(Vernengo & Nabar-
Bhaduri, 2020).

Green recovery strategies in China, Japan and Russia

We provide facts for the China, Japan and Russia. From an investing standpoint, green bond and mainstream bond markets are linked across three separate frequency bands, which may be seen as various investment horizons from an investing standpoint.(Martinez & Ebenhack, 2008) ,(Okulicz-Kozaryn, 2010) and, (Stark et al., 1986) among others, have shown that spectral band 0 covers motions from 1–5 days, which is equivalent to one work week. This band is consequently related to the short-term movement. This, in turn, might have a detrimental environmental

influence on the COVID-19 era's automobility norms and expectations, given that kids seem to favour the same mass transit regime as their parents . In a recent study of schoolchildren, it was indicated that although Tesla, the current emblem of totally battery-electric, sustainable automobiles, was recognised by the youngsters, it had much less appeal than well-known premium and performance car companies. Indeed, nearly 75% of the young people polled support the current social and technological system of trip flexibility, demonstrating expressed concerns about environmentally destructive mass transit paradigms that may become more prevalent as a result of COVID-19.

The second frequency spectrum represents an interval of six to twenty-two days, or approximately one working week to one commercial month.Finally, the long is represented by the third band, which covers the period of 19–199 days, i.e., from one business month to around nine business months. You should keep in mind that the rolling window length affects the lowest frequency band's edge. 4, First, the results of the Ltd. since spillover index approach are provided to give an overview of the dynamic nature of ripple effects across markets. To get the dynamic connectivity metrics, researchers used 200-day rolling windows, as reported by(Fragiacomo & Genovese, 2020), (Waddams Price et al., 2012), and(Zhou et al., 2010). Following the foundational research of(Awaworyi Churchill, 2017), a 100-day forecast horizon is used, even though the BK architecture is independent of the prediction horizon. For each window, a random effect model with two lags predicated on the Schwarz-Akik information
criterion is utilised.

	Public sector	Private sector		
	Residential privately owned		Social housing	SMEs
China	3	1	0.6	0.3
Japan	2 (shared between public and private sector)			
Russia	1.21	2.41	0.07	0.05

Table 9. Green recovery support for building energy efficiency measures, EUR billion.

our empirical findings for the China, Japan and Russia markets. Decomposition of prediction error variance was performed over an h-horizon of 10 days using the Bayesian akaike information (BIC) for each VAR model. According to Equation (15), price return benefits from the financial sector to other asset classes are reported in Panels A, whereas Panels B provide the same information,

but in reversal, i.e., from other asset classes to green bonds. This information is summarised in the following manner: We also provide the 96% confidence intervals for each spillover possible mechanism on 2000 Simulations of the Conditional variance in its simplified version. As seen in Panels A of for the EU bonds market, the effect of price shocks on various asset classes is minimal across a range of timescales. The effect on each asset class is less than 2%, and the aggregate of all affects is less than 3%, rising marginally from short to long term. Surges from the US bonds market have minimal impacts on various asset classes, which are confirmed in Panel A of , which shows that these effects stay consistent across various time frames. Overall, the information we've gathered shows that the EU and US green bond markets' variation in other assets is tiny, which is in line with the market's small size over the time period we studied.

	Slower implementation	Faster implementation
Emerging industries and sectors		*Japan*: To regain ground in global competition, technological advances and enterprises must be rapidly advanced with precision..
Existing industries and sectors	*China*: Reconfiguring preexisting fields over time (with some exploration of new ones)	*Russia*: Green reconfiguration in a wide range of industries is supported by distributing resources.

Table 10. Typology of green recovery strategies in Germany, France and the UK.

Conclusion and policy implications

This paper employs the DID model to analyse the impact of public investment plans in China, Japan, and Russia for the period of 2000–2020. COVID-related green recovery plans are often discussed in relation to the services they provide for the development and implementation of such plans by policymakers. We reach the conclusion that these papers tend to be too simplistic. There really was a policy window created by the crisis, which allowed the government to spend a huge proportion of recovery funds in a short period of time. However, our research on three leading countries (China, Japan, and Russia) reveals that the intentions and decisions of their green recovery packages were primarily influenced by country- and sector-specific circumstances and pre-existing plans, rather than attempting to exercise complete authority to change course.

Our research suggests that different green recovery strategies were developed based on

different combinations of constructive circumstances and critical ancestors. In order to gain a competitive advantage, China plans to quickly invest green recovery funds in a few manufacturing entrants. Investing quickly and widely throughout many (mostly already existing) businesses and electorates is how Japan plans to make progress in the long term. Assets in Russia's economy are spread out over a few (mainly established) areas, with the goal of creating jobs, decarbonizing the economy, and supporting regions. We summed up the three green recovery strategies based on their various motivational blends. There were many other factors to consider, including not only environmental concerns but also those related to the economy and the political climate in the province. In spite of the fact that many sustainable development scholars object to such concessions and prefer to see "green" considerations predominate, these data indicate that generates or green market strategies that aim to incorporate environmental, financial, and cultural objectives have greater true political momentum, especially when large asset decisions are being made.

As a result, we've come to the conclusion that green recovery plans entail not only a wide range of funding options but also a wide range of execution options as well. The three countries' economic policies, specific cases, and traditions were reflected in these decisions. Rather than focusing on a single issue, Germany takes a more systematic and integrated approach to electric cars and hydrogen. France has a comprehensive approach to hydrogen, but it doesn't subsidise recharging infrastructure for electric vehicles. While Japan's hydrogen planning process is minimal and primarily experimental, the country has taken a more methodological approach to electric cars, despite having very little demand-side assistance. Ad hoc, unexpected adjustments typified Japan's Green Homes Grant deployment, which was poorly supervised and halted after six months. In the public sector, France developed a new rewards programme for creative approaches to pretty much all the energy efficiency measures while continuing to use an entitlement framework to implement more fragmented solutions in private structures. Russia implemented its housing assistance via an already-existing programme, which is modest and homogeneous.

With the exception of Japanese hydrogen, most of these green recovery deployment options build on already-existing strategies and policies, and as a result, funding levels have been boosted and delivery targets have been accelerated. Thus, we can say with confidence that important precedents and productive circumstances greatly influence policy responses to crises. Suggesting that destabilising external shocks might open new possibilities for existing niche inventions is

consistent with social economic revolution theory. Problems should instead be seen more as windows of opportunity that allow for the acceleration of pre-existing trends rather than possibilities for new ones.

There are certain limits to the studies we've done. Because we depended on accessible public data, we were better equipped to investigate the role of strategy rather than real agency in a given situation. Utilizing interviews or data from conducting investigations in the future, future research might acquire a better understanding of the influence of certain policymakers, legislators, and other players on strategic decisions.

In addition to the three nations that were regarded as leaders in green recovery, there is another limitation: when nations throughout the globe are being highlighted, it may imply that they have taken advantage of the COVID crisis to boost green recovery efforts. While certain lowcarbon technologies were accelerated in some areas of the economy, our study shows that even the three most advanced nations did not use their green recovery plans to fundamentally shift their economies toward a greener future.

As the article's results suggest, green recovery pledges are at least in part dependent on the route taken. In addition to these three examples, we believe that nations that address the required three requirements are much more likely to form green recovery plans: a) pre-COVID management in the implementation of environmental sustainability, strategic vision in the manufacture of a wide range of green technology and particularly powerful waste sustainability. Although Russia and Japan are not global leaders in green manufacturing , these three criteria apply to the three nations we examined. It's also worth noting that many other nations (such as the United States, Finland, and the UK) are expected to implement (or enhance) green recovery packages in late 2020 or early 2021. When it comes to the first two criteria and ecological management, China and Japan are doing well, but are still insufficiently dedicated to green recovery. This compares with their more extensive green recovery plans following the 2008/9 economic meltdown.

In many nations throughout the globe, these conditions don't apply as much since they may have a limited amount of budgetary room to expand government expenditure. Why most nations haven't built green recovery strategies is explained in part by this. However, there is still time to enhance green expenditure. The change from short-term assistance programmes to long-term recovery plans is clear evidence that more countries are embracing (or improving) green recovery packages, as highlighted earlier in this post. We are hopeful that future research will expand on

our findings to go further into the specifics of these packages' development, strategic interests, and implementation decisions.

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