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## Article

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# Under the same roof? The Green Belt and Road Initiative and firms' heterogeneous responses

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## ABSTRACT

Launched in 2017 the Green Belt and Road policy acts as an important upgrade to China's recent core foreign strategy (i.e., the Belt and Road Initiative) and aims to balance the economic development and environmental harmony in countries along the routes. In this paper, we take the implementation of this green policy as a quasi-natural experiment and employ a difference-in-difference method to identify the impact of the policy on Chinese outward direct investment (ODI) firms. We find that the policy has a significant and robust effect on improving the overall performance of ODI firms. Under the same policy roof, however, the seemingly similar impact masks the distinct responses of state-owned and non-state-owned enterprises. Non-state-owned enterprises improve their performance by pursuing green credits and technology upgrades. State-owned enterprises achieve improved performance through better compliance with the green policy and the accompanying government subsidies, in addition to technology upgrades.

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## KEYWORDS

Green Belt and Road Initiative; firms' performance; corporate financing; technological innovation; government subsidy; state ownership

## 1. Introduction

The state-owned enterprises (SOEs) feature the Chinese economy and distinguish China from most of the other economies. The role of SOEs and their diverse performance from non-SOEs attract wide attention from both academia and government. Among these interests, people pay particular attention to the divergent motivations and policy responses of firms induced by their ownership heterogeneity (e.g., Chen et al., 2011; Hau, Huang, & Wang, 2020).

Furthermore, the on-going economic reforms in the past four decades have demonstrated China's efforts to transforming SOEs into market-oriented enterprises. During the well-known reform of "Grasp the Large and Let Go of the Small" (or "zhuada fangxiao" in Chinese) in the 1990s, many small SOEs were privatized and large SOEs were corporatized and merged into industrial groups (Hsieh and Song, 2016). In 2012 the "non-tradable share reform" further granted legitimate trading rights to the state-owned shares of listed SOEs, opening the door to a second privatization in China (Liao, Liu, & Wang, 2014). Through a series of reforms, policymakers attempt to build up a modern

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system of enterprise management based on property rights and market, and gradually remove the institutional advantages of SOEs and the discriminations against non-SOEs (Liu, Wang, & Zhu, 2021). One of the objectives of this paper is to compare and contrast the current performance of state-owned and non-state-owned enterprises. Different from the existing literature, we proceed with firms' performance and responses following the recently launched national strategies in China, that is, the Belt and Road Initiative (the BRI) and its upgraded version, the Green Belt and Road Initiative (the green BRI). We find that the seemingly similar responses of SOEs and non-SOE under the same policy roof are actually driven by diverse mechanisms.

We focus our attention on the BRI because it is the most prominent foreign policy of China in recent years. Although the policy itself and its contributions to the growth and employment of the countries along the routes (the BRI countries, hereafter) have been discussed intensively, the unexpected burden of resource extractions and environmental emissions received less attention during the implementation of the BRI. In fact, the BRI is characterized by the infrastructure construction through China's outward direct investment (ODI). Infrastructure constitutes a key driver of economic growth and job creation but comes at a cost. If the BRI countries fall into unsustainable infrastructure construction and resource extraction, the BRI will generate long-lasting negative impacts on these countries' ecological environment, their neighbors, and the entire world.

To balance the short-run urgency of economic development and the long-run harmony with the environment in the BRI countries, China has been making progress in greening the BRI (Zhou, Gilbert, Wang, Cabre, & Gallagher, 2018). In particular, the Chinese government released the *Guidance on Promoting a Green Belt and Road* (the Guidance, hereafter) in 2017, a sweeping manifesto for sustainable development within the initiative, and formally provided a high-standard definition of the green BRI. In the same year, China also issued *The Belt and Road Ecological Cooperation Plan*, and sustainability became a core part of the official *Guiding Principles of Belt and Road Financing*.

In the wake of these policies, some studies find that the Guidance produced a strong policy effect on greening Chinese ODI in the BRI countries (e.g., Liu, Wang, Jiang, & Wu, 2020). However, it is still unknown whether and how the performance of the Chinese ODI enterprises is affected by the policy intention to green the BRI-related projects and whether SOEs and non-SOEs behave similarly. On the one hand, if ODI firms suffer losses because of the policy intention of the Guidance, it will undermine the sustainability of the policy, at least economically. This motivates us to explore the influence of the green BRI on Chinese ODI firms. On the other hand, the green BRI differs from environmental regulation policies. It advocates measures to guide and encourage Chinese enterprises to go green. Although the existing literature finds that appropriate environmental regulations can promote corporate innovation and competitiveness (Porter & van der Linde, 1995), it remains unclear whether the green BRI can affect ODI firms through similar or diverse mechanisms and whether SOEs and non-SOEs respond in the same way to the common policy shock. This encourages us to explore and compare the channels through which the identified impacts work.

Specifically, we regard the implementation of the green BRI (i.e., the Guidance and accompanying policies) as an exogenous policy shock to individual Chinese enterprises and employ a difference-in-difference (DID) method to identify the policy effects on the

performance of ODI enterprises. Our major findings are summarized here. First, the green BRI improved the overall performance of ODI enterprises in the BRI countries. Under our baseline identification strategy, this policy on average raises the return on asset (ROA) of the Chinese ODI firms by 0.004 (equivalent to 8.51% of firms' average ROA during the sample period), a number with both statistical and economic significance. The result is robust to various concerns regarding identification strategies, potential endogeneity, omitted variable bias, and alternative variable definitions. Second, the improvement of ODI firms' performance is primarily achieved through better financing conditions, technological innovation, and government subsidies induced by the green BRI. They improve firms' financial access with a lower cost, promote firms' technological upgrades and productivity, and raise direct funding support transferred from government agencies. Third, the impacts of the same policy demonstrate heterogeneity in terms of firm ownership. Although the green BRI generates positive impacts on both SOEs and non-SOEs, we find that only non-SOEs achieve better performance through better access to financing. Accordingly, only SOEs achieve improved performance through better compliance with the green BRI and the increased subsidies from government agencies. Both types of firms benefit from the pursuit of green technology upgrades. Although both SOEs and non-SOEs face similar motivations (i.e., profit maximization) and identical policy shocks, they respond differently and exhibit divergent transmission channels.

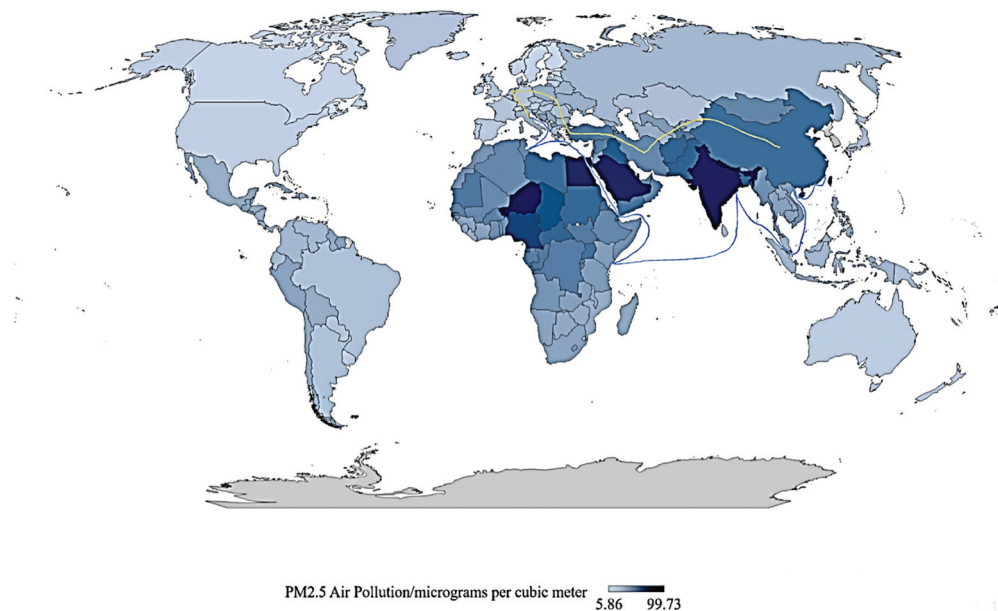
The major contribution of this paper is three-fold. First, we focus on the impacts of the recently proposed *green BRI*, an important but under-explored topic, and compare the performance of SOEs and non-SOEs through the lens of this policy shock. The existing studies paid more attention to the effects of the initial BRI. To the best of our knowledge, the impact of the green BRI has not been well explored (except on ODI in the energy sector by Liu et al., 2020). It also provides us a sound scenario to contrast the performance of SOEs and non-SOEs after four decades of reforms. Second, we provide *firm-level* evidence for the policy impacts of the green BRI. Among the previous studies concerning the BRI, scholars mainly concentrate on its macro effects on trade, foreign direct investment, economic growth, and emerging technologies but largely ignore its micro effects on the performance of ODI enterprises. The latter is important because it concerns the sustainability of firms' future behavior, hence the sustainability of the BRI. Third, we identify the channels through which the green BRI affects the performance of ODI firms and compare the responses of SOEs and non-SOEs. As an upgraded version of the initial BRI, the green BRI differs from pure environmental regulations. It is guiding and encouraging, not compulsory for firms to pursue green projects. Our work identifies the transmission mechanisms between the green BRI and firm performance from the perspective of corporate financing, technology innovation, and government support, whereas environmental regulations usually work through technology innovation only. Our work also reveals the divergent responses of SOEs and non-SOEs despite their seemingly similar reaction to the identical policy shocks.

The remaining part of this paper is organized as follows. [Section 2](#) provides background information on the implementation of the BRI and the green BRI. [Section 3](#) details data sources, the identification strategy, and variable definitions. [Section 4](#) discusses the empirical results with various robustness checks. [Section 5](#) explores the transmission mechanisms and compares the responses of SOEs and non-SOEs. [Section 6](#) concludes the paper.

## 2. The BRI and the Green BRI

In the existing literature, the BRI and its potential impacts have attracted global attention (Zhai, 2018). Many researchers tried to quantify the effects of the BRI on international trade (Baniya, Rocba, & Ruta, 2020; Bastos, 2020), foreign direct investment (Du & Zhang, 2018; Luo, Chai, & Chen, 2019), technological spillover (Deng, Wang, Li, & Liang, 2020), debt sustainability (Bandiera & Tsiropoulos, 2020), and economic growth (Yang, Huang, Huang, & Chen, 2020; Zhai, 2018). Most of the studies find that the BRI contributes to economic development of the countries along the routes.

While benefiting the economic growth and employment of the BRI countries, the implementation of the BRI has been accompanied by the unexpected burden of resource extractions and environmental emissions (Fang et al., 2021; Losos, Pfaff, Olander, Mason, & Morgan, 2019). The BRI covers 65 countries and most of them are severely challenged by environmental issues. Figure 1 shows the global air quality in 2017 measured by PM 2.5, sourced from WHO Global Household Energy database. The darker the color in the figure, the higher the PM 2.5 in that country/region. It shows that, most of the countries along the routes (the yellow and blue lines) have darker shaded areas, indicating a relatively severe degree of environmental pollution. In addition, the BRI covers a vast area stretching across 3 continents and 65 countries. They occupy approximately 40% of the earth's total land area and account for 55% of global CO<sub>2</sub> emissions. Without China, the remaining BRI countries still account for 26% of the global CO<sub>2</sub> emissions, and the number may grow to 50% by 2050 in the worst-case scenario according to Pike (2019). As mentioned earlier, the BRI is mainly implemented through China's ODI in the



**Figure 1.** Global air conditions in 2017. Notes: This figure depicts the global air pollution in 2017 based on PM<sub>2.5</sub> (micrograms per cubic meter). The yellow and blue lines represent the “Silk Road Economic Belt” and “21st-Century Maritime Silk Road”, respectively, hence the “Belt and Road”. The darker the color is, the more serious the pollution is in a country/region.

infrastructure along the Belt and Road routes. Infrastructure construction and operation enhance economic growth and create job positions but generate environmental costs at the same time. According to an estimate of World Bank, 70% of global greenhouse emissions are due to infrastructure construction (Standard Chartered, 2020).

The green BRI represents the efforts of China to promote growth along the BRI routes and its intention to build a more environmentally friendly BRI. In 2017, the Ministry of Ecology and Environment, the Ministry of Foreign Affairs, the National Development and Reform Commission, and the Ministry of Commerce jointly released the Guidance with other supportive documents, aiming to “promote green development, strengthen eco-environment protection, and jointly build a green silk road”.<sup>1</sup>

The green BRI is not an environmental regulation policy. Environmental regulations tend to impose direct requirement on firms to control pollution, make abatement investment, and meet the emission standard (Jaffe & Palmer, 1997; René & Serena, 2011). According to the “Pollution Halo Hypothesis”, appropriate environmental regulations can promote corporate innovation. The innovation may possibly offset the losses caused by environmental regulations and improve firms’ competitiveness (Porter & van der Linde, 1995). However, the green BRI attempts to guide and encourage Chinese enterprises to go green. As stated in the Guidance, the green BRI aims “to push China’s financial institutions, multilateral development agencies initiated and participated by China and relevant enterprises to adopt the principle of *voluntary* environment risk management so as to support green Belt and Road Initiative”, “to enhance green guidance for corporate behavior and encourage businesses to adopt *voluntary* measures”, and “to *guide* the environment-friendly industries with competitive edge to ‘go global’ in clusters”.<sup>2</sup>

The strong policy signal of the green BRI mainly targets the Chinese ODI enterprises investing along the routes. On the one hand, the green BRI encourages green credit to the environment-friendly ODI enterprises through better financial access and lower financing costs. On the other hand, the policy signal may encourage large enterprises to voluntarily adopt stricter environmental standards (Losos et al., 2019) and, in turn, pursue technological progress that leads to lower emission and higher productivity. These mechanisms are different from technological innovation induced by the pressure of environmental regulations. We attempt to explore whether and how the performance of the Chinese ODI enterprises is affected through these mechanisms.

### 3. Identification strategy and variable definitions

#### 3.1. Data sources

Our sample includes Chinese companies listed on the Shanghai or Shenzhen stock exchanges that conducted ODI during the period 2010 to 2019. The data comes from the China Stock Market Accounting Research (CSMAR) database, jointly produced by GTA Information Technology Co. Ltd, the University of Hong Kong, and the China Accounting and Finance Research Center of the Hong Kong

<sup>1</sup>The official document is available at [http://english.mee.gov.cn/Resources/Policies/policies/Frameworkp1/201706/t20170628\\_416864.shtml](http://english.mee.gov.cn/Resources/Policies/policies/Frameworkp1/201706/t20170628_416864.shtml).

<sup>2</sup>Please refer to footnote 1 for the link to the official document.



Polytechnic University. As one of the most widely used databases in academic research on China (Markóczy, Sun, Peng, Shi, & Ren, 2013), CSMAR provides specific information about the overseas affiliates of listed companies, including the registered place of the overseas affiliates, registered capital, the relationship with the parent company, and the holding ratio of the listed company. If (i) the affiliated relationship is a subsidiary of a listed company, a joint venture of a listed company, or an associated company of a listed company, (ii) the affiliated party is registered outside of Mainland China, and (iii) the holding ratio exceeds 10%, the listed company is regarded as an ODI firm.

We cleaned the data set by excluding firms with unusual operating profit margins (higher than 100% or lower than -100%), negative capital, or continuous losses (special treatment firms with the delisting risk). We also removed financial firms and winsorized firms' performance at the 1% and 99% percentiles. Table 1 reports the descriptive statistics of variables.

### 3.2. Identification strategy

We adopt a DID approach to evaluate the impact of the green BRI on Chinese ODI firms' performance. We consider the implementation of the green BRI as a quasi-natural experiment. In our baseline estimations, the first difference comes from ODI firms' performance between those placing their investment in the BRI countries and those in the non-BRI countries. The second difference comes from firms' performance before and after the implementation of the green BRI policy.

Different from the cross-sectional analysis, our estimations are based on panel data. As the green BRI was implemented in 2017, the time dummy (*Post*) takes 0 for years before 2017, and 1 otherwise. In the baseline case, we identify a firm to be "treated" by the green policy (*Treat* = 1) if it *only* made ODI in the BRI countries before the policy year. That is, we consider the impact of the green policy on BRI incumbents. If a firm made ODI *only* in the non-BRI countries throughout the sample period, it is incorporated into the control group (*Treat* = 0).<sup>3</sup> The baseline model is specified as follows:

$$Y_{it} = \beta_0 + \beta_1 \text{Treat}_i \cdot \text{Post}_t + \gamma X_{it} + \lambda_i + \delta_t + \varepsilon_{it} \quad (1)$$

where the subscript *i* represents the firm and *t* represents the year. *Y* represents firm's performance and *X* represents control variables.  $\lambda_i$  and  $\delta_t$  stand for firm and time fixed effects, respectively.  $\varepsilon_{it}$  is the random disturbance term.

Our regressor of interest is the interaction term between the treatment dummy (*Treat*) and the time dummy (*Post*). Its coefficient ( $\beta_1$ ) captures the policy impact of the green BRI on ODI firms' performance. In the baseline specification of Equation (1), the time dummy, *Post*, is a discrete variable. It indicates whether or not the green BRI was implemented at time *t* but cannot measure policy intensity, that is, how strongly the green BRI was promoted. To add this information, we follow Qi, Tang, Yin, and Zhao (2020) and resort to *People's Daily*, the flagship newspaper of the Chinese government and the key outlet of public policy

<sup>3</sup>We also consider alternative identifications in the robustness checks. See Section 4.3.1.



**Table 1.** Summary statistics.

Variables	Obs.	Mean	SD	Min	Max	Definition
ROA	11,677	0.047	0.060	-0.225	0.228	Firms' return on assets.
ROE	11,658	0.081	0.106	-0.440	0.360	Firm's return on equity.
ROIC	11,669	0.060	0.249	-7.394	21.228	Firm's return on invested capital.
<i>Treat</i>	11,677	0.151	0.358	0	1	<i>Treat</i> = 1 for ODI firms investing <i>only</i> in the BRI countries before the policy year. <i>Treat</i> = 0 for ODI firms investing <i>only</i> in the non-BRI countries throughout the sample period.
<i>Treat-eco</i>	11,675	0.065	0.158	0	0.693	For firms investing <i>only</i> in the non-BRI countries throughout the sample period. <i>Treat-eco</i> = 0 normalized frequency of eco-friendly keywords mentioned in the annual reports. <i>Treat-eco</i> = 0 for firms investing <i>only</i> in the non-BRI countries throughout the sample period.
<i>Treat-scale</i>	11,673	0.075	0.214	0	2.197	For firms investing <i>only</i> in the BRI countries before 2017, <i>Treat-scale</i> is the natural log of the average number of firms' overseas branches before 2017. <i>Treat-scale</i> = 0 for firms investing <i>only</i> in the non-BRI countries throughout the sample period.
<i>Treat-only</i>	8732	0.072	0.258	0	1	<i>Treat-only</i> = 1 for ODI firms investing <i>only</i> in the BRI countries throughout the sample period. <i>Treat-only</i> = 0 for ODI firms investing <i>only</i> in the non-BRI countries throughout the sample period.
<i>Post</i>	11,677	0.465	0.499	0	1	<i>Post</i> = 1 for observations after 2017 and 0 otherwise.
<i>Post-2017</i>	11,677	0.428	0.466	0	1	<i>Post-2017</i> = 2/3 for the year 2017 and takes the same values as <i>Post</i> for other years.
<i>Policyintensity</i>	11,677	3.413	3.661	0	7.637	<i>Policyintensity</i> is the natural log of times that "green BRI" was mentioned in <i>People's Daily</i> after 2017; <i>Policyintensity</i> = 0 before 2017.
<i>FC</i>	11,677	0.235	1.150	-5.457	30.917	A comprehensive financial constraint index a la Bellone et al. (2009) to reflect ODI firms' corporate financial constraints. The larger the index, the weaker the financial constraints faced by the ODI firms.
<i>Patent</i>	11,677	0.293	0.624	0.000	6.593	The lagged log value of the green patent applications.
<i>Subsidy</i>	10,523	0.369	2.550	-0.048	109.310	Various forms of transfers, subsidies, compensations, and/or awards related to technology innovation, environmental protection, building demolition and relocation, poverty reduction, culture and education, etc., from the government or different agencies of the government sector.
<i>SOE</i>	11,677	0.260	0.439	0	1	<i>SOE</i> = 1 for state owned enterprises and 0, otherwise.
<i>TFP</i>	11,673	17.918	5.865	2.351	23.705	Firms' total factor productivity (TFP) according to Levinsohn and Petrin (2003).
<i>Size</i>	11,677	3.931	8.189	0.052	28.636	Logarithm of firms' total assets.
<i>Age</i>	11,654	2.878	0.326	1.099	4.159	Year of observation minus the year of establishment.
<i>Lev</i>	11,677	0.562	0.232	-7.612	0.992	Ratio of a firm's year-end total assets minus total liabilities to assets.
<i>ROS</i>	11,677	0.253	0.187	-0.993	0.980	Ratio of a firm's operating profit to its operating income.

announcement in China. We searched the key word “green BRI” among all published articles on *People’s Daily* and constructed the variable *Policyintensity* as the natural log of times that “green BRI” was mentioned after 2017. Before the policy shock, the *Policyintensity* is equal to zero. Then we perform estimations for Equation (1) by replacing the policy dummy, *Post*, with the continuous measure, *Policyintensity*.

### 3.3. Variables

Following the literature, we adopt the return on assets (ROA) to measure firms’ performance which is less affected by firms’ financial leverage. In the robustness analysis of Section 4.3.5, we also take other measures into consideration.

In addition to the firm and time fixed effects, we follow the literature on foreign investment to further control for variables at the firm level. These control variables include firms’ total factor productivity (*TFP*) measured by the LP method (Levinsohn & Petrin, 2003), firm size (*Size*) measured by the logarithm of its total assets, firm age (*Age*) measured by the year of observation minus the year of its establishment, firm leverage (*Lev*) measured by the ratio of a firm’s year-end total assets minus total liabilities to assets, and operating profit margin (*ROS*) measured by the ratio of a firm’s operating profit to its operating income.

## 4. Empirical results

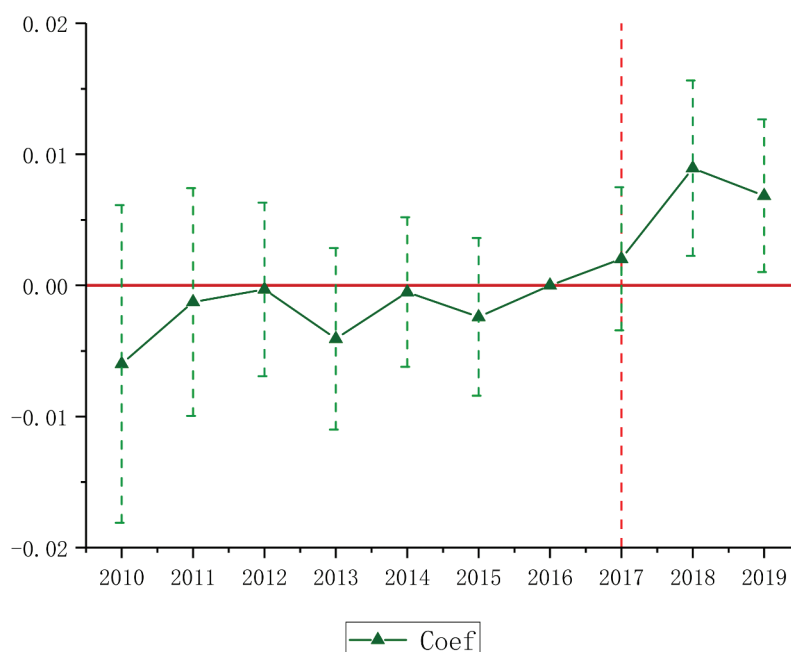
### 4.1. Parallel trend

One essential requirement of applying a DID strategy is that the treatment and control groups have similar trends before the policy shock. To check this, we follow Beck, Levine, and Levkov (2010) and Lu, Tao, and Zhu (2017) to conduct a parallel trend test:

$$Y_{it} = \beta_0 + \sum_{t=2010}^{2019} \beta_t \text{Treat}_i \cdot \text{Year}_t + \gamma X_{it} + \lambda_i + \delta_t + \varepsilon_{it} \quad (2)$$

where  $\text{Year}_t$  is a year dummy and other variables are identical to the baseline regression (1). We focus on the interaction between the year dummy  $\text{Year}_t$  and the treatment dummy  $\text{Treat}_i$ . Its coefficient ( $\beta_t$ ) measures the difference of firms’ performance between the treatment and control groups in period  $t$  (relative to a reference year, which is 2016 in our case). If  $\beta_t$  is not statistically significant, it implies the absence of significant difference between these two groups of firms in terms of their performance in period  $t$ .

We examine the changes of coefficients ( $\beta_t$ ) before and after the green BRI. As shown in Figure 2, all the differences (relative to the reference year) are insignificant before 2017, suggesting a parallel trend of firms’ performance between the treatment and control groups before the policy shock. Conversely, the coefficients become significant after 2017, suggesting a divergent trend of ODI firms’ performance between the treatment and control groups after the green BRI.



**Figure 2.** Parallel trend. Notes: This figure reports the results of the parallel trend test in Equation (2). The solid line represents  $\beta_t$ , the difference (relative to the reference year) between ODI firms' performance in the BRI and non-BRI countries in period  $t$ . The dashed lines represent the 95% confidence intervals. Estimated differences are insignificant before 2017, indicating that the performance of firms in the treatment and control groups follows the same trend before the policy shock.

## 4.2. Baseline results

Table 2 reports the baseline results of Equation (1). Columns (1) and (2) only include the interaction term, while Columns (3) and (4) further incorporate various control variables. In all cases, we incorporate firm and year fixed effects and have all standard errors clustered at the firm level.

In all columns, the coefficient of the core explanatory variable is positive and statistically significant. In our preferred case with two-way fixed effects and all control variables (Column 3), the coefficient of *Treat\*Post* is 0.004, which implies that the ROA of Chinese ODI firms investing in the BRI countries grows, on average, by 0.4% more than their counterparts investing in the non-BRI countries. According to Table 1, the average ROA during the sample period is 0.047. It implies that the implementation of the green BRI on average raises the level of ROA by  $0.004/0.047 = 8.51\%$ , hence producing statistically and economically significant impacts on Chinese ODI firms' performance. This finding is also verified by replacing the time dummy with the continuous measure of policy intensity. In Column (4) with two-way fixed effects, the coefficient of *Treat\*Policyintensity* is 0.001. For each 1% increase in accompanying policy intensity during the sample period, the ROA of China's ODI firms investing in the BRI countries is 0.1% higher than that of other ODI firms.

**Table 2.** Baseline estimations.

	(1)	(2)	(3)	(4)
<i>Treat*Post</i>	0.007*** (3.012)		0.004* (1.887)	
<i>Treat*Policyintensity</i>		0.001*** (2.976)		0.001* (1.871)
<i>TFP</i>			0.024*** (9.727)	0.024*** (9.727)
<i>Size</i>			0.012*** (6.099)	0.012*** (6.100)
<i>Age</i>			−0.020*** (−3.875)	−0.020*** (−3.874)
<i>Lev</i>			0.073*** (4.384)	0.073*** (4.384)
<i>ROS</i>			0.221*** (27.071)	0.221*** (27.072)
Constant	0.046*** (273.330)	0.046*** (275.096)	−0.477*** (−7.662)	−0.477*** (−7.662)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	11,475	11,475	11,447	11,447
R-squared	0.549	0.549	0.693	0.693

Notes: This table reports the results of the baseline estimations of Equation (1). The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

### 4.3. Robustness checks

One may argue that our baseline identification strategy is not without problems. For example, the green BRI may hinge on the initial BRI; there may be unobserved and omitted variables that drive the results; the treatment effects may be endogenous; and the policy effects may not be comparable between the treatment and control groups due to different firm characteristics. In this section, we attempt to address these concerns.

#### 4.3.1. Alternative identification strategies

In the baseline estimations, a treated firm must make ODI only in the BRI countries before the policy year. It examines the effect of the green BRI on China's incumbent investors. The identifying assumption is that the BRI investment before 2017 is independent of the green policy. An alternative identification strategy is to focus on the incumbent BRI investors and find their different exposure to the environmental policy of foreign investment.<sup>4</sup> In particular, we resort to the method of text analysis. We develop our crawlers to crawl pre-defined keywords related to eco-friendliness in the annual reports of all listed companies in our sample before 2017.<sup>5</sup> By aggregating the frequency of keywords, we calculate the average word frequency for each company and use their normalized metric as a proxy for eco-friendliness of BRI investors up to 2017 (*Treat-eco*). We use this proxy to measure the extent to which a firm can be treated by the green policy. The idea is that an eco-friendly firm may better comply with the green policy (positive treatment) and less likely be “punished” by the financial institution, capital

<sup>4</sup>We would like to thank an anonymous referee for pointing this out to us.

<sup>5</sup>The crawlers consider 18 keywords including green, environmental protection, energy saving, emission reduction, pollution, sustainability, recycling, clean production, renewable, green consumption, ecological civilization, new energy, etc.

market, or government agencies (negative treatment) as we discussed later in [Section 5](#). Then the dummy variables, *Treat*, in the baseline treatment group is replaced by the continuous measure, *Treat-eco*, and stays unchanged in the control group. Such an identification strategy mainly focuses on firms' environmental specifics instead of investment scope as in the baseline case.

In the second case, we follow a similar spirit but concentrate on firms' ODI scale before 2017 to capture their different exposure to the green policy. In particular, we turn to the average number of firms' overseas branches (including firms' subsidiaries, associated companies, and joint ventures) before 2017 as firms' exposure to the policy intensity. A firm with more ODI is expected to be more intensively affected by the green policy through its on-going ODI projects. Then we replace the dummy variable, *Treat*, in the baseline treatment group by the continuous measure, *Treat-scale*, and keep it unchanged in the control group.

In the third case, we pay special attention to the policy year 2017. In particular, the *Guidance* was officially released in April, 2017. Two thirds of the year of 2017 falls within the post-policy period. In this case, we set the variable *Post* = 2/3 in the year of 2017 and keep others unchanged as in the baseline setup and re-estimate Equation (1).

In the fourth case, we refine the treatment group in the baseline setup. Some ODI firms stop investing in the BRI countries or switch to the non-BRI countries after the green BRI. In this case, we exclude this kind of firms from the treatment group and explore the policy effects on those ODI firms that only invest in the BRI countries both before and after the policy shock.

[Table 3](#) summarizes the estimation results. Columns (1) and (2) perform continuous DID estimations identified by firms' pre-policy eco-friendliness and ODI scales, respectively. As expected, the green policy exerts more impacts on environmentally friendly ODI firms. Column (3) splits the policy year and the results are very close to the baseline estimations. Columns (4) and (5) refine the treatment group and the estimates are higher

**Table 3.** Alternative identifications.

	Continuous DID		Post-2017	Refine Treatment Group	
	(1)	(2)	(3)	(4)	(5)
<i>Treat-eco*Post</i>	0.007* (1.681)				
<i>Treat-scale*Post</i>		0.011*** (3.224)			
<i>Treat*Post-2017</i>			0.004* (1.884)		
<i>Treat-only*Post</i>				0.012*** (2.987)	
<i>Treat-only*Policyintensity</i>					0.002*** (2.983)
Controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	11,445	11,439	11,447	8,353	8,353
R-squared	0.693	0.693	0.693	0.702	0.702

Notes: This table reports the results of the estimations of Equation (1) for alternative identification strategies. Columns (1) and (2) perform continuous DID estimations identified by firms' pre-policy eco-friendliness and ODI scales, respectively. Column (3) splits the policy year and Columns (4) and (5) refine the treatment group. The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

than in the baseline estimations. This is due to the change of investment destinations of some firms. These firms invested in the BRI countries only before the policy but stopped doing so or switched their ODI to non-BRI countries after the green policy. They used to receive higher returns from their ODI before the green BRI; hence, the removal of these firms from the treatment group raises the identified policy effects. All these estimates lend support to the robustness of the baseline results.

#### 4.3.2. A placebo test: random sampling

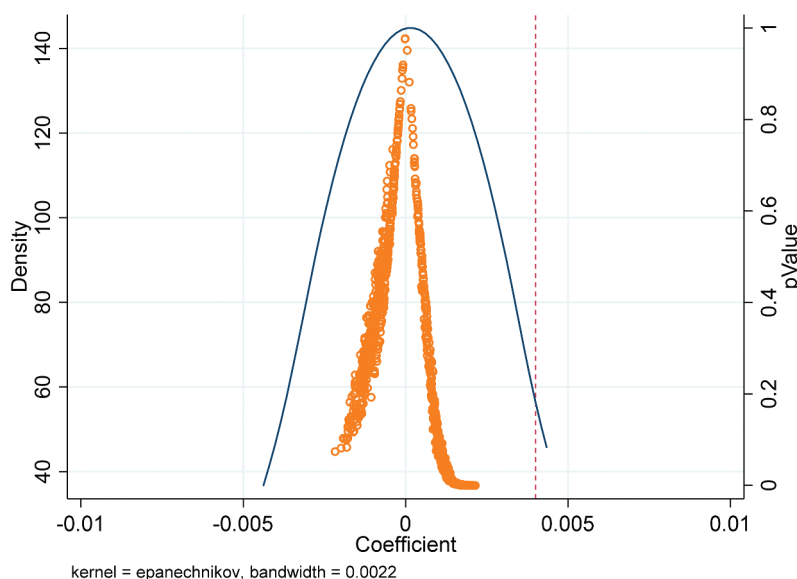
The second concern about our baseline identification strategy lies in whether the identified effects are driven by the green BRI policy. For instance, the distinction between the treatment and control groups may coincide with other unobserved (policy or non-policy) factors, independent of the BRI. The identified effects may be induced by other shocks, not necessarily the green BRI. To address these concerns, we follow Liu and Lu (2015) and conduct a placebo test. That is, we randomly generate a year of the green BRI policy and randomly draw 208 out of 2095 firms to construct a *false* treatment group, and then re-estimate the baseline model using the placebo policy year and the placebo treated firms.<sup>6</sup> We repeat this exercise 2000 times. If the identified effects in the baseline regressions are driven by the distinction between ODI in the BRI and non-BRI countries, we would find that most of the 2000 coefficients of the placebo interactive term are close to zero and not systematically different from zero. Figure 3 reports the distribution of the estimated coefficients of the placebo interactive term (the orange circles). It also plots the estimated empirical density function (on the left scale) using the Epanechnikov kernel with the optimal bandwidth given by cross-validation. As shown by the figure, most of the estimates are very close to zero with corresponding p-values larger than 0.1 (on the right scale). The average value of the estimated coefficient is 0.00005 which is not statistically different from zero; while our baseline estimate (i.e., 0.004) is well beyond the 95% percentile of the 2000 placebo estimates (i.e., 0.0023). This exercise shows that the identified effects in the baseline regression result from the distinct impacts of the green policy on the ODI firms investing in the BRI and non-BRI countries, and are less likely driven by other unobserved factors.

#### 4.3.3. Instrumental variable estimations

Another concern about our identification strategy involves the potential endogeneity of the treatment effects. One may argue that the Green BRI policy hinges on the initial BRI and is not random. It is also possible that ODI firms are located in cities that place more emphasis on environmental protection, which not only facilitates the release of the green policy but also induces firms to transfer their projects to BRI countries through ODI, resulting in a reverse causality problem. We resort to the instrumental variable and two-stage least square (2SLS) estimations to address its impact.

We use the thermal inversions (*TI*) as an instrumental variable of *Treat*. Existing studies have shown that the intensity of temperature inversion can significantly reduce air quality and bring about environmental pollution (Chen et al., 2018; Fu, Brian, & Zhang, 2021). When the temperature inversion occurs, air pollutants are aggravated because of the difficulty to disperse. As a result, temperature inversion is highly correlated with the degree

<sup>6</sup>There are 208 firms in the treatment group in the baseline estimation. We randomly draw the same amount of firms for each false treatment group in the placebo test.



**Figure 3.** Distribution of coefficients of the placebo interactive term. Notes: This figure reports the distribution of the coefficients of the placebo interactive term based on random sampling. In the estimation, both the placebo year of the green BRI policy and the placebo treated firms are randomly drawn to construct the false treatment group. We repeat the exercise 2000 times. Each circle stands for an estimate of the coefficient of the placebo interactive term with its p-value indicated by the right scale. The solid line shows the fitted empirical density function of the distribution of the coefficients of the placebo interactive term on the left scale.

of local air pollution in Chinese cities. As China attaches increasing importance to environmental quality, pollution has become an important criterion for promoting leaders (Wu & Cao, 2021). The more serious the environmental pollution, the greater the pressure and incentive for environmental regulation. According to the “Pollution Haven Hypothesis”, environmental regulation increases the cost of environmental governance, reduces profit margins, causes the cost of environmental regulations exceeding the compensation effect of innovation (Hanna, 2010), and eventually leads to the industrial transfer through ODI. Therefore, firms locating in polluting cities have more incentives to make ODI abroad and BRI countries become their important choice of destinations since 2013. At the same time, the intensity of temperature inversion is an exogenous meteorological variable. There is no well-documented evidence that it will directly affect firms’ performance. Therefore, *TI* meets the requirement of relevance and exclusivity for an instrumental variable.<sup>7</sup>

The first-stage estimation results are shown in Columns (1) and (3) in Table 4. Both coefficients are positive and statistically significant. *TI* is associated with a higher possibility of investing abroad in the BRI countries, or being treated by

<sup>7</sup>As an alternative, we also use the degree of urbanization, proxied by the logarithm of nighttime light in the city where the ODI firm is located ( $\ln DN$ ), as an instrumental variable of *Treat*. Existing studies have shown that the promotion of urbanization worsens the ecological environment and increases pollution (Glaeser & Kahn, 2010). Firms from these places have more incentives to invest abroad, including those BRI countries. Moreover, the satellite data of nighttime light comes from the observation of DMSP/OLS satellites, relatively exogenous to the performance of specific firms from these cities. The nighttime light affects firms’ ODI decisions through different reasons but reaches qualitatively similar results.



**Table 4.** Instrumental variable estimations.

	(1)	(2)	(3)	(4)
	<i>Treat*Post</i>	<i>ROA</i>	<i>Treat*Policyintensity</i>	<i>ROA</i>
<i>Tl*Post</i>	0.059*** (3.154)		0.427*** (3.107)	
<i>Treat*Post</i>		0.124** (2.176)		
<i>Treat*Policyintensity</i>				0.017** (2.160)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Kleibergen-Paap F	169.405		169.079	
Observations	10,777	10,777	10,777	10,777

Notes: This table reports the results of instrumental variable estimations of Equation (1). Thermal inversion (*Tl*) is used to instrument the treatment effects. The Kleibergen-Paap F statistics are reported in the first-stage estimations in Columns (1) and (3). The second-stage estimations are reported in Columns (2) and (4). The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

the green policy. The Kleibergen-Paap F statistics are 169.405 and 169.079, respectively, well beyond the 10% critical value of 16.38, and reject the hypothesis of a weak instrumental variable. Columns (2) and (4) in Table 4 report the second-stage estimation results. Both coefficients are significantly positive at the 5% level, lending support to the robustness of the baseline regression.

#### 4.3.4. Propensity score matching

Another potential distortion to our baseline identification comes from different firm characteristics between the treatment and control groups, which could influence ODI firms' choice of countries to invest in and bring about a "self-selection effect". To account for the possible selection bias brought by diverse firm characteristics, we use a combination of propensity score matching (PSM) and DID method to re-estimate the model.

Specifically, we first estimate a logit model with the same set of control variables as in the baseline regression (1) to obtain each firm's likelihood of investing in a BRI country (propensity scores). Based on these firms' scores, we then construct the control group by matching corresponding firm(s) for each firm from the treatment group. We employ two matching methods. One is the nearest neighbor matching, which matches each firm in the treatment group with its nearest neighbor among firms investing only in the non-BRI countries (i.e., the non-treated firm with the closest score to the treated firm). The other one is radius matching, which specifies the maximum propensity score difference (the radius) and matches each firm from the treatment group with firms investing only in the non-BRI countries and lying in the specified radius.

Table 5 reports the balance diagnostic of the two matching methods. In both cases, the *t* statistics suggest that firms in the treatment and control groups do not exhibit systematic differences in terms of the same set of covariates as in Equation (1) after the matching process. It weakens the possible sample selection bias. Table 6 reports the DID estimation results of Equation (1) after we perform PSM. Columns (1) to (2) are based on the nearest neighbor matching and Columns (3) to (4) are based on radius matching. In

**Table 5.** Balance diagnostics of PSM.

Panel A: Nearest Neighbor Matching						
Covariates	U or M	Treat	Control	%bias	t statistics	p values
<i>TFP</i>	U	18.104	17.880	3.70	1.47	0.141
	M	18.104	18.085	0.30	0.09	0.930
<i>Size</i>	U	4.284	3.876	4.90	1.93	0.054
	M	4.284	4.288	−0.10	−0.02	0.987
<i>Age</i>	U	2.896	2.875	6.80	2.53	0.011
	M	2.896	2.908	−3.90	−1.17	0.244
<i>Lev</i>	U	0.513	0.571	−26.70	−9.77	0.000
	M	0.513	0.505	3.80	0.92	0.359
<i>ROS</i>	U	0.215	0.259	−25.20	−9.22	0.000
	M	0.215	0.213	0.90	0.27	0.787
Panel B: Radius Matching						
Covariates	U or M	Treat	Control	%bias	t statistics	p values
<i>TFP</i>	U	18.104	17.880	3.70	1.47	0.141
	M	18.104	18.124	−0.30	−0.10	0.923
<i>Size</i>	U	4.284	3.876	6.80	2.53	0.011
	M	4.284	4.246	0.30	0.08	0.940
<i>Age</i>	U	2.896	2.875	6.80	2.53	0.011
	M	2.896	2.895	0.30	0.08	0.940
<i>Lev</i>	U	0.513	0.571	−26.70	−9.77	0.000
	M	0.513	0.513	−0.10	−0.02	0.980
<i>ROS</i>	U	0.215	0.259	−25.20	−9.22	0.000
	M	0.215	0.215	−0.20	−0.05	0.957

Notes: This table reports the sample means for the treatment group (Treat) and control group (Control) before (U) and after (M) performing the propensity score matching. Panels A and B are based on the nearest neighbor matching and radius matching, respectively. The last two columns report the t statistics and p values for the test of the difference between the treatment and control groups.

**Table 6.** Propensity score matching.

	Nearest Neighbor Matching		Radius Matching	
	(1)	(2)	(3)	(4)
<i>Treat*Post</i>	0.006*** (2.776)		0.003* (1.810)	
<i>Treat*Policyintensity</i>		0.001*** (2.738)		0.001* (1.794)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	11,439	11,439	11,445	11,445
R-squared	0.602	0.601	0.696	0.696

Notes: This table reports the results of the estimations of Equation (1) using PSM-DID method. Columns (1) to (2) are based on the nearest neighbor matching; Columns (3) to (4) are based on the radius matching. The t statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

all four cases, the coefficients of both *Treat\*Post* and *Treat\*Policyintensity* remain positive and take values close to the baseline estimates in Table 2. This finding suggests a weak impact of the self-selection bias, supporting the robustness of the baseline results.

#### 4.3.5. Alternative explained variables

Finally, we also consider the robustness of the baseline results to alternative measures of firms' performance. We use the return on equity (ROE) and the return on invested capital (ROIC) as alternative measures. We re-estimate Equation (1)

**Table 7.** Alternative explained variables.

	ROE		ROIC	
	(1)	(2)	(3)	(4)
<i>Treat*Post</i>	0.024** (2.492)		0.011* (1.892)	
<i>Treat*Policyintensity</i>		0.001** (2.098)		0.002* (1.888)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	11,427	11,427	11,438	11,438
R-squared	0.617	0.617	0.196	0.196

Notes: This table reports the results of the estimations of Equation (1) for alternative measures of firm performance, that is, the return on equity (ROE) and the return on invested capital (ROIC). The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

and report the results in Table 7. Again, the estimated coefficients of *Treat\*Post* and *Treat\*Policyintensity* remain positive with both statistical and economic significance.

## 5. Working mechanisms and ownership heterogeneity

Our empirical results have shown that the green BRI promotes the performance of Chinese ODI firms investing in the BRI countries. In this section, we explore how this happens. We first turn to the Guidance and find potential channels through which the green BRI affects firms' performance. Then following the literature (e.g., Chen et al., 2018; Flückiger, Hornung, Larch, Ludwig, & Mees, 2021), we re-estimate Equation (1) by replacing the outcome variable with possible channel variables to examine the mediation effects of potential channel variables that connect green BRI to firms' performance. Based on that, we further explore whether SOEs and non-SOEs respond similarly to the common green BRI policy shock.

### 5.1. Corporate financing

Despite the comprehensive terms and conditions introduced in the Guidance, we identify three plausible mechanisms. The first one results from the encouragement in the Guidance on the provision of green credit and funding support through the Asian Infrastructure Investment Bank (AIIB), the Silk Road Fund (SRF), and the South-South Cooperation Fund. Contrary to market-based financial intermediaries, these funding facilities play a different role (Zhou et al., 2018). Environmentally friendly ODI to the BRI countries is likely to obtain more loans with lower costs.

In addition to these official funding facilities, the Guidance emphasizes that government and commercial financial institutions share information on firms' environmental protection, which links firms' environmental practices to their credit access to commercial financial institutions. As the green credit provided by these financial intermediaries concentrates on corporate environmental and social responsibility, a prudent investigation of firms' environmental performance becomes a key

step during project financing. Meanwhile, the behavior of financial intermediaries also conveys a strong signal to the capital market. External investors receive more information about firms' environmental practices and reduce information asymmetry by observing the behavior of financial intermediaries.

Essentially this policy design allows firms with better compliance with the Guidance to enjoy preferential loans with reduced costs from official funding facilities, financial intermediaries, and capital market. On the contrary, heavy-polluting firms may face indirect punishment, that is, higher financing costs with limited financial access to both indirect and direct financing channels. Due to the importance of multiple funding channels for ODI firms (e.g., Buch, Kesternich, Lipponer, & Schnitzer, 2014; Helpman, Melitz, & Yeaple, 2004), they have incentives to follow the Guidance. We expect that the green BRI eases firms' credit constraint, hence promoting their performance.

To examine the channel of corporate financing, we construct a comprehensive index *a la* Bellone et al. (2010) to reflect ODI firms' corporate financial constraints. Among the indicators considered, the net cash flow ratio (net cash flow divided by net fixed assets) reflects the internal financial constraint. Firm size (the logarithm of total assets), liquidity ratio (current assets divided by current liabilities), and solvency (fixed assets divided by total liabilities) represent external financial constraint. The net sales margin (net profit divided by operating income) measures profitability. Each financial indicator captures a particular dimension of firms' financial constraint; we rely on the principal component analysis to construct the financial constraint index (*FC*). The *larger* the index, the *weaker* the financial constraints faced by the ODI firms.

Column (1) in Table 8 reports the estimated relationship between the green policy and firms' financial constraints (*FC*). The coefficient of the core interactive term is positive with statistical significance, suggesting that the implementation of the green BRI significantly reduced the financing constraints of ODI firms. This finding verifies our earlier conjecture that the green BRI can promote ODI firms' performance by alleviating their financing constraints.

**Table 8.** Working mechanism.

	<i>FC</i>	<i>Patent</i>	<i>Subsidy</i>
	(1)	(2)	(3)
<i>Treat*Post</i>	0.207*** (8.778)	0.180*** (7.500)	0.138* (1.812)
Controls	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	11,447	11,447	10,228
R-squared	0.727	0.550	0.717

Notes: This table reports the results of estimations of Equation (1) by replacing the outcome variable with possible channel variables. Columns (1) examine the channel of corporate financing, where the variable *FC* measures the constructed (inverse) index of financial constraint. Columns (2) examine the channel of green innovation, where the variable *Patent* measures the (lagged) log number of firms' green patent applications. Columns (3) examine the channel of government subsidies, where the variable *Subsidy* measures the amount of government subsidies and transfers. The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

## 5.2. Green innovation

The second channel comes from the higher standard on firms' cleaning capability put forward by the Guidance. The green BRI encourages ODI firms to improve their production technology and reduce pollutant emissions. Although new technology improves productivity, firms may be reluctant to make technological innovation because technology upgrade is costly. The green BRI, on the one hand, motivates firms to adopt cleaner production technology to receive green funds with reduced costs from financial intermediary and capital market. This compensates the cost of technological innovation in the short run and the resulting higher productivity improves firms' performance in the long run. On the other hand, compliance with the green BRI maintains or enhances firms' competitive advantages against their peers. Although the green BRI does not directly prohibit firms' ODI like traditional environmental regulations do, failure to follow the Guidance reduces their opportunities due to the diminishing competitiveness compared to those who pursue green and upgrade technologies.

To measure firm's innovation, we resort to their number of green patent applications. Due to the time lag in the process of patent application, we use the lagged value of the green patent applications (*Patent*) in our estimations. The results are summarized in Column (2) in Table 8. The coefficient of *Treat\*Post* remains significantly positive. This finding shows that the implementation of the green BRI promotes corporate performance by stimulating their green innovation.

## 5.3. Government subsidy

In addition to the eased financial constraint and technology innovation, we also notice that the Guidance emphasizes the joint funding support from the central government, local government, and private sector to ODI firms, in particular to those investing in the BRI countries. This type of funding support differs from the channel of eased financing constraint originating from the official and commercial financial intermediaries or capital market. Rather, it is less market-oriented and directly sourced from the government or different agencies of the government sector. In practice, this type of support may take various forms, including government transfers, subsidies, compensations, and/or awards related to technology innovation, environmental protection, building demolition and relocation, poverty reduction, culture and education, etc. Intuitively, qualified ODI firms are more capable of performing better due to various forms of direct subsidies from the government agencies.

The impact of subsidies is summarized in Column (3) in Table 8. As expected, the coefficient of *Treat\*Post* is significantly positive. As encouraged by the Guidance, the green BRI motivates direct funding support of different levels of government agencies to ODI firms, which promotes their performance although in a less market-oriented way.

## 5.4. SOEs versus Non-SOEs

We have shown that the green BRI improves firms' financing conditions and stimulates their green technological upgrades and access to government subsidies, leading to improved performance. An interesting question we ask here is that, should we expect

more homogeneous behavior of SOEs and non-SOEs after four decades of economic reform? The implementation of the green BRI provides us a unique perspective to contrast their responses.

We re-estimate the baseline model in Equation (1) using the sub-samples of SOE and non-SOEs and report all results in Table 9. In Columns (1) and (2), the dependent variable is firms' performance (e.g., *ROA*). In both cases, *Treat\*Post* generates significantly positive impacts on *ROA*, implying that the green BRI has promoted the overall performance of both SOEs and non-SOEs. SOEs are able to respond as well as non-SOEs and improve their performance in the face of the same policy shock.

However, as we investigate further the working channels that link the green BRI to firms' performance, we find that the similar impacts of the green policy shock mask the divergent responses of SOEs and non-SOEs. In the remaining columns of Table 9, we replace the dependent variable with one of the three channel variables examined in Section 5. Columns (3) and (4) contrast the different efforts of SOEs and non-SOEs in complying with the green BRI to gain financing advantages. Although both SOEs and non-SOEs *can* obtain the benefits, only non-SOEs have chosen to respond to this channel significantly. Columns (5) and (6) show that the channel of technology upgrades of the green BRI works for both SOEs and non-SOEs.

Compared to SOEs, non-SOEs seem to have more incentives of following the green BRI to gain benefits of eased financing constraints. By contrast, Columns (7) and (8) tell a different story about government subsidies. The insignificant coefficient of *Treat\*Post* for non-SOEs in Column (8), compared to the significance of the same coefficient at the 5% level for SOEs in Column (7), reveals that the various support of government funding has only significantly benefited SOEs after the green BRI, and eventually contributes to their performance.

How do we understand the divergent responses of SOEs and non-SOEs under the same policy roof of the green BRI? On the one hand, the green BRI has produced a positive impact on both types of firms. As a non-compulsory guiding policy, the green BRI relies on the market to influence firms' behavior. The on-going economic reforms have gradually empowered Chinese firms to observe and respond to market signals in the process of profit maximization. This gives rise to similar observed impacts

**Table 9.** Ownership heterogeneity.

	SOEs	Non-SOEs	SOEs	Non-SOEs	SOEs	Non-SOEs	SOEs	Non-SOEs
	<i>ROA</i>		<i>FC</i>		<i>Patent</i>		<i>Subsidy</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Treat*Post</i>	0.006** (2.027)	0.004* (1.823)	0.025 (1.317)	0.246*** (7.577)	0.321*** (5.666)	0.166*** (6.096)	0.824** (2.129)	0.023 (1.145)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,969	8,031	2,969	8,031	2,969	8,031	1,797	8,031
R-squared	0.656	0.627	0.885	0.720	0.606	0.507	0.784	0.386

Notes: This table reports the divergent transmission channels through which SOEs and non-SOEs respond to the policy shock. The dependent variable is *ROA* in Columns (1) and (2); it is changed to financial constraints (*FC*) in Columns (3) and (4), patent applications (*Patent*) in Columns (5) and (6), and government subsidies (*Subsidy*) in Columns (7) and (8). The *t* statistics are reported in the parenthesis. \*\*\*, \*\*, \* represent significance levels of 1%, 5%, and 10%, respectively. Standard errors are clustered at the firm level.

of the green BRI on both types of firms. On the other hand, although reforms in the past four decades have gradually reduced institutional discrimination against non-SOEs and corporatized all SOEs, ownership heterogeneity still accounts for profound differences in the behavior of SOEs and non-SOEs. Our analysis suggests that, although both SOEs and non-SOEs benefit from green technological innovations, SOEs rely further on government subsidies than on financing benefits, while the opposite is true for non-SOEs.

To some extent, this reflects the long-term advantage of state ownership in terms of access to resources, scale of operations, and implementation of national strategies. SOEs have long enjoyed preferential access to abundant credit relative to non-SOEs (Liu et al., 2021; Ru, 2018), which has reduced the need of SOEs to comply with the green BRI for easier access to green credit. Accompanied with their policy orientation and large size, SOEs are better suited than non-SOEs to fulfil the country's international investment, cooperation, and negotiations strategies (Guo, Jiang, & Shi, 2018; Zhang & Zhang, 2016). In this process, SOEs become qualified for various forms of funding support from government agencies, which directly improves their performance. In sharp contrast, non-SOEs are not born with the above ownership advantages. They have to chase technology that helps them receive green funds in the short run and improves their productivity in the long run.

## 6. Conclusions

The Belt and Road Initiative has been an essential strategy promoted by the Chinese government in recent years. It contributes to the economic growth and job creation of the BRI countries but brings concerns on the ecological and environmental issues. The green BRI, launched in 2017, represents China's efforts to balance the economic development and ecological harmony. Contrary to existing studies on the impact of the initial BRI or the aggregate impact of the green BRI, we focus on the influence of the green BRI on individual ODI firms in the BRI countries because firms' performance fundamentally determines the sustainability of the BRI. Moreover, the green BRI provides us a unique perspective to compare and contrast the behavior of SOEs and non-SOEs. We pay special attention to their responses under the same policy roof and examine whether state ownership still matters in the propagation of policy after a prolonged process of marketization.

To identify the policy impacts of the green BRI, we adopt a DID method by considering the green BRI as a quasi-natural experiment. Our study finds that the green BRI improves the performance of the ODI enterprises investing in the BRI countries. The results do not change with alternative identification methods, estimation methods, or variable definitions and pass the placebo test with randomly generated treatment groups and policy years. We show that the green BRI facilitates firms' corporate financing, motivates their technological innovation, brings about government subsidies, and eventually promotes their performance.

Despite the similar improvement of performance during the propagation of the green BRI, SOEs and non-SOEs prefer and proceed with different channels. In addition to technology upgrades, the SOEs manage to improve their performance by receiving subsidies, while non-SOEs intend to respond more by chasing green credit. This difference has a strong reason in the process of economic traditions and reforms. The market-



oriented reforms endow both SOEs and non-SOEs with the modern enterprise management and motivations to maximize profits based on the property rights and market rules. However, because the initial advantage is not the same, SOEs intend to inherit and expand their advantage of resource acquisition. Under the pressure of the green BRI, fulfilling national strategies and receiving government subsidies become a feasible way to maximize profits while meeting green policy requirements. For non-SOEs, despite the successful reforms to weaken discrimination, non-SOEs are still not comparable to SOEs in terms of accessing resources from the outside; instead, chasing low-cost green credit and pursuing technology upgrades are more reliable ways to build competitive advantages from the inside. Compared to SOEs' reliance on access to resources, the easing of financial constraints and technological upgrades have raised the productivity of non-SOEs and may help them catch up with SOEs in the long run.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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