

# The Belt and Road Initiative and Green Productions: Evidence from Chinese Overseas Industrial Parks

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(CEA) Beijing 2025 Annual Conference

18<sup>rd</sup>- 20<sup>th</sup> April 2025

## Overseas Economic and Trade Cooperation Zone(OETCZs)

- Industrial parks invested and built by Chinese enterprises in overseas regions.
- The zone offers complete infrastructure, industry-specific ecosystems, one-stop administrative services, and business-supporting amenities *et al.*
- Spillover benefits to local economies (job creation, technology transfer *et al.*)
- Most of the parks are located in countries or regions along the Belt and Road
- By 2018, these zones had attracted \$36.6 billion in investments, with over four-fifths going to Belt and Road countries..
- The Chinese government has placed high importance on green development, issuing policies in both 2017 and 2022 to emphasize making green the defining feature of Belt and Road cooperation.

## Motivations

- OETCZs have increasingly demonstrated their indispensable role in BRI, **servicing as crucial platforms** for BRI implementation
- Functioning as international cooperation hubs linking China with host countries, these zones **provide a gateway for Chinese enterprises** to "go global."
- The development of OETCZs consistently adheres to the new development philosophy of "**innovation, coordination, green development, openness, and shared benefits.**"

Indicator	2016	Spe.2018	This Study
Total Zones	77	113	201
<b>Zones in BRI Countries</b>	<b>56 (72.7%)</b>	<b>82 (72.6%)</b>	<b>138 (68.7%)</b>
Total Cumulative Investment (USD billion)	241.9	366.3	—
<b>Investment in BRI Countries (USD billion)</b>	<b>185.5 (76.7%)</b>	<b>304.5 (83.1%)</b>	—

## Motivations

- Investigating whether China's overseas economic and trade cooperation zones along the Belt and Road can promote the synergistic development of host countries' economies and environments.
- Validating the practical outcomes of China's new development philosophy - "innovation, coordination, green development, openness and sharing" - in these overseas industrial parks
- Providing policy references for advancing high-quality Belt and Road cooperation.

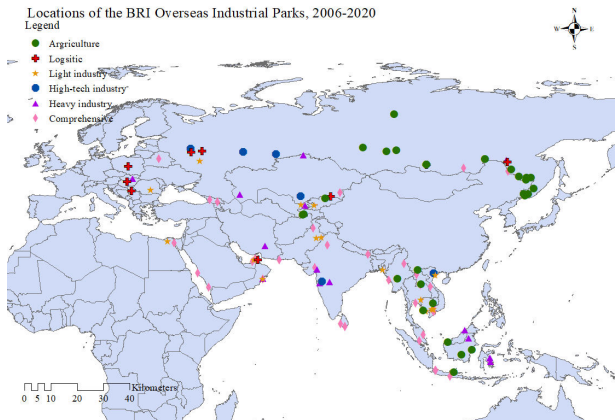
### This paper examines:

- The causal relationship between the establishment of China's overseas economic cooperation zones and host countries' GTFP growth.
- The underlying mechanisms driving this beneficial impact.

## Contributions

- This study systematically investigates the impact of China's overseas economic cooperation zones on host countries' GTFP growth, thereby addressing a critical gap in existing literature that has largely neglected environmental effects.
- This study explores the underlying mechanisms through which cooperation zones foster sustainable development in host countries
- This study employs various multi-period Difference-in-Differences (DID) approaches rigorously examine heterogeneous treatment effects in staggered policy adoption, ensuring robust and reliable conclusions.

## Research samples



- List of 138 Chinese Overseas Industrial Parks along the BRI
- Economic, Environmental, Infrastructure, and Renewable Energy Patent Data for BRI Countries (2006-2020)

## Methodology

- GTFP growth measurement, we use the SBM-DDF-GML index to calculate GTFP growth.
- Those countries that host Chinese industrial parks along the BRI (treatment group) are the treated group. The dummy '*time*' is also introduced after the establishment of the first Chinese industrial park (post-treatment) in the host country. Therefore, our core treatment variable is  $\text{COCZ} = \text{country} * \text{time}$ .
- Quasi-experiment analysis: We estimate the causal impact using the following model:

$$\text{GTFP}_{it} = \alpha_0 + \alpha_1 \text{COCZ}_{it} + \alpha_2 X_{it} + \delta_i + \varphi_t + \varepsilon_{it}$$

## Baseline results

Table 1: Baseline regression results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
cocz	0.019** (0.009)	0.018** (0.009)	0.019** (0.009)	0.020** (0.009)	0.018** (0.008)	0.018** (0.008)	0.019** (0.008)
lnurban		0.104* (0.053)	0.074 (0.057)	0.073 (0.057)			0.066 (0.068)
lnmanu			0.023 (0.015)	0.027* (0.014)			0.023 (0.015)
goveff				-0.020* (0.010)			-0.014 (0.013)
ln_trade					-0.019 (0.015)	-0.018 (0.015)	-0.014 (0.016)
wto_o					-0.032** (0.014)	-0.032** (0.014)	-0.026* (0.014)
ln_natural						-0.002 (0.004)	-0.001 (0.004)
Country FE	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
$R^2$	0.037	0.039	0.041	0.043	0.043	0.042	0.044
No. of Obs	819	819	819	819	819	819	819

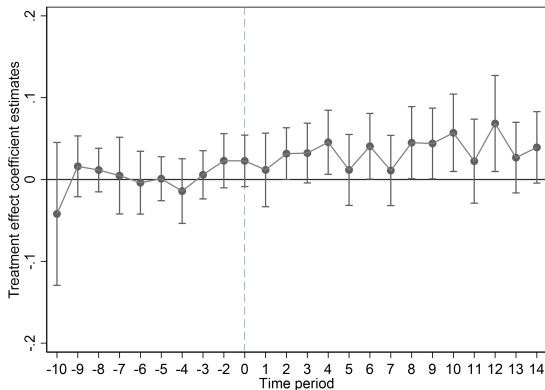
Standard errors in parentheses

\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



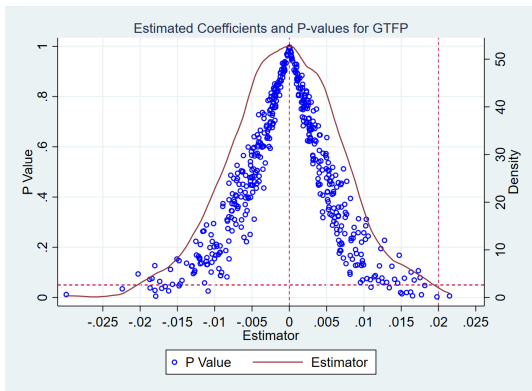
## Robustness tests

- Satisfying the hypothesis of parallel trends is crucial for the DID (Difference-in-Differences) estimations.
- There is no significant difference in the dependent variable among countries along the Belt and Road before the establishment of the cooperation zone



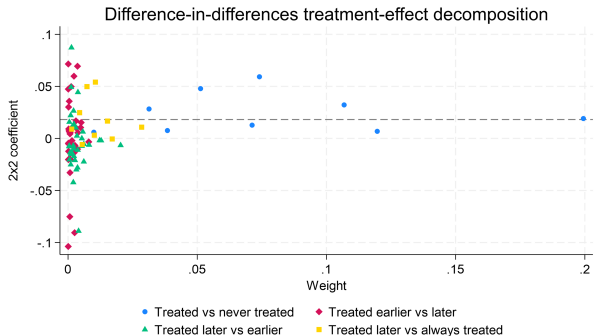
## Randomization tests

- We conducted a placebo test by randomly selecting both the treatment group and the policy timing simultaneously
- From the distribution and significance of the estimated coefficients of the 500 random core explanatory variables, the coefficients are generally centered around zero, to the left of the actual estimated value of 0.02, and the majority of p-values exceed 0.1

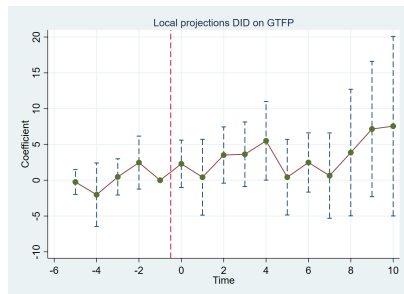
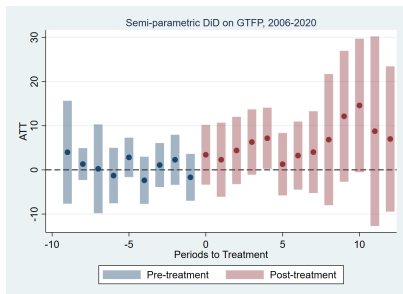


## Goodman-Bacon Decomposition

- It can be seen that nearly 80% of the weight proportion in our estimates using a two-way fixed effects model comes from the “good control group” that has never been treated and has not yet been treated, while the treatment effect weights from the “bad control group” are relatively smaller.
- The green triangles and yellow squares are distributed around the 0 value.



# DiD in Dynamics



- In the CS-DID method, we use the group that has never been treated as the clean control group for regression; In the LP-DID method, the dependent variable in the regression is changed by using the average of all pre-treatment periods as the baseline.
- The average effect of treatment before treatment is not significant, while the average effect of treatment after treatment increases significantly and is positive.

## Endogeneity Test

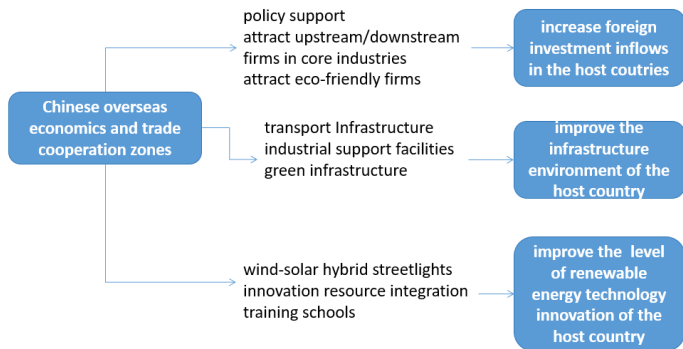
- Treatment effect model (suggested by Heckman, 1979). The results indicate that the IMR is not significant, and the core explanatory variables are significantly positive at the 10% significance level.
- Other robustness tests: Exclude the sample data of Russia; replace the dependent variable; replace the core explanatory variable

Table 5: Other Robustness Checks using subsample and alternative specifications

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>IV<sub>distance</sub></i>	<i>GML3<sub>exceptRussi</sub></i>	<i>GML2</i>	<i>GML3<sub>2000</sub></i>	<i>TC3<sub>2005</sub></i>	<i>GML3<sub>2005</sub></i>
<i>coc2</i>	0.049* (0.028)	0.020** (0.861)	0.022* (1.066)	0.018** (0.940)	0.020* (0.008)	
<i>coc2_stats</i>						0.020* (0.010)
<i>IMR</i>	-0.018 (0.015)					
<i>lnurban</i>	0.099* (0.052)	0.085 (0.054)	0.100 (0.067)	0.073 (0.050)	-0.090 (0.071)	0.089 (0.054)
<i>lnmanu</i>	0.009 (0.012)	0.028* (0.016)	0.037* (0.020)	0.041** (0.018)	0.075*** (0.018)	0.030** (0.014)
<i>goveff</i>	-0.017 (0.012)	-0.023** (0.011)	-0.026** (0.010)	-0.017 (0.011)	-0.000 (0.013)	-0.021** (0.010)
<i>R<sup>2</sup></i>	0.038	0.034	0.021	0.045	0.070	0.040
No. of Obs	739	753	767	832	832	832
Province	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

## Mechanism analysis



## Mechanism analysis

- We compare the conventional FDI spillover effects and the impacts of historical Chinese FDI before 2007
- We also examine the benefits of OETCZs establishment on host countries' with relatively poor infrastructure establishment and quality of business environment, which normally constrains the GTFP growth indirectly.
- Lastly, we examine the role of the establishment of OETCZs in sustainability to the development of clean energy.

## Mechanism analysis

Table 6: Mechanisms of the GTFP increase due to BRI industrial park establishment

	(1)	(2)	(3)	(4)	(5)	(6)
	<i>FDI</i>	<i>Infrastructure</i>	<i>Renewable energy patents</i>	<i>FDI<sub>China</sub></i>	<i>Business Environment</i>	<i>Technology</i>
<i>cocz</i>	0.967* (0.550)	0.145* (0.080)	0.509** (0.252)	0.033* (0.016)	0.028** (0.013)	0.027** (0.011)
<i>cocz_China</i>				-0.027* (0.016)		
<i>cocz_business</i>					-0.036* (0.018)	
<i>cocz_patents</i>						-0.022** (0.011)
<i>lnurban</i>	5.720 (5.235)	5.311*** (1.476)	1.062 (1.484)	0.096 (0.075)	0.103 (0.066)	0.059 (0.055)
<i>lnmanu</i>	2.095 (1.760)	0.547** (0.209)	0.991*** (0.303)	0.032* (0.017)	0.037** (0.016)	0.025* (0.014)
<i>govoff</i>	-1.293 (1.085)	0.098 (0.107)	-0.055 (0.296)	-0.027* (0.015)	-0.023** (0.011)	-0.021** (0.010)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
<i>R</i> <sup>2</sup>	0.663	0.942	0.853	0.068	0.047	0.045
No. of Obs	784	758	628	534	729	819

Standard errors in parentheses. \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$



## Summary

- China's overseas economic and trade cooperation zones along the Belt and Road can promote the growth of total factor productivity of the host countries.
- This positive effect is mainly due to increased foreign direct investment in the host country, improving the infrastructure environment of the host country, and improving the level of innovation in renewable energy technology in the host country.
- Host countries that do not have Chinese FDI benefit more than those that already have. The establishment of OETCZs is also more beneficial to host countries with a poorer initial ranking in the business environment and a lower initial level of scientific research.

## Policy Implications

- Targeted Zone Placement: the zones can be considered in some countries or regions with poor basic conditions, which will bring positive spillover effects to the host country to a greater extent.
- Green energy cooperation: the cooperation zone should pay attention to the use and development of renewable energy and strengthen energy cooperation with the local area. Just like creating knowledge-sharing platforms for best practices in renewable energy applications, establishing joint renewable energy labs with host-country universities or tech institutes.
- Investment attraction strategy: the cooperation zone should actively introduce green enterprises into the park and give some preferential policies(eg: tax incentives) to green enterprises through cooperation with the local government

Thanks for your attention!

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