



Does The Belt and Road Initiative Promote the Entrepreneurship in Participating Countries

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Abstract

In the context of global economic restructuring and the rise of emerging markets, the Belt and Road Initiative (BRI), a key international economic cooperation platform led by China, has not only reshaped regional economic ties but also provided external opportunities for the restructuring of entrepreneurial ecosystems in countries along the route. Based on data from 22 co-built countries and 15 non-co-built countries from 2010 to 2019, this paper considers the Belt and Road Initiative as a quasi-natural experiment and constructs a multi-temporal double-difference model to identify the path of the Initiative's impact on entrepreneurial activities. The empirical results show that the initiative significantly increases the entrepreneurial participation rate in participating countries, and the policy effect is more significant in developing countries, countries with low capital openness, as well as in Asia and Africa. Mechanism tests further find that digital infrastructure development and total factor productivity (TFP) enhancement play a mediating role in the path of policy impact on entrepreneurial activities, suggesting that the initiative effectively stimulates entrepreneurial behavioral responses at the national level by improving the institutional environment and resource allocation conditions. This paper theoretically expands the research on the behavioral mechanism of the economic effects of the Belt and Road Initiative and empirically reveals how external institutional policies promote entrepreneurial activity through ecological improvement and efficiency enhancement. In terms of policy recommendations, entrepreneurship development should be incorporated into the key agenda of the 'Belt and Road' cooperation framework, promote the cross-border collaborative construction of digital infrastructure, and strengthen the institutional supply and entrepreneurship support system, to further stimulate the entrepreneurial potential of developing regions.

Keywords: The belt and road initiative; Entrepreneurship; Digital infrastructure; Total factor productivity

Introduction

Since the turn of the 21st century, the global economic landscape has undergone a profound transformation. Growth in traditional advanced economies has decelerated, while the influence of emerging markets and developing countries has steadily expanded. Since its inception in 2013, the Belt and Road Initiative (BRI) has evolved into a pivotal platform for international economic cooperation, spanning multiple nations across Asia, Europe, and Africa. By prioritizing infrastructure connectivity, policy coordination, unimpeded trade, and financial integration, the initiative aims to foster regional economic integration and sustainable development [1]. The BRI has not only restructured the framework of international economic cooperation but has also

unlocked new developmental opportunities for participating countries along its routes. Entrepreneurship serves as a fundamental driver for stimulating economic growth, catalyzing innovation, and enhancing employment opportunities. Consequently, the level of entrepreneurial activity directly shapes a nation's economic dynamism and social stability. While existing literature has extensively examined the macro-level impacts of the Belt and Road Initiative (BRI) on trade flows and digital economy advancement, there remains a significant gap in systematic empirical evidence regarding how the initiative influences entrepreneurial activities in participating countries [2,3]. In particular, the heterogeneous effects of the BRI across diverse stages of economic development and varying institutional environments require further rigorous investigation.

The drivers of entrepreneurial activity are multifaceted and complex. Existing literature systematically categorizes these determinants into several dimensions: policy and institutional environments, socio-cultural factors, individual entrepreneurial characteristics, and economic and financial conditions. Specifically, policy-related research highlights the impact of smart city initiatives and institutional spillover effects [4,5]. Socio-cultural studies emphasize the role of social capital, the vibrancy of entrepreneurial culture, and gender dynamics [6]. At the individual level, psychological traits and human capital are identified as primary factors, while economic and financial research focuses on the availability of financial resources and the quality of infrastructure [7-10]. Despite these insights, there remains a lack of systematic empirical research on the specific mechanisms through which the Belt and Road Initiative stimulate entrepreneurship in participating countries. While scholars generally agree that the BRI creates a favorable environment by improving infrastructure (Yang et al., 2020), optimizing institutional frameworks, and fostering cross-border cooperation, the precise transmission pathways—and the differentiated impacts across varying levels of economic development and market environments—constitute a significant research gap [11,12].

To address these questions, this study treats the BRI as a quasi-natural experiment. Utilizing a staggered DID approach, we combine data from the GEM, the World Bank, and other international databases to empirically examine the initiative's impact on entrepreneurial activity in participating countries. By comparing the entrepreneurial participation rates of BRI and non-BRI countries before and after the initiative's implementation, this research seeks to identify the causal effects of the BRI. Furthermore, we investigate the underlying mediating mechanisms, specifically focusing on how the initiative optimizes the entrepreneurial ecosystem by enhancing digital infrastructure and increasing Total Factor Productivity. The remainder of this paper is organized as follows: Section 2 provides a comprehensive review of the relevant literature and theoretical mechanisms; Section 3 details the empirical strategy and data sources; Section 4 presents the empirical results and discussion; and the final section concludes the study with a summary of findings and targeted policy implications.

Literature Review

As a new paradigm of global cooperation championed by China, the Belt and Road Initiative (BRI) aim to drive high-quality economic development in participating countries through core mechanisms of infrastructure connectivity, trade and investment facilitation, and policy coordination. Within this macro-landscape, entrepreneurship—as a crucial endogenous engine of economic

growth—and its interaction with the BRI have increasingly attracted scholarly attention. Although existing literature has explored the BRI's macro-impacts across diverse dimensions such as policy environments, cultural backgrounds, investment drivers, and infrastructure, and while some studies have examined the initiative's specific effects on regional entrepreneurial activities, there remains a lack of systematic synthesis and mechanistic integration regarding how the BRI drives entrepreneurship in participating nations [13,14]. From an institutional perspective, the BRI provides critical structural support for entrepreneurial activities by reshaping institutional environments, reducing transaction costs, and expanding market access [15,16]. Specifically, Yang demonstrates that the BRI, serving as a potent home-country institutional arrangement, significantly enhances the corporate social responsibility performance of emerging market multinational enterprises through the interplay of institutional pressure and resource support [17]. This effect is particularly pronounced among state-owned enterprises and in host countries with high regulatory standards, suggesting that the BRI guides firms to effectively overcome the "liability of foreignness" and acquire international legitimacy through non-market strategies. Furthermore, quantitative analysis by De Soyres indicates that while hard infrastructure significantly lowers transport costs, the realization of its economic welfare effects relies heavily on complementary institutional reforms, such as trade facilitation. In addition, within the cultural dimension, the BRI effectively enhances opportunity recognition and individual entrepreneurial intention by fostering a positive entrepreneurial culture, bridging cultural distances, and promoting cross-cultural integration.

From an investment and trade perspective, the BRI stimulates entrepreneurial vitality in participating countries by deepening Outward Foreign Direct Investment (OFDI) and expanding trade networks, which generate technology spillovers and market access effects [18]. Zhang find that by lowering institutional barriers and strengthening policy communication, the BRI significantly amplifies the positive innovation spillovers of OFDI on host countries [19]. Sutherland further point out that BRI policies significantly increase the willingness of Chinese firms to enter countries characterized by high institutional risk [20]. This unique flow of capital fills the "institutional voids" left by global capital in underdeveloped regions, fundamentally activating the entrepreneurial ecosystems of peripheral markets. Notably, high-level political mutual trust plays a pivotal role in this process. Using large-sample industry data from 84 countries spanning 2005-2017, Shao empirically demonstrates that close international political cooperation under the BRI framework significantly increases the level of Chinese OFDI [21]. This investment growth, driven by top-level design, not only supplies scarce capital factors to host countries but also creates abundant market opportunities for

local entrepreneurs through upstream and downstream industrial linkages.

From an infrastructure and technology perspective, the BRI is evolving from traditional connectivity in transportation and energy toward digital empowerment, thereby providing both the physical foundation and technological bedrock for entrepreneurial activities. Regarding physical infrastructure, improvements in transportation and energy facilities directly lower the operational barriers for start-ups [22-24]. Thurer emphasize that BRI infrastructure projects significantly shorten cross-border transport lead times and reduce logistics complexity [25]. An assessment by the Eurasia Group notes that BRI projects offer participating countries the opportunity to bridge infrastructure gaps at costs below the market average [26]. This cost advantage is expected to translate into long-term dividends in the form of future trade growth, FDI inflows, and improvements in social welfare. Furthermore, technology spillovers and digitalization are emerging as new drivers of growth. An exploratory study by Senadjki, based on data from six countries including Algeria, Malaysia, and Indonesia, finds that BRI projects directly promote the digital transformation of host-country enterprises by integrating modern technologies into industrial infrastructure development [27]. This technological empowerment not only enhances the efficiency of traditional industries but also establishes the necessary conditions for new forms of entrepreneurship grounded in digital technologies. In summary, while existing research highlights the direct and indirect impacts of the BRI from various angles, most studies treat the initiative merely as a contextual background rather than identifying a causal relationship with entrepreneurial behavior. Furthermore, research has focused heavily on short-term macro-effects, leaving a void in empirical discussions of long-term impacts. Compared to previous studies, the marginal contribution of this paper is threefold: first, we use a long-cycle panel dataset (2010 – 2019) from the GEM and the World Bank to examine entrepreneurial effects from a dynamic perspective; second, we employ a staggered DID method to isolate the causal impact of the BRI; and third, we shift to a micro-individual perspective, using the entrepreneurial participation rate as the dependent variable to more accurately measure actual entrepreneurial behavior and activity levels.

Empirical Methods and Data

Econometric model specification

The BRI is characterized by its expansive geographical reach and significant cross-regional cooperation framework. Spanning from the Pacific Ocean in the east to the Baltic Sea in the west, the initiative traverses the continents of Asia, Europe, and Africa, encompassing diverse regions such as Central Asia, West Asia,

North Africa, Southeast Asia, South Asia, and Central and Eastern Europe. Treating the inception of the BRI as a quasi-natural experiment, this study employs a staggered DID approach to systematically evaluate the initiative's catalytic effect on entrepreneurial activities across various nations. To isolate and identify the impact of the BRI, we designate countries that have officially joined the initiative as the treatment group, while countries and regions that have not participated serve as the control group. Based on this classification, the following staggered DID model is constructed:

$$sa = + \cdot \text{Treat} \times \text{Post} + + + +$$

In this model, $bstart_{it}$ represents the level of entrepreneurial activity for country i in year t . $Treat_i$ is a binary treatment dummy variable, assigned a value of 1 if country i is a participating member of the BRI, and 0 otherwise. $Post_t$ is a time dummy indicating the period following the initiative's implementation (defined as 1 for the year 2014 and onwards, and 0 prior to 2014). $Treat_i \times Post_t$ serves as the primary explanatory variable, with its coefficient capturing the average treatment effect of the policy. The vector X_{it} represents a comprehensive set of control variables encompassing both macroeconomic indicators and the entrepreneurial ecosystem. Including macro indicators related to the entrepreneurial ecosystem such as population size ($lpop$), entrepreneurial intent (sub), per capita income ($Igni$), urbanization level ($urban$), birth rate ($birth$), and industrial concentration (HHI). To ensure the robustness of our causal inference, λ_i and δ_t denote country fixed effects and year fixed effects, respectively. These control for time-invariant country characteristics and common shocks that affect all nations within a specific year. Finally, ϵ_{it} represents the idiosyncratic error term.

Samples and data

Given the profound and widespread shock of the COVID-19 pandemic on the global economic system since early 2020, combined with the inherent time lags in policy transmission, this study limits the research period to 2010-2019. This timeframe is designed to mitigate the interference of major exogenous events on estimation results. Furthermore, this period encompasses the proposal and early implementation phases of the BRI, providing a relatively clear and stable macroeconomic backdrop for assessing policy effects. Based on data availability and sample representativeness, the final panel comprises 37 countries, consisting of 22 BRI participating countries and 15 non-participating countries.

The core explanatory variables for this study are sourced from the Global Entrepreneurship Monitor (GEM) database. Jointly initiated by Babson College and London Business School in 1999, GEM has evolved into one of the world's most extensive and

widely cited platforms for entrepreneurship research, covering nearly 100 economies and partnering with over 300 academic and research institutions. To construct the key independent variable for assessing policy impact, we categorize the sample based on the official list of BRI partner countries released by the Ministry of Commerce of the People's Republic of China. Countries that have signed cooperation documents with China are classified as the treatment group, while those that have not are classified as the control group.

To control for country-level heterogeneity that may affect entrepreneurial activity, we introduce a series of control variables. Macro-level variables — including GDP per capita, total population, and urbanization rate—are primarily derived from the World Bank database to reflect national economic and social development. Variables related to the entrepreneurial environment are drawn from the GEM database to capture the institutional and cultural foundations of entrepreneurship. Finally, following standard practices in the literature, we minorize all continuous variables at the 1st and 99th percentiles to minimize the influence of outliers and enhance the robustness of the regression estimates.

Variable Specifications

Dependent variable

In the baseline regression model, we employ the level of national entrepreneurial activity as the dependent variable to evaluate the impact of the BRI on entrepreneurial vitality. Specifically, this is measured using a core metric from the GEM database, based on the survey question: "Are you, alone or with others, currently trying to start a new business?" The selection of this metric is driven by its ability to effectively capture the early-stage dynamics of entrepreneurship, reflecting the critical transition from entrepreneurial intention to tangible action. Compared to traditional indicators—such as the number of registered firms or the stock of existing enterprises—this variable provides a more timely and sensitive reflection of the frontiers of the entrepreneurial ecosystem. Specifically, the dependent variable represents the percentage of the adult population $bstart_{it}$ in country i during year t who are actively engaged in start-up activities. This measure not only gauges the vibrancy of the entrepreneurial environment but also provides a vital perspective for assessing the contemporaneous impact of policy shifts on entrepreneurial behavior.

Core explanatory variable

In our empirical model, the core explanatory variable is the treatment effect of the BRI. This is constructed as an interaction term between a treatment group dummy $Treat_t$ and a time dummy $Post_t$, designed to capture the marginal impact following the

policy's implementation. Specifically, $Treat_t$ is a binary variable indicating a country's participation in the BRI; it takes a value of 1 if the country is a signatory to the initiative, and 0 otherwise. Similarly, $Post_t$ is a temporal dummy variable that equals 1 for the years following the policy's introduction and 0 for the preceding period. By employing this interaction term $Treat_t \times Post_t$, this study effectively identifies the causal impact of the BRI on entrepreneurial activity. The coefficient of the interaction term reflects the differential change in entrepreneurial levels for participating countries post-implementation relative to the control group. This allows us to quantify the treatment effect and isolate the actual policy influence from other time-invariant or period-specific factors.

Control variables

To mitigate potential endogeneity bias arising from omitted key variables in the empirical model, this study incorporates a set of control variables in the regression analysis to enhance the robustness of the results. Specifically, the control variables include national population size ($lpop$), entrepreneurial activity intentions (sub), income per capita ($lgni$), the level of urbanization ($urban$), the birth rate ($birth$), and industrial concentration (HHI). Among these variables, $lpop$ captures a country's total population, reflecting both its potential market size and labor supply. It is a core macroeconomic factor shaping the availability of entrepreneurial opportunities and the intensity of resource allocation constraints. sub measures the proportion of adult respondents who report an intention to start a business within the next three years in a given country-year. This indicator is derived from the Global Entrepreneurship Monitor (GEM) survey and reflects entrepreneurial intentions at the subjective level. Capturing the psychological and cognitive motivations underlying entrepreneurial behavior, it helps control for endogeneity stemming from cross-country differences in individual entrepreneurial propensity and, to some extent, proxies for the national entrepreneurial culture and latent entrepreneurial dynamism. $lgni$, defined as gross national income per capita, is commonly used to indicate a country's stage of economic development and is closely related to opportunity recognition, access to finance, and the accumulation of human capital. $urban$ represents the degree of urbanization and reflects the integrated conditions of infrastructure, human resources, and information flows, serving as an important environmental pillar of the entrepreneurial ecosystem. $birth$, measured by the birth rate, affects labor supply trends and long-term market potential through its influence on demographic structure and population growth. Finally, HHI is used to assess the level of industrial concentration within a country or region. Higher values indicate greater market concentration, which may restrain competition while

simultaneously enabling scale-based entrepreneurial opportunities, thereby shaping the dynamic competitive structure of the entrepreneurial environment.

Table 1 reports the descriptive statistics for the main variables. Overall, the summary statistics suggest that differences across variable distributions are modest, indicating that the data are well-suited for subsequent regression analysis (Table 1).

Empirical Results Analysis

Baseline regression results

This section examines the causal impact of participation in the Belt and Road Initiative (BRI) on national entrepreneurial activity. The baseline estimation results, reported in column (1) of (Table 2), show that in the absence of any control variables, the implementation of the BRI is positively and significantly associated with higher levels of entrepreneurial activity, with an estimated coefficient of 2.51 that is significant at the 1 percent level. As additional control variables and fixed effects are progressively introduced (columns (2) to (5) of Table 2), the estimated effect remains stable and statistically significant at the 5 percent level. Overall, the empirical evidence indicates that participation in the BRI significantly promotes entrepreneurial activity in participating countries. This positive effect persists after controlling for both country and time fixed effects, suggesting that the pro-entrepreneurship impact of the policy is robust and sustained over time.

Parallel trend assumption and dynamic effects

The validity of the DID estimator relies on the parallel trend assumption. Following the methodology of Liu and Qiu, we examine whether the treatment and control groups exhibited similar evolutionary trends before the policy intervention [28]. While the BRI was initially proposed in September 2013, we designate 2014 as the first year of the policy shock to account for potential policy transmission lags, consistent with the established literature [29]. As illustrated in (Figure 1), the estimated coefficients for all years before 2014 are statistically insignificant and close to zero. This indicates that there were no systematic differences in the trends of entrepreneurial activity between the treatment and control groups during the pre-treatment period, thereby satisfying the parallel trend requirement. Following the formal implementation of the BRI, the coefficients of the key explanatory variables become positive and statistically significant, exhibiting a gradual upward trajectory. These results suggest that the initiative has a sustained and increasing impact over time. Overall, the empirical evidence fails to reject the parallel trend assumption and aligns with the theoretical expectations of our identification strategy.



Figure 1: Parallel Trend Assumption and Dynamic Impact.

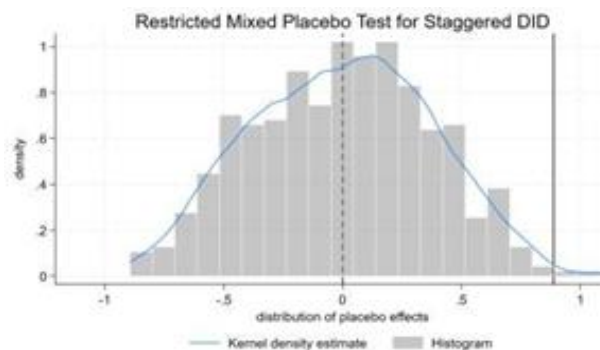


Figure 2: Mixed Placebo (Non-Restricted).

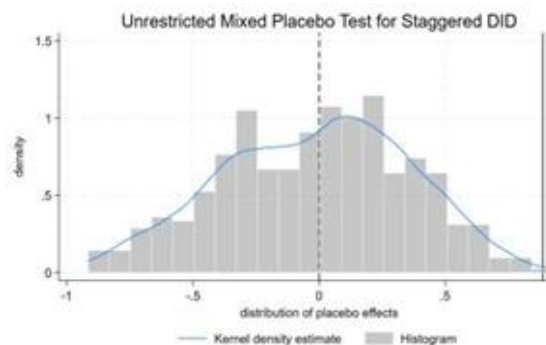


Figure 3: Mixed Placebo (Restriction).

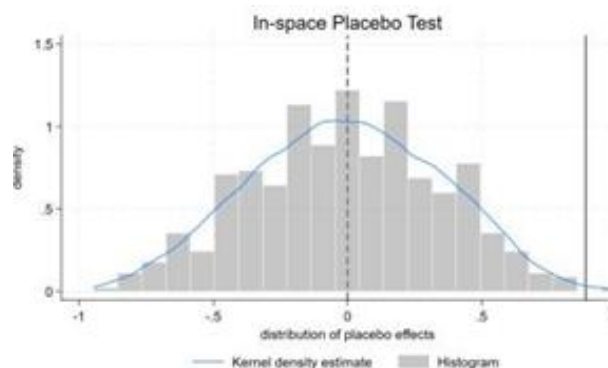


Figure 4: Spatial Placebo.

Robustness test

Placebo tests

To ensure that the observed changes in entrepreneurial activity are indeed driven by the BRI rather than other unobserved factors, we conduct two types of placebo tests to verify the internal validity of our results.

1. Counterfactual Policy Timing: Time-based Placebo

We construct a counterfactual policy shock by artificially advancing the implementation date of the BRI by three years. We create a pseudo-interaction term, `treat_post_3`, to test whether the treatment effect exists in a period where no such policy was present. As reported in Column (1) of (Table 3), the estimated coefficient for `treat_post_3` is statistically insignificant at the 10% level. This non-significant result indicates that the baseline findings are not driven by pre-existing trends or anticipation effects, further reinforcing the robustness of our primary regression.

2. Random Assignment of Treatment Group: Space-based Placebo

By conducting this spatial and mixed placebo simulation, we observe that the pseudo-coefficients are centered around zero, suggesting that our baseline results are not the product of random chance [30]. These findings collectively confirm the stability and reliability of the estimated policy effects (Figure 2-4).

Eliminate the influence of China as the initiative's sponsor

Given that China, as the architect of the BRI, possesses unique characteristics in terms of policy implementation intensity, resource mobilization capacity, and institutional environment, its inclusion might introduce structural bias into the overall estimation. Specifically, the policy effects observed in China may differ significantly in magnitude and mechanism from those in other participating countries. To address this concern and ensure the external validity of our findings, we re-estimate the baseline model by excluding the China sample. The results, reported in Column (2) of Table 3, demonstrate that the promotional effect of the BRI on entrepreneurial activity remains positive and statistically significant. This confirms that our primary conclusions are not driven by the idiosyncratic national conditions of China, but rather reflect a broader policy impact across the participating economies. This sensitivity test further strengthens the robustness of our core results.

Alternative Estimator: Random Effects Model

In addition to the fixed effects specification, we re-estimate the relationship using a RE model. The results, presented in Column (3) of Table 3, confirm that the BRI continues to exert a statistically

significant positive impact on entrepreneurial activity. The consistency of results across different model specifications alleviates concerns regarding the potential bias associated with specific estimator choices.

Sample Expansion Test

To enhance the external validity and generalizability of our conclusions, we extend the research sample to include a more diverse set of economies. This expanded dataset incorporates developed European economies (e.g., Ireland, Finland, Norway, Hungary), key Middle Eastern and Asian nations (e.g., Egypt, UAE, Saudi Arabia, Qatar, Indonesia, Kazakhstan), as well as representative countries from Oceania and Latin America (e.g., Australia, Canada, Jamaica, Morocco). The estimation results for this broader sample are reported in Column (4) of Table 3. The positive correlation between the BRI and entrepreneurial activity remains robust within this expanded context. This finding reinforces the explanatory power of our baseline results, demonstrating that the policy effect is not artifacts of a specific sample selection or data composition. By holding true across a wider array of institutional and economic environments, the research underscores the broader applicability and policy relevance of the initiative's impact on global entrepreneurship.

Heterogeneity Analysis

Heterogeneity Across Regions

The BRI spans countries across multiple regions worldwide, each characterized by distinct geographical locations, resource endowments, and regional contexts. These heterogeneity factors jointly shape the effectiveness and transmission mechanisms of the policy. From a geographic distance perspective, countries neighboring China typically face lower transportation and communication costs, facilitating smoother cooperation mechanisms and, consequently, a greater likelihood of benefiting from the policy. In contrast, countries located farther away may encounter higher logistics costs and greater coordination challenges, which could impede policy implementation and attenuate its effects. To investigate the differential impacts of the policy across regions, this study categorizes the sample countries into five major regions—North America, Asia, South America, Europe, and Africa—and conducts a series of difference-in-differences regressions for each group. The results, reported in (Table 4), reveal significant regional heterogeneity in policy effects. In Asian and African countries, the coefficient on `treat_post` is positive and statistically significant, indicating that the policy effectively stimulated entrepreneurial activity in these regions. This outcome likely reflects that these countries are better positioned to benefit from BRI-induced infrastructure investments,

capital inflows, and strengthened regional cooperation, which collectively improve the entrepreneurial environment. Most of these countries are still in the developmental stage and therefore exhibit higher dependence on external resources and institutional support, making them more responsive to policy interventions.

Table 1: Variable Descriptions and Descriptive Statistics.

Variable name	Variable Measurement Indicator	Data Source	Sample size	Mean	Min	Max
bstart	the percentage of the adult population in country <i>i</i> that is actively engaged in start-up activities in year <i>t</i>	The NES of the GEM	370	14.704	1.667	45.788
treat_post	the interaction term between the treatment-group dummy variable $Treat_t$ and the post-period time dummy variable $Post_t$	the list of Belt and Road partner countries released by China's Ministry of Commerce	370	0.356	0.000	1.000
TFP	Total Factor Productivity (TFP), %	Econmap	370	0.709	0.387	1.133
Infra	Digital Infrastructure Development Index	the World Bank	370	0.091	0.013	0.177
lgni	Income per capita (log-transformed)	the World Bank	370	9.652	7.108	11.375
lpop	National population size (log of total population, in tens of millions)	the World Bank	370	3.408	0.642	7.243
sub	Entrepreneurial intention (percentage of adult respondents planning to start a business within the next three years, %)	The NES of the GEM	370	17.237	1.852	60.753
urban	Urbanization rate, %	the World Bank	370	71.966	30.930	95.500
birth	Birth rate (per thousand population)	the World Bank	370	13.996	7.900	27.525
HHI	Labor intensity in the secondary and tertiary sectors	the World Bank	370	0.490	0.120	0.710

Table 2: Baseline Regression Analysis.

	(1)bstart	(2)bstart	(3)bstart	(4)bstart	(5)bstart
treat_post	2.51***	0.714**	0.677**	0.812**	0.887**
lpop		-0.172	1.916	-0.180	1.930
sub		0.796***	0.785***	0.794***	0.780***

lgni		-0.287	-0.540	-0.168	-0.463
urban		0.0467	-0.140***	0.0544	-0.143***
birth		0.0616	-0.328	0.0910	-0.291
HHI		-7.623*	-9.024	-8.550	-11.63
Control Variables	No	Yes	Yes	Yes	Yes
Country Fixed Effects	No	No	Yes	Yes	Yes
Time Fixed Effects	No	No	No	Yes	Yes
Clustering at the national level	No	No	Yes	No	Yes
Sample size	370	370	370	370	370
Note: (1) ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The same convention applies to the tables hereafter.					

Table 3: Robustness Tests.

Variable name	bstart			
	(1)Counterfactual Timing	(2)Excluding Subsample	(3)Alternative Estimator	(4)Sample Expansion
treat_post_3	0.541	0.802**	0.812***	0.453*
Control Variables	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
Clustering at the national level	Yes	Yes	Yes	Yes
Sample size	370	360	370	580

Table 4: Heterogeneity Analysis: Regression Results.

	(1)North	(2)Asia	(3)South	(4)Europe	(1)Developing	(2)Developed	(1)Openness	(2)Openness
	America	& Africa	America		Countries	Countries	Low	High
treat_post	0.878	3.230*	0.774	0.081	1.373**	0.004	1.194**	0.238
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

at the								
national								
level								
Sample	30	100	80	160	180	190	167	156
size								

Table 5: Regression Results for the Mediating Analysis of Digital Infrastructure Development.

	(1)all	(1)North America	(2)Asia & Africa	(3)South America	(4)Europe
treat_post	0.0752**	-0.562	0.867**	1.186**	-1.413*
lpop	0.200	-3.642***	-3.831***	-4.771***	-5.488***
sub	0.001	-0.00212	-0.00347	-0.00181	-0.00275
lgni	0.049	-0.148	-0.128	-0.191	-0.111
urban	0.018**	-0.0191	-0.0371**	-0.0123	-0.0159
birth	0.008	-0.0763	-0.0929	-0.0664	-0.086
HHI	0.0003	5.504***	5.317***	4.955***	5.081***
Control Variables	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Clustering at the national level	Yes	Yes	Yes	Yes	Yes
Sample size	370	30	100	80	160

Table 6: Regression Results of Total Factor Productivity Mediation Analysis.

	(1)all	(1)North America	(2)Asia & Africa	(3)South America	(4)Europe
treat_post	0.053**	2.038	1.523**	2.421**	-0.1631
lpop	0.378	-4.118***	-3.783***	-4.289***	-3.793***
sub	-0.0003	-0.00214	-0.00252	-0.000617	-0.00217
lgni	-0.049	-0.142	-0.126	-0.110	-0.151
urban	0.005	-0.0201	-0.0227	-0.0226	-0.0192
birth	-0.0203*	-0.0607	-0.0821	-0.0600	-0.0759
HHI	-0.822**	5.386***	5.893***	5.852***	5.425***
Control Variables	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
Clustering at the national level	Yes	Yes	Yes	Yes	Yes
Sample size	370	30	100	80	160

By contrast, the estimated effects in North America and Europe are not statistically significant. This may be because these regions already possess relatively mature entrepreneurial ecosystems, well-developed institutional frameworks, robust capital markets, and innovation mechanisms, leaving limited scope for marginal gains from external policy interventions. Similarly, the regression results for South American countries are insignificant, which could be attributed to relatively unstable domestic economic systems, weak policy enforcement, and less efficient entrepreneurial environments. These factors likely constrain the implementation and diffusion of the BRI, preventing it from substantially stimulating local entrepreneurial potential.

Heterogeneity Across Development Stages

Countries at different stages of economic development exhibit notable differences in the drivers, mechanisms, and policy responsiveness of entrepreneurial activity. In developed economies, well-established infrastructure, mature market mechanisms, and abundant capital accumulation create a relatively favorable entrepreneurial environment. Institutional barriers are relatively low, and entrepreneurs typically have easier access to financing, information, and other resources, which implies that external policy interventions yield limited marginal incentives. By contrast, developing countries often face structural constraints such as underdeveloped institutions, weak infrastructure, and restricted financing channels. In this context, external policy interventions—particularly those associated with the Belt and Road Initiative (BRI), including infrastructure investment, cross-border capital flows, and strengthened regional cooperation—can exert more direct and significant effects on entrepreneurial ecosystems. Prior studies indicate that supportive policies not only reduce entry barriers but also stimulate potential entrepreneurs' opportunity recognition and behavioral translation, serving as critical mediating mechanisms for promoting entrepreneurial activity. In environments where entrepreneurship receives strong social and governmental endorsement, entrepreneurs are motivated not only by subsistence-driven factors such as poverty alleviation and income enhancement but also by status-driven incentives, including social recognition and participation, which encourages proactive opportunity identification and creation. Therefore, the policy environment plays a particularly pivotal role in shaping entrepreneurial behavior in developing countries. Building on the country development stage classification in studies such as Lu, this paper further categorizes the sample into developed and developing countries and conducts separate regression analyses. As reported in Table 4, the coefficient on *treat post* is positive and statistically significant for developing countries, indicating that the BRI has indeed exerted a positive effect in these contexts, substantially stimulating entrepreneurial activity. These findings confirm the

theoretical expectation that developing countries are more responsive to the initiative and demonstrate its practical impact in alleviating development constraints and unlocking entrepreneurial potential. In contrast, the regression results for developed countries are not significant, suggesting that the BRI's entrepreneurial incentives are relatively limited in these economies, likely due to the presence of mature entrepreneurial ecosystems and institutional frameworks, which constrain the incremental effectiveness of external policy interventions.

National Financial Openness

Following the methodology of Li and Wu, this study classifies the Belt and Road Initiative (BRI) partner countries into high and low capital openness groups based on the median value of each country's capital account openness index. Group-specific regressions are then conducted to examine the heterogeneity of the initiative's effects under different institutional settings. The empirical results, reported in Table 4, indicate that in countries with relatively low capital openness, the coefficient on the *treat post* variable is 1.194 and statistically significant at the 5% level. This finding suggests that the BRI effectively stimulates entrepreneurial activity in institutional environments where capital mobility is constrained. Compared to countries with higher openness, entrepreneurs in low-openness economies face more pronounced limitations in financing channels, institutional support, and cross-border resource allocation. In this context, the BRI's infrastructure investments, inflows of foreign capital, and institutional coordination provide critical resources and environmental support, generating a substantial short-term incentive effect on entrepreneurial behavior. These results further confirm the theoretical expectation that the initiative's marginal effects are stronger in countries with weaker institutional foundations: external interventions tend to be more effective in environments where institutional development is limited. By contrast, in countries with high capital openness, although the *treat post* coefficient remains positive (0.238), it is not statistically significant. This non-significance may reflect that in economies with relatively mature entrepreneurial ecosystems, well-developed financing systems, and efficient resource allocation, the marginal incentives from the initiative are comparatively limited. Furthermore, high-openness countries may experience more complex institutional coordination, greater information asymmetries, overlapping policies, or diluted effects, which can interfere with the transmission mechanisms of the BRI at the entrepreneurial level and reduce the observable impact and effectiveness of the initiative.

Mechanism Analysis

Digital infrastructure development

Following the approach of Wang, a composite Digital Infrastructure Development Index is constructed to capture the overall digital capacity of BRI partner countries [31]. This index integrates multiple dimensions, including network penetration, digital communication capabilities, and information service provision, thereby reflecting not only the hardware foundation but also the information service ecosystem and technology access capabilities. As such, it provides a comprehensive measure of the external spillover effects of the initiative in the digital domain. The results reported in Column (1) of (Table 5) indicate that the effect of treat post on digital infrastructure (infra) is positive and statistically significant at the 5% level, with a coefficient of 0.0752. This suggests that the BRI has substantially enhanced investment intensity and cooperation depth in digital initiatives across participating countries. The finding implies that increased cross-border digital connectivity, network coverage, and technology sharing under the initiative have materially improved information access, technological adoption, and data service capabilities. Such improvements contribute to narrowing the regional “digital divide” and inject new growth momentum into BRI partner countries, supporting the development of a “Digital Silk Road” and promoting more inclusive and sustainable regional development. Further, the study examines regional heterogeneity in the mediating pathway by categorizing the sample into four geographic groups: North America, Asia & Africa, South America, and Europe. Columns (2) through (5) of Table 5 report the estimated effects of the BRI on digital infrastructure development (infra) for each region. In Asia & Africa and South America, the coefficients on treat_post are 0.867 and 1.186, respectively, and both are positive and statistically significant at the 5% level, indicating that the initiative significantly improves the technological and informational environment critical to entrepreneurship in these regions through enhanced digital infrastructure investment. By contrast, the mediating effect is not significant in North America and Europe and is even negative in Europe, suggesting that in regions with relatively advanced infrastructure, the marginal scope for policy-driven digital improvements is limited, thereby weakening the indirect effect of infrastructure development on entrepreneurial activity. Extant literature emphasizes that robust digital infrastructure not only reduces information asymmetries and transaction costs in the entrepreneurial process but also enhances the efficiency of entrepreneurial resource allocation and market reach by expanding market boundaries, strengthening platform connectivity, and facilitating data circulation [32,33]. Under the BRI, initiative-driven digital investments are likely to generate stronger marginal incentives, particularly in countries with relatively weaker institutional foundations. In these contexts,

digital infrastructure development provides entrepreneurs with essential external support and technical empowerment, thereby objectively enhancing entrepreneurial activity.

Total factor productivity

In a further mediation analysis, this paper introduces Total Factor Productivity (TFP) as another key mediating variable to examine whether the Belt and Road Initiative indirectly promote entrepreneurial activity growth by enhancing production efficiency. As a core indicator measuring the comprehensive efficiency of an economic system, TFP reflects not only technological progress but also the synergistic improvement in resource allocation efficiency, organizational management capabilities, and institutional enforcement capacity. It represents the potential output capacity of a nation or region's economic operations. This study employs the Solow residual method to estimate TFP across countries, systematically assessing the Belt and Road Initiative's potential impact on production efficiency. Empirical results, as shown in Column (1) of (Table 6), reveal that the regression coefficient for treat_post on TFP is 0.053 and significantly positive at the 5% significance level. To further identify regional heterogeneity in the productivity-enhancing pathway of the Belt and Road Initiative, this study conducts geographically grouped regression on the mediation effect model. As shown in columns (2) to (5) of Table 6, the regression coefficient of treat_post on TFP is 1.523 and 2.421 for Asia-Africa and South America, respectively, and is significantly positive at the 5% significance level. This indicates that in these developing regions, the initiative has effectively enhanced overall productivity by optimizing resource allocation, promoting technology diffusion, and fostering institutional coordination, thereby providing a more robust macroeconomic foundation for entrepreneurial activities. In contrast, this coefficient is insignificant in North America and Europe, suggesting that in developed regions, the mechanism through which policies improve the entrepreneurial environment via efficiency pathways has relatively limited effects. Furthermore, extensive research has demonstrated that increases in total factor productivity provide a more favorable practical foundation for entrepreneurial activities [34]. On one hand, higher productivity means that more output can be generated per unit of resources, thereby reducing entrepreneurial costs and enhancing project feasibility and expected returns. On the other hand, efficiency gains are often accompanied by industrial structure optimization and the expansion of emerging industries, creating more entry opportunities and innovation space for entrepreneurs. Moreover, improvements in production efficiency usually enhance supply chain coordination, infrastructure utilization, and labor allocation efficiency, thereby further alleviating operational bottlenecks and uncertainties during the entrepreneurial process.

From the perspective of entrepreneurial incentive mechanisms, increases in TFP not only improve the macroeconomic environment but also strengthen potential entrepreneurs' confidence in market prospects and profit expectations. When economic systems operate more efficiently, entrepreneurs find it easier to identify viable market opportunities and take action. Particularly in developing economies with relatively weak institutional foundations, productivity gains can partially compensate for institutional shortcomings, providing crucial external support for entrepreneurship. Thus, by driving TFP growth, the Belt and Road Initiative improve the entrepreneurial ecosystem at the macro level, fostering a more dynamic and viable environment for innovation and business creation.

Conclusion

This study examines the Belt and Road Initiative (BRI) using panel data from 22 participating countries and 15 non-participating countries between 2010 and 2019. By constructing a multi-period difference-in-differences model, we systematically evaluate the initiative's impact on entrepreneurial activity in participating nations. Furthermore, through heterogeneity analysis and mediation effect identification, we explore potential pathways through which the BRI may indirectly influence entrepreneurial behavior and assess its varying effects across different institutional and developmental contexts. The findings indicate that the Belt and Road Initiative have a significant overall positive effect on entrepreneurial activity in participating countries. This effect remains robust after controlling for country and year fixed effects, suggesting that the initiative may improve the external conditions of entrepreneurial ecosystems by enhancing factor connectivity, reducing institutional transaction costs, and optimizing resource allocation. Heterogeneity analysis further reveals that this positive effect is more pronounced in developing economies, countries with lower capital openness, and geographically proximate nations. This reflects that in countries with relatively insufficient infrastructure, institutional safeguards, and factor availability, the resource support and institutional coordination brought by external initiatives can exert stronger marginal incentive effects, thereby more effectively stimulating entrepreneurial potential. At the mechanism level, this study finds that digital infrastructure development and total factor productivity (TFP) growth play mediating roles in the Belt and Road Initiative's impact on entrepreneurial activity. On one hand, expanded digital facilities enhance entrepreneurs' capabilities to access information, connect with markets, and expand networks, thereby lowering initial entry barriers and operational costs. On the other hand, improved productivity strengthens the resource allocation foundation for macroeconomic operations, unleashes market vitality, and

provides a more stable and predictable external environment for entrepreneurial activities. While theoretical support for these transmission channels exists in existing literature, this study provides new empirical evidence at the cross-country panel level [35-49].

Based on these findings, this paper argues that promoting entrepreneurship should be further prioritized as a key objective for enhancing endogenous economic momentum in participating countries during the ongoing advancement of high-quality Belt and Road development. In practical implementation, greater emphasis should be placed on cross-border collaborative development of digital infrastructure. This involves expanding digital communication networks, enhancing data service capabilities, and establishing platform interconnection mechanisms to support digital entrepreneurship and cross-border innovation. Concurrently, developing economies still face varying constraints in institutional provision, financing environments, and talent safeguards. It is necessary to gradually improve the institutional embeddedness conditions for entrepreneurial activities by refining the business environment, promoting institutional transparency, and strengthening entrepreneurial support mechanisms. At the macro level, incorporating productivity enhancement into the core of regional development cooperation is also advisable. Leveraging industrial collaboration and technology diffusion mechanisms can optimize the allocation of local production factors, creating a more resilient and sustainable economic foundation for entrepreneurial activities. Furthermore, given the significant disparities in economic development levels, institutional structures, and industrial foundations among countries covered by the Belt and Road Initiative, implementation should be tailored to local conditions through differentiated, tiered support strategies. In countries with underdeveloped entrepreneurial support systems, efforts should focus on foundational capacity building, institutional safeguards, and expanding financing channels. Conversely, in nations with more mature entrepreneurial ecosystems, exploring high-value-added entrepreneurial platforms, cross-border incubators, and regional innovation networks can drive entrepreneurial activities toward higher quality and efficiency. In summary, the Belt and Road Initiative has not only generated positive impacts in traditional infrastructure connectivity and economic exchanges but may also indirectly improve entrepreneurial ecosystems and institutional environments through digital transformation and productivity enhancements, thereby unlocking broader entrepreneurial potential across participating countries. Moving forward, as the initiative's cooperative mechanisms deepen, developing targeted, synergistic, and efficient entrepreneurial support systems to promote balanced regional entrepreneurial vitality will likely play an increasingly vital role in achieving inclusive growth and sustainable development goals.

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