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ENHANCEMENT OF PROJECT ACTIVITY AND INNOVATION CAPABILITY THROUGH OUTWARD FOREIGN DIRECT INVESTMENT BY CHINESE DIGITAL ENTERPRISES UNDER THE BELT AND ROAD INITIATIVE

ПОЛІПШЕННЯ ПРОЕКТНОЇ АКТИВНОСТІ ТА ІННОВАЦІЙНИХ МОЖЛИВОСТЕЙ ШЛЯХОМ ПРЯМИХ ІНОЗЕМНИХ ІНВЕСТИЦІЙ КИТАЙСЬКИХ ЦИФРОВИХ ПІДПРИЄМСТВ В РАМКАХ ІНІЦІАТИВИ «ОДИН ПОЯС, ОДИН ШЛЯХ»

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The article is devoted to Outward Foreign Direct Investment (OFDI) by Chinese digital economy enterprises. Project activity is not only as the core carrier of OFDI, but also a key link connecting enterprise investment behavior and improvement of innovation capacity. This study adopts the difference-in-differences (DID) method, introduces project activity as an intermediary variable, and empirically examines the impact of OFDI-driven project activity on the innovation capacity of Chinese digital economy enterprises under the BRI framework. Empirical results show that: first, under the BRI framework, OFDI of digital economy enterprises has a significant positive impact on improvement of innovation capacity. Second, project activity plays a partial mediating role between the OFDI of digital enterprises and their innovation capacity. Third, OFDI project activities of digital enterprises in priority areas have a more significant impact on innovation capacity.

Keywords: Belt and Road Initiative (BRI); Outward Foreign Direct Investment (OFDI); Project Activity; Innovation Capacity; Digital Enterprises; Project Management.

Стаття присвячена актуальним питанням прямих іноземних інвестицій (OFDI) китайських підприємств в рамках просування ініціативи «Один пояс, один шлях». Проаналізована проектна діяльність, яка є не тільки основним носієм OFDI, але й ключовою ланкою, що пов'язує інвестиційну поведінку підприємств та покращення інноваційного потенціалу. Ця стаття фокусується на підприємствах цифрової економіки. На основі даних китайських підприємств цифрової економіки, що котируються на акціях класу А, з 2002 по 2020 рік, це дослідження використовує метод різниці в різницях (DID), вводить проектну діяльність як проміжну змінну та емпірично досліджує вплив проектної діяльності, зумовленої OFDI, на інноваційний потенціал китайських підприємств цифрової економіки в рамках BRI. Емпіричні результати показують, що: по-перше, в рамках BRI, OFDI підприємств цифрової економіки має значний позитивний вплив на покращення інноваційного потенціалу. По-друге, проектна діяльність відіграє часткову посередницьку роль між OFDI цифрових підприємств та їхнім інноваційним потенціалом; цифрові підприємства можуть сприяти інноваціям, оптимізуючи управління всім життєвим циклом проектів OFDI та надаючи повну віддачу ролі проектам в інтеграції ресурсів та техно-



логічній практиці. По-третє, проєктна діяльність цифрових підприємств у пріоритетних сферах, включаючи телекомунікації, радіо та телебачення, послуги супутникового передавання, а також виробництво комп'ютерів, комунікацій та іншого електронного обладнання, має більш значний вплив на інноваційний потенціал. Це дослідження збагачує теоретичну систему в галузі прямих іноземних інвестицій та інновацій на підприємствах, надає міцну теоретичну підтримку та практичне керівництво для китайських підприємств цифрової економіки з метою оптимізації структури закордонних проєктів в межах ініціативи "Один пояс, один шлях", підвищення ефективності управління повним життєвим циклом проєкту та його інноваційної здатності за допомогою проєктної діяльності OFDI.

Ключові слова: Ініціатива "Один пояс, один шлях" (BRI); прямі іноземні інвестиції (OFDI); проєктна діяльність; інноваційний потенціал; цифрові підприємства; управління проєктами.

Statement of the problem. The Belt and Road Initiative (BRI), proposed in 2013, has gradually become a core platform for Chinese enterprises to "go global" and carry out OFDI. Under the guidance of the BRI, Chinese enterprises have launched a large number of specific investment projects in countries along the routes, covering key fields such as infrastructure construction, digital economy, and energy cooperation. Among these projects, digital economy cooperation projects have become a new growth point of BRI cooperation in recent years.

From the professional perspective of Project Management, scientific and standardized project management can effectively help enterprises optimize resource allocation, improve technical levels, and enhance innovation awareness. For digital enterprises with "light asset" characteristics and technology-driven attributes, the whole-life-cycle management of overseas OFDI projects is particularly important – it helps enterprises better adapt to investment environment and market demand of host countries, reduce project risks, and fully release the innovation-driven effect of OFDI [1, p. 15; 2, p. 74].

Existing studies have shown that the BRI has significantly promoted Chinese enterprises' OFDI and helped enterprises enhance their innovation capacity through OFDI. For digital enterprises, overseas OFDI projects are mainly concentrated in fields such as digital infrastructure construction, digital technology R&D, and digital service cooperation.

Analysis of recent research and publications. Existing research has thoroughly confirmed that the BRI significantly promotes Chinese enterprises' OFDI and provides a favorable policy environment and collaborative platform for improving innovation capabilities through OFDI and related project activities. Some scholars argue that under the BRI framework, Chinese enterprises can better absorb the reverse technology spillover effects of host countries through specific OFDI projects, thereby driving innovation capability

enhancement [3, p. 125]. However, most studies focus on the overall level of enterprises, with relatively few examining the mediating role of specific project activities – particularly research on digital enterprises participating in BRI project activities remains scarce.

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Digital enterprises can acquire two types of innovation knowledge in OFDI: domestic innovation knowledge accumulation and knowledge gained from international learning and exchanges. On one hand, intangible assets such as digital innovation knowledge and technology can be transferred to overseas subsidiaries at a lower cost, enhancing the firm's ownership advantages through OFDI. On the other hand, digital multinational enterprises absorb advanced digital innovation technologies by engaging with global suppliers, overseas consumers, and research institutions, updating their digital knowledge base and improving the technological innovation capabilities of the parent company. Second, compared to traditional enterprises, digital enterprises rely on digital infrastructure to rapidly transmit and process information, aligning with the Davido Law – that the first generation of digital innovation products entering the market automatically captures 50% of the market share [4, p. 78].

Existing research [5, p.24] indicates that the outward OFDI of digital enterprises has a significant positive innovation effect, which is mainly achieved through three mechanisms: reducing transaction costs, expanding market size, and promoting digital upgrading. Based on this, this study further clarifies that digital enterprises have stronger technological dependence and innovation drive compared to other economic sectors. Their OFDI project activities under the framework of the Business Innovation Strategy (BRI) have a more significant role in promoting innovation capabilities.

Highlighting previously unresolved parts of the overall problem. Research on the relationship between project activity and enterprise innovation is mainly concentrated in the field of domestic projects, while research on the impact of OFDI project activity on the innovation capacity of digital enterprises under the BRI framework is still relatively scarce.

Formation of the objectives of the article (task statement). The paper focuses on the following core objectives: first, can the specific OFDI-driven project activities of Chinese digital enterprises under the BRI framework promote the improvement of their innovation capacity? Second, from the perspective of Project Management, what is the internal mechanism through which specific project activities play a mediating role in the process of OFDI promoting digital enterprises' innovation? Third, what are the differences between digital enterprises and other sectors in the impact of OFDI project activity on innovation capacity?

Summary of the main research material. This study selected digital enterprises listed on the Chinese A-share market from 2002 to 2020 as the initial sample, and further screened digital enterprises that carried out OFDI project activities under the BRI framework after 2013. The definition of digital enterprises is based on the "Statistical Classification of Digital Economy and Its Core Industries (2021)" released by the National Bureau of Statistics [6]. The research data mainly comes from the CSMAR database [7], Wind database [8], annual reports of listed companies, and the official website of the Ministry of Commerce [9].

Dependent variable: Enterprise innovation capability (Innoit). This study uses the number of patent applications submitted by digital enterprise *i* in year *t* as an indicator to measure the innovation capability of the enterprise, and takes its natural logarithm to reduce the impact of heteroscedasticity.

Independent variable: BRI driven OFDI (DIDit). This study adopts a stepwise DID method, where DIDit is a dummy variable representing whether digital enterprise carries out OFDI and related project activities under the BRI framework (1 represents carried out, 0 represents not carried out) [10].

Mediating variable: Project activity level. Based on the professional characteristics of project management, this study selected three core indicators to measure the project activity level of digital enterprises: the number of overseas investment projects, project investment scale, and project completion rate. Principal component analysis was used to integrate these three indicators into a comprehensive indicator of project activity level [11].

Mechanism variables: transaction cost, market size, and digitization level. These three variables are used to examine the intrinsic mechanism by which OFDI promotes digital enterprise innovation through project activities.

Control variables: Referring to existing relevant research, this study selects the following control variables to eliminate the influence of other factors on corporate innovation: firm size, firm age human capital level, debt to asset ratio, return on assets, and ownership nature.

Based on the DID model, this paper introduces project activity level as a mediating variable to explore the mechanism by which OFDI promotes digital enterprise innovation through project activities. Referring to the views of Jiang Ting, Yuan Chun, and others [12, p. 108; 13, p. 144], the revised benchmark model is as follows:

$$\ln\text{innoit} = \alpha_0 + \alpha_1\text{DIDit} + \sum_k \alpha_k X_{kit} + \gamma_t + \mu_i + \varepsilon_{it} \quad (1)$$

$$M_{it} = \beta_0 + \beta_1\text{DIDit} + \sum_k \beta_k X_{kit} + \gamma_t + \mu_i + \varepsilon_{it} \quad (2)$$

In the formula, subscripts *t* and *i* represent the year and the enterprise respectively. The explained variable is *Innoit*, which indicates the innovation of digital enterprise *i* in year *t*. The explanatory variable *DIDit* is the difference-in-differences estimator, which indicates whether digital enterprise *i* has carried out OFDI in year *t*. If enterprise *i* has carried out OFDI in year *t*, *DIDit* = 1; otherwise, it is 0. α_1 measures the driving effect of digital enterprises' OFDI on enterprise innovation. *X_{kit}* represents a series of control variables affecting the innovation of digital enterprises. μ_i is the individual fixed effect, γ_t is the time fixed effect, and ε_{it} is the random error term. *M* represents mediating variables, including enterprise transaction cost (*cost*), market scale (*market*), and enterprise digitization level (*digital*). When β_1 is significant in equation (2),

it indicates that digital enterprises' outward direct investment can affect their technological innovation through mechanisms such as transaction cost savings, market expansion, and digital upgrading.

It should be emphasized that the priority domain identification framework is the core component of this article, and this study has made detailed improvements to this framework. Specifically, by integrating the priority areas of BRI cooperation (such as digital infrastructure, cross-border digital cooperation), the professional characteristics of project management, and the features of digital enterprise projects, this article clarifies the priority areas of digital enterprise OFDI project activities under the BRI framework. The identification criteria mainly include three aspects: first, the compatibility with the priority areas of BRI digital cooperation; secondly, the feasibility and operability of project implementation; thirdly, the innovation driven effect of OFDI projects. Based on these standards, this study identifies telecommunications, broadcasting and television, satellite transmission services, as well as electronic equipment manufacturing industries such as computers and communications, as priority areas.

On the basis of benchmark regression, robustness test, mediation effect test, mechanism test, and heterogeneity analysis, the empirical analysis results of specific project activities as mediating variables were supplemented, and detailed analysis was conducted on key industries.

This article uses a progressive double difference model to empirically test the innovation effect of digital enterprises' outward direct investment. The benchmark regression results are shown in a Table 1. Column (1) represents the result with only the core explanatory variable added, and the regression coefficient of DID is significantly positive at the 1% level. Column (2) shows that after adding relevant control variables, the coefficient of the core explanatory variable remains significantly positive at the 1% level. Columns (3) and (4) show the regression results after gradually incorporating time fixed effects and individual fixed effects. With the introduction of control variables and fixed effects, the R² value of the regression equation increases, and the fitting degree of the regression model improves significantly, while the direction and significance of the core explanatory variable coefficients remain unchanged. The regression results of column (4) indicate that the regression coefficient of the double difference item is 0.2206, which is

significantly positive at the 1% level. This means that the innovation effect of digital enterprises' outward foreign direct investment is significantly positive, and the behavior of digital enterprises' outward foreign direct investment helps to improve the innovation level of enterprises. This conclusion verifies hypothesis 1. From the estimated coefficients of the control variables in column (4) of the Table 1, it can be seen that the number of executives (man), human capital (hr), enterprise age (age), and capital intensity (kl) have a significant positive impact on digital enterprise innovation.

The baseline regression analysis results show that the DIDit coefficient is significantly positive at the 1% significance level, indicating that under the BRI framework, digital enterprise OFDI (driven by specific project activities) has a significant positive impact on innovation capability enhancement. This conclusion fully echoes the core viewpoint of the paper, confirming that BRI driven OFDI can effectively promote innovation in digital enterprises.

To ensure the reliability of the empirical results, this study conducted a series of robustness tests, including parallel trend tests, placebo tests, dependent variable replacement, and exclusion of other policy interferences. The test results show that the DIDit coefficient is still significantly positive, indicating the robustness of the conclusion that 'broadband drives OFDI to promote digital enterprise innovation'.

The results of the mediation effect test show that the DIDit coefficient in model (2) is significantly positive, indicating that BRI driven OFDI can significantly improve the project activity level of digital enterprises; The coefficient of term γ in model (1) is significantly positive, and although the DIDit coefficient is still significantly positive, its absolute value is smaller than the baseline regression value. This indicates that under the BRI framework, project activities play a partial mediating role between digital enterprise OFDI and innovation capabilities. From a project management perspective, this means that digital enterprises can enhance their innovation capabilities by initiating OFDI project activities, optimizing project lifecycle management, and fully leveraging project resource integration and technological practices.

The results of the mechanism verification are shown in a Table 2. Column (1) in the table shows the test results of the transaction cost saving mechanism, where the regression coefficient of the double difference item is significantly negative at the 5% level, indicating

Table 1

Benchmark Regression Results

	(1) <i>Ininno</i>	(2) <i>Ininno</i>	(3) <i>Ininno</i>	(4) <i>Ininno</i>
DID	1.5089*** (0.0515)	0.3958*** (0.0471)	0.2607*** (0.0437)	0.2206*** (0.0460)
<i>Inman</i>		0.1711*** (0.0408)	0.1954*** (0.0374)	0.1740*** (0.0377)
<i>Inhr</i>		0.1183*** (0.0125)	0.0605*** (0.0117)	0.0370*** (0.0122)
<i>Inage</i>		0.4814*** (0.0234)	0.2044*** (0.0260)	0.2482*** (0.0288)
<i>Inkl</i>		0.1055*** (0.0049)	0.1068*** (0.0141)	0.0957*** (0.0141)
Constant term	3.3893*** (0.0615)	- 0.2614 (0.2086)	- 0.6757*** (0.2302)	- 0.1746 (0.2271)
Time fixed effect	No	No	No	No
Individual fixed effect	No	No	No	No
Observations	5276	4733	4733	4733
R ²	0.1609	0.5226	0.6120	0.6127

Note: The values in parentheses are cluster-robust standard errors at the enterprise level; *, **, and *** indicate that the empirical results are significant at the 10%, 5%, and 1% levels respectively.

Source: compiled by the authors

that digital enterprises' outward direct investment can significantly reduce transaction costs and promote innovation. Digital enterprises' outward direct investment significantly reduces transaction costs such as information search and transmission for digital products and services, further accelerating the sharing of research and development achievements and knowledge spillover, and driving enterprise innovation. Column (2) shows the test results of the market size expansion mechanism. The double difference partial regression coefficient is significantly positive at the 5% level, indicating a significant market size expansion mechanism. Digital enterprises' outward direct investment can leverage economies of scale, enhance complementary digital resource acquisition capabilities, and accelerate the matching of supply and demand information, thereby achieving market size expansion and supporting digital enterprise innovation. Column (3) represents the test result of the digital upgrade mechanism, and the double difference item shows the regression coefficient, which is significantly positive at the 10% level. Digital enterprises can achieve digital upgrading through channels such as enhancing their own digital capabilities, and promote the improvement of their innovation level. The above research results indicate that digital enterprises'

outward direct investment promotes digital enterprise innovation through cost savings, market expansion, and the implementation of digital upgrading mechanisms.

The mechanism test results indicate that BRI driven OFDI can promote digital enterprise innovation through three paths: reducing transaction costs, expanding overseas market size, and accelerating digital upgrading. Specifically, OFDI project activities can: reduce cross-border transaction costs by integrating global resources; expand the scale of overseas markets through overseas project layout, thereby enhancing innovation demand; by collaborating on projects and absorbing advanced digital technologies, we can promote the digital upgrading of enterprises and enhance their innovation capabilities.

Heterogeneity analysis focuses on examining industry differences in the impact of OFDI project activities on the innovation capabilities of digital enterprises. The research results indicate that the OFDI project activities of digital enterprises in the fields of telecommunications, broadcasting and television, satellite transmission services, as well as electronic equipment manufacturing such as computers and communications, have a more significant promoting effect on the improvement of innovation capabilities.

Table 2

Mechanism Test Results

	(1) Transaction cost saving (Incost)	(2) Market scale expansion (Inmarket)	(3) Digital upgrading (digital)
DID	- 0.0976**(0.0487)	0.2078**(0.0871)	0.0242*(0.0138)
Constant term	0.4842**(0.1925)	2.6580*** (0.4012)	- 0.7191*** (0.0621)
Control variables	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes
Observations	4733	4377	4287
R ²	0.0998	0.2972	0.1992

Note: The values in parentheses are cluster-robust standard errors at the enterprise level; *, **, and *** indicate that the empirical results are significant at the 10%, 5%, and 1% levels respectively.

Source: compiled by the authors

Table 3 shows the test results of the innovation effect of foreign direct investment by enterprises in different digital industries. Columns (1) to (4) in Table 3 are the inspection results of computer, communication and other electronic equipment manufacturing industries, telecommunications, radio and television and satellite transmission services, software and information technology services, and Internet and related services, respectively. Specifically,

the results in column (1) show that the DID regression coefficient of the sample in the computer, communication, and other electronic equipment manufacturing industry is 0.2515, which is significantly positive at the 1% level. For computer, communication, and other electronic equipment manufacturing enterprises, the innovation level of the enterprises significantly improves after outward direct investment. The Chinese computer, communication, and

Table 3

Heterogeneity Test of Digital Industries

	(1) Computer, communication, and other electronic equipment manufacturing (Ininno)	(2) Tele-communications, radio, television, and satellite transmission services industry (Ininno)	(3) Software and information technology service industry (Ininno)	(4) Internet and related service industry (Ininno)
DID	0.2515*** (0.0560)	0.2706*** (0.0601)	0.0949 (0.0858)	-0.2983 (0.1865)
Constant term	-1.2225*** (0.3894)	-3.5388* (1.8671)	-1.3342*** (0.5035)	1.8688*** (0.5368)
Control variables	Yes	Yes	Yes	Yes
Time fixed effect	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes
Observations	2828	169	1177	559
R ²	0.6561	0.5854	0.6374	0.2652

Note: The values in parentheses are cluster-robust standard errors at the enterprise level; *, **, and *** indicate that the empirical results are significant at the 10%, 5%, and 1% levels respectively.

Source: compiled by the authors

other electronic equipment manufacturing industry has high competitiveness in the global market, strong innovation capabilities, and has initially formed a large-scale application effect. Enterprises' outward direct investment realizes the market expansion of digital manufacturing industry, strengthens the economies of scale and market competition, helps to reduce transaction costs and research and development costs, and assists enterprises in innovation. The regression coefficient of DID in the telecommunications, broadcasting and television, and satellite transmission service industries in column (2) is 0,2706, which is significantly positive at the 1% level. This means that for telecommunications, broadcasting and television, and satellite transmission service enterprises, after outward direct investment, their innovation level significantly improves. Telecommunications, broadcasting and television, and satellite transmission services are important digital infrastructure, and related enterprises can seize opportunities in the overseas digital infrastructure market by "going global" and achieve innovation spillover through market expansion. However, the innovation effect of OFDI in software and information technology services, the Internet and related services in columns (3) and (4) is not significant.

Conclusions. This article took digital enterprises as the research object, deeply integrates BRI with specific project activities, and empirically tested the impact of digital enterprise OFDI project activities on innovation capabilities within the BRI framework and its internal mechanisms. The main research conclusions are:

1. Under the BRI framework, digital enterprise OFDI (driven by specific project activities) has a significant positive impact on enhancing innovation capabilities, and this conclusion still holds true after a series of robustness tests.

2. Project activities play a partial intermediary role between digital enterprise OFDI and innovation capabilities. Digital enterprises can promote innovation by optimizing the full lifecycle management of OFDI projects, fully leveraging the role of projects in resource integration and technological practice.

3. Telecommunications, broadcasting and television, satellite transmission services, as well as electronic equipment manufacturing such as computers and communications, are the key areas of digital enterprise OFDI project

activities. The impact of OFDI project activities in these fields on innovation capability is more significant.

The research results provide theoretical support and practical reference for Chinese enterprises to enhance their innovation capabilities through OFDI project activities under the BRI framework.

Based on the research findings, this article proposes the following recommendations, which fully integrate the BRI initiative, project management professional perspective, and the positioning of digital enterprises:

1. Optimize the environment for digital enterprises to carry out cross-border OFDI project activities. Relevant departments should introduce more targeted support measures, simplify the approval process for overseas OFDI projects of digital enterprises, provide financial and tax support, and encourage digital enterprises to participate in cross-border digital cooperation projects (such as digital infrastructure joint construction projects), fully leveraging the role of specific projects in promoting innovation.

2. Strengthen the project management capabilities of digital enterprises. From the perspective of project management, relevant departments and industry associations should guide digital enterprises to strengthen the full lifecycle management of overseas investment projects, improve project planning, implementation, monitoring, and risk control levels, optimize project resource allocation, and enhance the role of projects in resource integration and technology spillover.

3. Guide digital enterprises to focus on the key areas of OFDI project layout. Based on the key area identification framework proposed in this article, relevant departments should guide digital enterprises to focus on key areas such as digital infrastructure, telecommunications, and electronic equipment manufacturing, optimize the layout of OFDI projects, and fully leverage the innovation driven role of OFDI.

4. Promote the coordinated development of various economic sectors under the BRI framework. We should strengthen the linkage between digital economy enterprises and other economic sectors, promote the coordinated promotion of OFDI project activities among various fields, comprehensively enhance the innovation capabilities of Chinese enterprises, and better serve the overall strategy of BRI and the construction of an innovative country.

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