

Retraction

Retracted: Effects of Digital Platform Openness on Recognition of Entrepreneurial Opportunities and Integration of Entrepreneurial Resources

Discrete Dynamics in Nature and Society

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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- [1] D. Li and K. Li, "Effects of Digital Platform Openness on Recognition of Entrepreneurial Opportunities and Integration of Entrepreneurial Resources," *Discrete Dynamics in Nature and Society*, vol. 2021, Article ID 1875715, 8 pages, 2021.

Research Article

Effects of Digital Platform Openness on Recognition of Entrepreneurial Opportunities and Integration of Entrepreneurial Resources

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Drawing on the theories of open innovation and entrepreneurship, this paper discusses the action mechanism of digital platform openness (DPO) on the recognition of entrepreneurial opportunities (EOR) and the integration of entrepreneurial resources (ERI) and explores the boundary conditions of this mechanism. Several hypotheses were put forward and verified by analysing 302 valid questionnaires. The results show that the breadth and depth of DPO positively affect EOR and ERI; these positive effects are positively moderated by the service level of the digital platform. The research findings provide a reference to digital platform enterprises to decide on platform opening strategy and platform service optimization.

1. Introduction

In the digital age, which is defined by digitization, intelligence, and sharing, platform economy grows into a new driver of the global economy. More than half of the top 20 digital giants in the world are digital platform enterprises, namely, Microsoft, Amazon, Tencent, Alibaba, Google, and Facebook, which show the development prospect of digital platform. The development of digital platforms has brought new opportunities for innovation and entrepreneurship. In search of new business opportunities, numerous entrepreneurs are renovating their business models in various fields, ranging from e-commerce live broadcasting, we media platform, software innovation, and intelligent hardware production, to sharing economy. Digital platforms, as a new economic paradigm, exert a profound impact on social economy and traditional entrepreneurial activities.

The previous research on digital platform and entrepreneurship mainly focuses on the influence of enterprise innovation and entrepreneurship, as well as entrepreneurial risks. Digital platform provides organizations and transaction intermediaries with a venue for value creation. Characterized by flexibility, openness, and sharing, digital

platform gathers these players together to start businesses, create values, and transfer values [1]. The resulting complementary and interactive ecosystem could generate economies of scale and expand the scope of innovation [2, 3]. On the digital platform, the value innovation is transferred from the inside of enterprises to the outside, which changes the path of value creation.

As the basis of digital platform, the digital technology affects the entrepreneurial process on three levels (i.e., individual, enterprise, and ecosystem) and thus influences the survival, performance, and competitive advantage of enterprises [4]. Digital entrepreneurship offers entrepreneurial teams more intelligent management means and enables them to make the optimal decisions. Therefore, the team members need to recognize, allocate, and utilize entrepreneurial resources in a systematic manner [5]. In fact, platform service innovation has different effects on value cocreation and network effect in different stages [6]. The service support environment of the digital platform can promote the capability upgrading and digital transformation of small and medium enterprises (SMEs) [7]. Besides, the digital platform underpins entrepreneurial activities and facilitates the classification of entrepreneurial risks [8].

Digital entrepreneurship faces more risks and uncertainties compared with traditional entrepreneurship [9].

The development of platform economy has attracted much attention to platform openness. Platform openness is the mechanism to control external innovation and competitive advantage. The openness of digital platform means the openness on digital infrastructure, data, information, resources, channel, service, etc. In the context of digitalization, the digital platform openness on the supply side and the demand side exert impact on performance of online platform enterprises [10]. The market potential of the platform could be influenced by every provider, technology, and user [11]. To expand the user base, the platform should conceptualize openness in an all-round way [12]. Any decision on platform openness must take account of suppliers, consumers, complementary service providers, product categories, sales channels, and the environment [13]. Compared with the closed platform, an open platform can greatly enhance the building ability of developers [14].

To sum up, the existing studies on digital platforms stress the impact on innovation. Most researchers of digital platform and entrepreneurship tackle three issues: platform architecture, digital technology, and supporting environment. The impact of platform openness on entrepreneurship has been primarily weighed in two dimensions, namely, decisions on innovation openness and decisions on platform openness. Overall, there are few systematic and in-depth studies on the relationship between digital platform openness (DPO) and entrepreneurship. From the perspective of DPO, this paper takes the service level of digital platform as a moderator variable and probes deep into how the depth and breadth of DPO affect the recognition of entrepreneurial opportunities (EOR) and the integration of entrepreneurial resources (ERI). The action mechanism of DPO on EOR and ERI was thoroughly investigated through an empirical analysis. The research results provide a reference for digital platform enterprises to promote EOR and ERI and thus improve the entrepreneurial quality.

2. Hypotheses

2.1. DPO and EOR. Every digital platform combines technical elements (software and hardware) with social elements (organizational processes and standards). The existing digital platforms are generally driven by demand, supply, or supply-demand matching. Relying on network-based information technology, each digital platform links up multiple interdependent players through open digital infrastructure. The interaction between these players creates new values. The digital platform provides entrepreneurs with an environment for research and development (R&D), as well as product and service innovation, giving birth to promising entrepreneurial opportunities [15].

The depth and breadth of DPO are conducive to knowledge dissemination. A highly open digital platform broadens the horizon and mind of entrepreneurs, enabling them to better recognize entrepreneurial opportunities [16]. The depth and breadth of DPO, along with the governance of digital platform ecosystem, might affect the intensity and

scope of entrepreneurial opportunities. The deeper and wider the openness of the digital platform, the easier it is for new enterprises to find and recognize entrepreneurial opportunities with proven business models [9].

The DPO provides the necessary technical supports for discovering and creating entrepreneurial opportunities. With the aid of digital platform, entrepreneurs may innovate intelligent hardware or provide innovative services to quickly identify market opportunities [17]. As more and more digital platforms (e.g., Facebook and Twitter) open their information, entrepreneurs now enjoy a golden opportunity to contact a wide group of potential users deeply and thereby expand their user base exponentially. The open information provides new insights into market demand, and a new tool to recognize entrepreneurial opportunities. In this way, entrepreneurs could reasonably develop complementary products and renovate their business models [18].

Furthermore, the DPO boosts the interaction between players in the entrepreneurial process. Thanks to an open digital platform, entrepreneurs could communicate more frequently with enterprises and consumers and better recognize entrepreneurial opportunities. In the presence of a deeply and widely open digital platform, entrepreneurs can utilize the editable digital technology to reshape, integrate, and innovate traditional industries, develop new demands, and pinpoint entrepreneurial opportunities [19]. Therefore, the following hypotheses were proposed:

H1a: DPO breath positively affects EOR

H1b: DPO depth positively affects EOR

2.2. DPO and ERI. The opening of digital platforms facilitates start-ups to recognize potential entrepreneurial resources. Firstly, a deeply and widely open digital platform reduces the cost of entrepreneurs for a complete search of information and helps them to identify and integrate the core resources needed for entrepreneurship [17]. Secondly, the opening of digital platform resources makes it easier for enterprises to integrate a wider range of resources, connect suppliers and demanders more efficiently, and improve their relationship with suppliers and consumers [20].

Digital platforms for crowdfunding and other purposes provide convenience for entrepreneurs to implement their creative thoughts, recruit team members, attract consumers, and solicitate financing supports, that is, to gather entrepreneurial resources more efficiently [21]. If the digital platform is open deeply and widely, entrepreneurs could search for entrepreneurial resources in a wide range, find it easy to acquire boundary resources, and integrate entrepreneurial resources in an efficient manner. For instance, DPO lays the foundation for efficient communication, and possible cooperation and transaction between entrepreneurs and platform participants. Hence, entrepreneurs could integrate entrepreneurial resources, such as information, knowledge, and capital, with a high efficiency [22].

In addition, the big data generated by the opening of digital platforms promote the mining of potential demands and unused resources, which in turn drive ERI. The greater

the DPO depth and breadth, the more transparent the information and data of the digital platform. The high transparency could enhance the trust between enterprises and help entrepreneurs recognize, acquire, and select the required entrepreneurial resources [23]. Therefore, the following hypotheses were presented:

H2a: DPO breath positively affects ERI

H2b: DPO depth positively affects ERI

2.3. Moderating Effect of Digital Platform Service Level.

The service level of the digital platform refers to the quality of platform services in the following aspects: digital technology support, product operation, channel management, financing support, incubation, property right protection, and risk governance. The digital platform with high service level may provide data resources, promotion channels, and entrepreneurial funds to help enterprises understand the market and grow up. It can provide forums, technical support, and training to help communicating and solving technical problems [24]. The service level determines how attractive the platform is to third parties, and how many users it could attract [25]. Platform leaders should lower the R&D cost of platform enterprises and improve the interactive efficiency of users, such that the enterprises could better meet consumer demand.

It is generally believed that the platform service level enhances the impact of DPO breadth and depth on EOR. As DPO gets deeper and wider, entrepreneurs may face more problems, including blocked promotion channels, limited funds, technical difficulties, and inefficient operation. With a high service level, the digital platform could provide strong technical support to facilitate the problem-solving by entrepreneurs. The entrepreneurs on such a platform may find it easy to accumulate consumers, open new promotion channels, forecast market demand, and implement new business models. The other benefits of a high service level include high-quality product operation and real-time capturing of entrepreneurial opportunities.

Besides, the platform service level is assumed to promote the impact of DPO breadth and depth on ERI. When the DPO increases in breadth and depth, entrepreneurs could access suitable open resources more efficiently and share platform resources. This provides favourable conditions for further collection and use of resources. With a high service level, the digital platform could attract more users with better incubation services and more fund supports, facilitating the resource integration by entrepreneurs. The digital platform with high service level may help start-ups analysing business data and monitoring funds to avoid the operational risks. It can provide specific measures of property rights protection to avoid property right risk. That is, the platform does well in information management, risk governance, and property right protection. The initial entrepreneurial resources are screened for entrepreneurs, making ERI an easy task. Therefore, the following hypotheses were proposed:

H3a: the digital platform service level positively moderates the impact of DPO breadth on EOR

H3b: the digital platform service level positively moderates the impact of DPO depth on EOR

H4a: the digital platform service level positively moderates the impact of DPO breadth on ERI

H4b: the digital platform service level positively moderates the impact of DPO depth on ERI

The conceptual model is shown in Figure 1.

3. Methodology

3.1. Data Collection. A questionnaire survey was carried out on the founders or senior managers of start-ups on digital platforms in Shanghai, Beijing, Guangdong, Zhejiang, and Jiangsu, China. Referring to the popular definitions of start-ups, every respondent meets the following condition: the enterprise has been operating independently for less than 8 years [26]. The survey was conducted both online and offline. A total of 385 questionnaires were distributed. About 78% (302) of valid responses were obtained. The sample characteristics are shown in Table 1.

3.2. Variable Measurement. The scales adopted in this research were translated and back-translated from the scales widely recognized in the relevant standards. The initial questionnaire was adjusted and modified according to the presurvey feedbacks from experts in relevant fields. The 5-point Likert scale was selected for the formal questionnaire, with 1 standing for strongly disagree and 5 for strongly agree.

The DPO was divided into the depth and breadth by the scale of Laursen and Salter [27] and measured by seven items: cooperation between the platform and external enterprises, cooperation between the platform and research institutions, cooperation between the platform and upstream and downstream organizations in the supply chain, the cooperation frequency between the platform and external innovation organizations/other organizations, etc.

Inspired by the scale of Ozgen and Baron [28], EOR was measured by the following items: whether the enterprises can perceive the unsatisfied demand, whether the enterprises can identify the products/services needed by consumers, etc.

The EOR was measured by the scale developed by Ozgen and Baron [28], including enterprises that can accurately perceive the unmet customer demands and enterprises that can effectively identify the products and services needed by consumers and so on.

Inspired by the scale of Peng et al. [29], ERI was divided into the cohesion of entrepreneurial resources, and coupling of entrepreneurial resources. The measuring items include enterprises that can gain competitive advantages through rational allocation and integration of similar resources, enterprises that often sort out and screen information to activate various information resources, etc.

The service level of the digital platform was measured by the scales of Sun and Kuang [30]. The measuring items include the digital platform providing data resources, the digital platform providing promotion channels, the digital

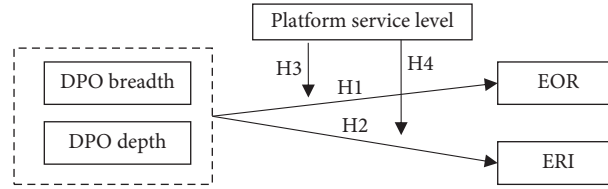


FIGURE 1: Conceptual model.

TABLE 1: Sample characteristics.

Variables	Category	Frequency	Percent
Enterprise size (no. of employees)	1–50	127	42.1
	51–100	124	41.1
	More than 101	51	16.9
Enterprise age (in years)	1–3	121	40.1
	3–5	120	39.7
	5–8	61	20.2
Entrepreneurial experience	Yes	168	55.6
	No	134	44.4
Industry	Services, business	121	40.1
	Information technology	99	32.8
	Equipment manufacturing	45	14.9
	Others	37	12.3

platform providing entrepreneurial funds, the digital platform providing specific measures of property rights protection, etc.

In addition, seven control variables were designed, such as enterprise age, entrepreneurial experience, enterprise size, and industry of the enterprise. All these control variables may affect EOR and ERI.

3.3. Reliability and Validity Test. The reliability of a scale is generally measured by Cronbach's alpha (α). In this paper, the reliability of the designed scale is tested on SPSS 21.0. The results show that Cronbach's α values of DPO, EOR, ERI, and platform service level were 0.922, 0.865, 0.935, and 0.903, respectively. Therefore, our scale is highly reliable.

Besides, the contents of the scale are valid, for all items were modified and improved as per expert opinions and mature scales.

In addition, a confirmatory factor analysis (CFA) was carried out on Amos 23.0. As shown in Table 2, the combined reliability (CR) values of DPO, EOR, ERI, and platform service level were all greater than 0.8, the factor loadings were all larger than 0.5, and the average variance extracted (AVE) values were all above 0.6. Therefore, our scale has good convergent validity.

Finally, the discriminant validity between the variables in our scale was proved well, because the square root of the AVE was greater than the correlation coefficient for DPO, EOR, ERI, and platform service level. The results are shown in Table 3.

4. Results Analysis

4.1. Descriptive Statistics and Correlation Analysis. Table 3 shows the mean, standard deviation, and correlation coefficient of each variable. The correlation analysis indicates that DPO is correlated with EOR ($r=0.342$, $P<0.05$) and ERI ($r=0.406$, $P<0.05$). Thus, the proposed hypotheses were verified preliminarily.

4.2. Hypothesis Test. The variables were centralized for hierarchical regression analysis on our model. Firstly, EOR and ERI were taken as the dependent variable in turn, creating two basic models M1 and M5, and enterprise size, enterprise age, entrepreneurial experience, and industry were introduced to the two models as control variables. Secondly, DPO was selected as the independent variable to create model M2 and model M6. Thirdly, platform service level was taken as the moderator variable to create model M3 and model M7. Eventually, the interaction term between DPO and platform service level was added to create model M7 and model M8. The results of hypothesis test are shown in Table 4.

M2 and M6 had a much greater ΔR^2 than the basic models M1 and M5, indicating that the explanatory model is greatly improved by the introduction of the independent variable. Therefore, DPO has an impact on EOR and ERI.

For M2, the regression coefficient of 0.245 ($P<0.01$) suggests that DPO significantly promotes EOR, which verifies H1: the regression coefficient of 0.322 ($P<0.01$) indicates that DPO significantly promotes ERI, which verifies H2.

TABLE 2: Results of reliability and validity test.

Variables	Number of items	Factor loadings	CR	AVE	Cronbach's α coefficient
DPO	7	0.778	0.922	0.629	0.922
		0.800			
		0.791			
		0.818			
		0.813			
		0.757			
EOR	4	0.787	0.867	0.621	0.865
		0.798			
		0.780			
		0.786			
ERI	10	0.792	0.944	0.627	0.935
		0.799			
		0.783			
		0.801			
		0.782			
		0.795			
		0.822			
		0.816			
Platform service level	7	0.779	0.915	0.605	0.903
		0.736			
		0.775			
		0.778			
		0.759			
		0.795			
		0.820			

TABLE 3: Descriptive statistics.

Variables	Mean									
Enterprise size	1.74	0.72	1							
Enterprise age	1.80	0.75	0.559**	1						
Entrepreneurial experience	1.44	0.49	-0.361**	-0.430**	1					
Industry	1.99	1.02	-0.002	0.042	-0.033	1				
DPO	3.04	1.24	0.140*	0.190**	-0.197**	0.061	(0.793)			
EOR	2.96	1.25	0.368**	0.470**	-0.383**	-0.096	0.342**	(0.788)		
ERI	3.08	1.44	0.373**	0.400**	-0.367**	-0.081	0.406**	0.569**	(0.792)	
Platform service level	3.68	1.32	0.384**	0.508**	-0.385**	-0.103	0.494**	0.601**	0.627**	(0.778)

Note: $P^* < 0.1$, $P^{**} < 0.05$, $P^{***} < 0.01$, $N = 302$. The square roots of AVE are bracketed along the diagonal.

Moreover, M4 achieved a larger ΔR^2 than M3, a sign of marked increase of explanatory power. The regression coefficient of the interaction term between DPO and platform service level stood at 0.072 ($P < 0.05$). Hence, platform service level positively moderates the impact of DPO on EOR, which verifies H3.

Further, M4 achieved a larger ΔR^2 than M7, evidence to increased explanatory power. The regression coefficient of the

interaction term between DPO and platform service level was 0.026 ($P < 0.01$). Therefore, platform service level positively moderates the impact of DPO on ERI, which verifies H4.

The results of simple slope analysis show that a high platform service level greatly enhances the promoting effects of DOP on ERI and EOR. The moderating effect of platform service level on the impact of DPO on EOR and ERI is illustrated in Figures 2 and 3, respectively.

TABLE 4: Results of regression analysis.

Variables	EOR					ERI		
	M1	M2	M3	M4	M5	M6	M7	M8
Enterprise size	0.112	0.105	0.031	0.042	0.175***	0.167***	0.088**	0.092**
Enterprise age	0.323***	0.295***	0.045	0.057	0.214***	0.177***	-0.089**	-0.085*
Entrepreneurial experience	-0.208***	-0.174***	-0.069	-0.06	-0.215***	-0.171***	-0.059	-0.056
Industry	-0.116**	-0.128***	-0.017	-0.013	-0.097	-0.113**	0.005	0.007
DPO		0.245***	0.163***	0.165***		0.322***	0.206***	0.196***
Platform service level			0.768***	0.758***			0.819***	0.816***
DPO × platform service level				0.072**				0.026***
R ²	0.284	0.341	0.655	0.660	0.238	0.336	0.693	0.694
Adjust R ²	0.274	0.329	0.648	0.652	0.227	0.325	0.687	0.687
ΔR ²	0.284	0.057	0.314	0.005	0.238	0.098	0.357	0.357
F	29.436***	30.573***	93.328***	81.454***	23.155***	29.946***	111.185***	95.26***

Note: P* < 0.1, P** < 0.05, P*** < 0.01, N = 302. All coefficients are standardized coefficients.

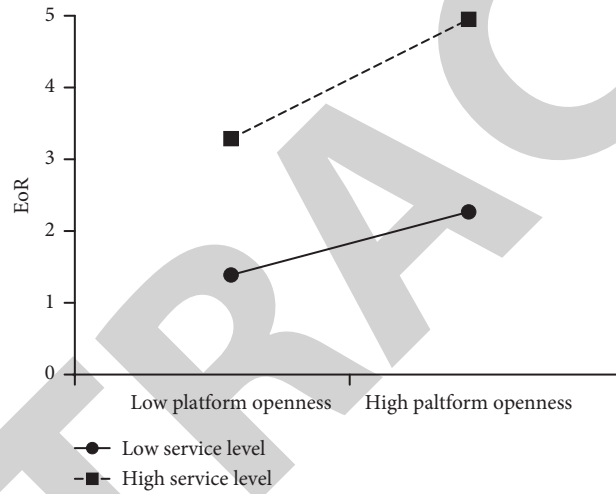


FIGURE 2: Moderating effect of platform service level on the impact of DPO on EOR.

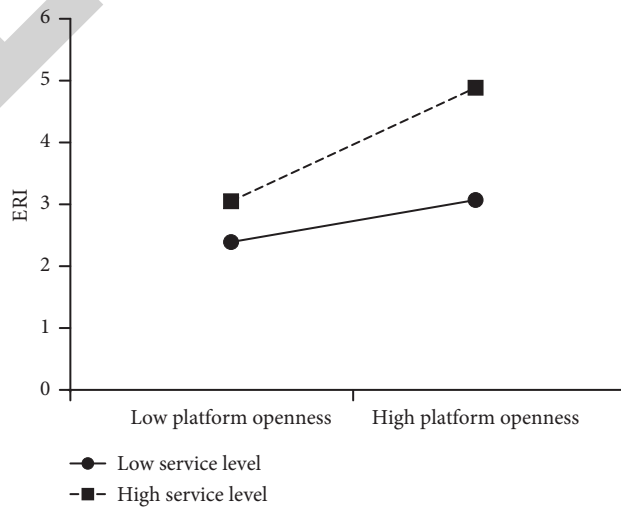


FIGURE 3: Moderating effect of platform service level on the impact of DPO on ERI.

5. Conclusions

This paper empirically analyses digital platform enterprises and discusses how DPO influences EOR and ERI. It was confirmed that the breadth and depth of DPO both promote EOR and ERI, and platform service level positively moderates the promoting mechanism. The main conclusions are as follows:

- (1) The breadth and depth of DPO promote EOR. By improving the depth and breadth of openness, the digital platform can provide entrepreneurs with a better environment for R&D and innovation and create an inclusive and orderly ecosystem. Therefore, digital platform enterprises should widen and deepen the cooperation with existing partners and step up the cooperation frequency. The high DPO is helpful for start-ups in the platform to identify business opportunities and improve innovation and entrepreneurial ability.
- (2) The breadth and depth of DPO promote ERI. If the digital platform opens much of its information and resources, entrepreneurs will acquire core resources accurately and make rational use of these resources during entrepreneurship. Hence, every digital platform needs to build an intelligent platform data system to facilitate resource query and improve the matching between platform resources and entrepreneurial resources.
- (3) The service level of digital platform positively moderates the impact of DPO on EOR and ERI. The EOR can be promoted more effectively by DPO under a high service level than under a low service level. Similarly, the ERI can be promoted more effectively by DPO under a high service level than under a low service level. As a result, every digital platform needs to continuously improve services and support start-ups in digital technology and financing. More resources of product operation should be shared, and an open, inclusive, and innovative teamwork environment should be created. In addition, a competitive and orderly platform innovation ecosystem should be realized by improving risk management.

6. Discussion

The existing research on digital platforms mainly tackles the openness of platform innovation and value innovation, especially in terms of the effects of platform governance, innovation performance, and digital platform technology. However, there is a huge research gap on the impact of DPO on entrepreneurship. This paper discloses the influence of DPO on EOR and ERI, shedding new lights on the study of digital platforms and entrepreneurship.

DPO decision-making has long been a difficulty among platform enterprises. Through theoretical and empirical analyses, this paper reveals how DPO influences EOR and ERI. Besides, the service level of digital platform was

introduced as a moderator variable of the said influence. This expands the research scope on DPO and provides a reference for further study on how digital platforms affects entrepreneurship.

DPO has a widespread impact on entrepreneurial behaviours. However, this paper only deals with the effects of DPO on EOR and ERI. In future research, consideration will be given to the influence of DPO on start-up growth, entrepreneurial risks, and business model innovation. Moreover, other influencing factors of the effect of DPO on entrepreneurship will be taken into account, such as the structure of the innovation network, and the perception of entrepreneurial risks.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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