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Causal-Comparative Analysis of Factors Affecting Psychological Capital of Knowledge-Based Companies: The Mediating Role of Entrepreneurial Orientation and Social Capital

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Abstract

Nowadays, entrepreneurship and knowledge-based companies are highly considered. This study aimed to investigate the factors affecting Psychological Capital (PsyCap) in two groups of agricultural and non-agricultural knowledge-based companies from Science and Technology Park (STP) of Fars Province, Iran. The population included the companies located in the STP incubators in Fars province. The data were collected from 238 participants (100 from agricultural companies and 138 from non-agricultural companies) as a sample through a questionnaire. The difference between agricultural and non-agricultural companies was remarkable in the effect of services provided by the incubators on the other variables. For the agricultural companies, the services provided by the park had no significant effect on entrepreneurial orientation, social capital, and product development process, but indicating a direct significant effect on PsyCap. Regarding the non-agricultural companies, the services provided by the park had a significant effect on entrepreneurial orientation, social capital, and product development process but had no direct effect on PsyCap. Due to the objectives of incubators` establishment as well as the cost and investment in this regard, the lack of appropriate efficiency is completely obvious in these centers, especially about agricultural companies which can be effective in providing food security using new technologies. Regarding the effect of services and facilities provided by STPs on the performance of companies at incubators, it is suggested that such services and facilities become more specialized and reinforced. In addition, it is emphasized to consider the necessity of educational and operational strategies in order to strengthen the entrepreneurial orientation, social capital, and PsyCap among the members.

Keywords: Resilience, Self-efficacy, Optimism, Hope, Social Capital, Entrepreneurial Orientation, Product Development Process.

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Introduction

In recent years, governments are trying to resolve economic issues such as job development, reducing unemployment, economic growth, increasing competition and improvement of the country's income by supporting small and medium-sized enterprises (SMEs). Incubators can be a facilitator and sponsor as a government support tool for these SMEs, especially in the start-up of these businesses. Actually, small companies play an essential role in employment as well as the economy improvement. However, their survival as new-born companies is often difficult and full of challenges, thus, many new companies are unfortunately unable to survive in their first years, which can be referred to as critical years, for various reasons. One can mention not having enough capital and experience and not being able to compete with other newly established or old companies. What should be done for these companies? An obvious solution is to create a supportive environment for young enterprises (Bollingtoft, 2012). Creating and development of incubators would be considered as one of these supportive programs.

Today, entrepreneurial ecosystems are highly regarded and numerous studies (Torun *et al.*, 2018; Covin *et al.*, 2020) are available on this subject. Governments are invested for the growth and development of the STPs and incubators (Rezaei-Moghaddam *et al.*, 2023). The National Business Incubator Association (NBIA) defines business incubators as "nurtures the start-up companies and helps them survive during the start-up period when they are vulnerable." Such centers provide appropriate business support services and resources for new companies. The most significant objectives of incubators are creating jobs, strengthening the entrepreneurial atmosphere, maintaining jobs in society, creating growth in local industry, and diversifying local economies" (Kemp, 2013). Incubators are considered as a part of entrepreneurial ecosystems. The activity of incubators has different generations. Accordingly, the services and facilities provided to companies are different. The first generation is related to the years before 1980 and focused mainly on providing an administrative atmosphere and some common facilities. The second generation is related to 1980-1990 which expanded into consulting services, network access, and sometimes investment. The main focus is on start-ups in the information technology sector and advanced technologies with the onset of the third generation in the late 1990s and mostly after 2000 (Torun *et al.*, 2018). Therefore, the main purpose of current research was to study the effects of different services and facilitates of science parks through incubators creation for innovative young SMEs in their first years of establishment. The other research questions were to understand that placing

SMEs at incubators could be helpful for improving the individual characteristics of company members such as entrepreneurial orientation (creativity, innovation, risk-taking and competition spirits) as well as other sociological factors like social capital (better networking and team working) and psychological capital (optimistic and hopeful entrepreneurs with resilient businesses) or not?

The services and facilities provided by STPs would be effective on the psychological capital of companies` members. Therefore, it would be important to study the effects of these services on entrepreneurs` PsyCap working in the knowledge-based companies settled at the park`s incubators. PsyCap is highly critical for the success of entrepreneurs since entrepreneurs always encounter a lack of financial, human, and social capital. As a result, entrepreneurs should trust themselves in this regard (Elsafty *et al.,* 2020). The services provided to companies in incubators potentially increase the synergy of psychological factors and PsyCap of companies, affecting the performance of entrepreneurs in business incubators. Incubators can increase the PsyCap of innovators and entrepreneurs and enhance the self-confidence and optimism of innovators. The individuals working in incubators continue entrepreneurship by improving self-efficacy, which has a positive effect on the innovation performance of technology start-up companies (Wang *et al.,* 2020).

Entrepreneurial orientation (EO) is considered as another psychological factor which was affected from services and facilities of parks. In other words, providing and facilitating various services with higher quality for start-up companies at park`s incubators would be effective on the entrepreneurs` incentives and improve their personal characteristics as well. Entrepreneurial orientation is regarded to cope with environmental challenges stimulating entrepreneurial behavior and creating flexibility and adaptability for businesses. The significance of EO is hidden in its potential to help the senior management in the company to define the organizational goal, maintain the company vision, and develop a strategy to achieve a competitive advantage over competitors (Covin *et al.,* 2020). It is considered as the orientation of senior managers or company owners to entrepreneurial efforts. Some studies indicated a positive relationship between EO and overall company performance (Rezaei and Ortt, 2018). Working at incubators can promote innovation, risk-taking and entrepreneurial spirit.

Social capital (SC) can be significant in the entrepreneurship of companies located in incubators. It considers the consequences of human socialization and their relationships with individual and social structures as well as the resources which are available to individuals and groups through

membership in social networks (Carrillo Álvarez and Riera Romaní, 2017). SC refers to the characteristics of social organizations such as networks, norms, and trust which facilitate action and cooperation for mutual benefit and improves, creates significant value, and increases performance when the companies in the incubator create strong network interactions (Hughes *et al.*, 2007). In a trustworthy environment, the companies located in the incubator tend to help each other because of the low risk of opportunistic behavior. Establishing a relationship with customers and friends enables the entrepreneur to have access to key strategic business information. Thus, facilitating the profitability of businesses and supporting networks result in improving growth and survival for new companies (Elsafty *et al.*, 2020).

Product development process (PDP) is one of the essential processes for the success, survival, and renewal of organizations, particularly for the companies in fast or competitive markets. Product development is considered as a set of activities which starts by identifying and understanding the opportunities on the market and ends by producing, selling, and delivering a product (Theodorakopoulos *et al.*, 2014). The PD process is critical for producing the products which satisfy customer needs and differentiate the company from competitors. An incubator facilitates the development and commercialization of new products and new business models by improving some opportunities to access resources.

The early models and theories of behavior analysis emphasized on the important variables of attitude, intention and subjective and social norms as explanations of behavior (Ajzen, 1991). The evolution trend of these models in TPB model showed that other important elements, especially the perceived control of behavior, also play an undeniable role in the occurrence of the considered behavior. Inspired by these models, the conceptual framework was designed for the analysis of PsyCap of knowledge-based companies (Figure 1). So that, SFSTP represents the perceived control of behavior and EO expresses the tendency and intention for entrepreneurial activities in companies` members. Considering that entrepreneurs in companies are engaged in PDP both individually or in the form of collective activities of the company, the social capital variable was clearly included in the model as an explanation of reference groups` viewpoints (subjective and social norms) affecting entrepreneurs. Therefore, all these variables were analyzed on the dependent variable of PsyCap in theoretical model. On the other hand, Entrepreneurial Event Model (EEM) (Shapero and Sokol, 1982), similar to TPB, offers three affecting factors to predict entrepreneurial behavior which consists of perceived desirability, perceived feasibility and

propensity to act that refers to services and facilities of STPs (SFSTP). Based on these two models, TPB and EEM, it can be seen that the influencing factors of entrepreneurial behavior comprise three components of attitude, social, and psychological dimensions which equivalent to entrepreneurial orientation, social capital and psychological capital, respectively. Previous studies, highlighted the role of these three factors (EO, SC and PsyCap) as strong predictor of successful entrepreneurship (Linan and Santos, 2007; Do and Dadvari, 2017; Jin, 2017). These indicate, theoretically and empirically, that PsyCap is positively associated with increased performance (SFSTP) and positive attitudes (EO). PsyCap is also part of the study of motivation theory, which assess optimistic variables, hope, self-efficacy and resilience. Referring to the two theories of TPB and EEM, it appears that attitude (EO), social and psychological dimensions (SC and PsyCap), are vital in order to improve entrepreneurship behavior. So, it makes sense that EO and social capital are considered to be mediate effect SFSTP to PsyCap and entrepreneurial behavior (Esfandabadi *et al.*, 2018; Mahfud *et al.*, 2020). This study evaluates the effect of each service variable provided in the park, social capital, EO, and PDP on the PsyCap of companies located in STP Incubators in two areas of agricultural and non-agricultural knowledge-based companies (Figure 1).

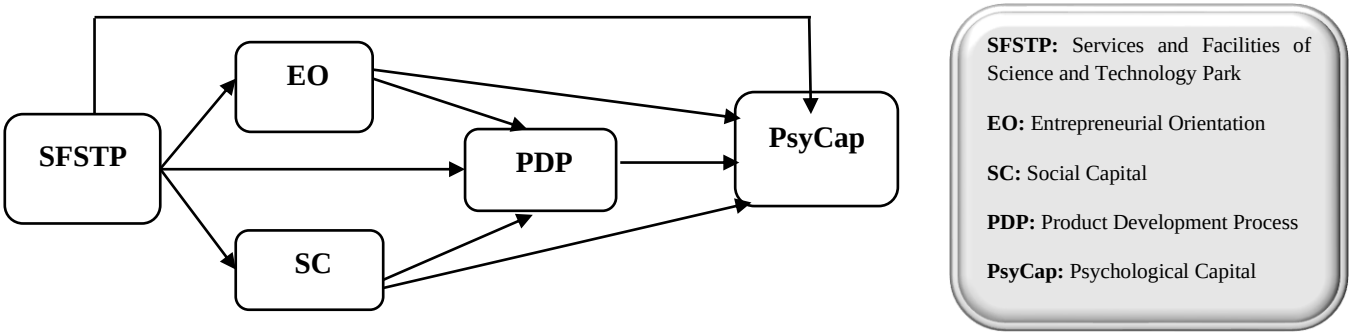

Figure 1. Theoretical framework of study.

Research Method

This study was conducted using survey. The study population included the members of knowledge-based companies located in STP Incubators in Fars province, Iran. According to the statistics of the STP Deputy Office, there were 2,502 members from 331 companies. The sample was selected through multi-stage stratified random sampling method based on the sampling formula (Fowler, 2009). First, 79 companies (Equation 1) were randomly selected and then, 238 members (Equation 2) of the managers and members of the companies were estimated as the samples. Third, these 238 members were selected from both types of companies active in the

agricultural field (100 members) and companies active in non-agricultural fields (138 members) were randomly selected and studied according to the size of each class.

$$n = \frac{N\delta^2}{(N-1)D + \delta^2} \quad \text{(Equation 1)}$$

$$n = \frac{(331)(25.6)}{(330) + (25.6)} = 79$$

$$D = \frac{B^2}{4} = 0.25$$

N = Total companies of Fars STP
n = Sample size
δ^2 = Sample variance *(Based on pilot study)*
B = Probable error *(Assumed 1 in this study)*

$$n = \frac{N\delta^2}{(N-1)D + \delta^2} \quad \text{(Equation 2)}$$

$$n = \frac{(2502)(65.9)}{(2501) + (65.9)} = 238$$

N = Total employees of the companies of Fars STP

Data collection was conducted through a questionnaire from the members of companies located in STP incubators in 2022. The face validity was confirmed by a group of professors at the School of Agriculture in Shiraz University, Iran. For testing the reliability of the questionnaire, the pilot study was carried out by collecting 30 questionnaires out of the main sample (companies located in the STP in Kerman province). Cronbach's alpha for all variables is higher than 0.9 and the measurement tool has high reliability. After confirming the questionnaire, the data were collected and analysed by SPSS16 and SmartPLS2. Descriptive statistics and structural equation model (SEM) were used for data analysis. Here are the conceptual and operational definitions of the variables as well as the research hypotheses:

Psychological Capital: PsyCap is defined as a multi-dimensional factor which refers to the positive psychological state of a person's growth and is known for optimism, resilience, self-efficacy and hope (Nkeshimana, 2018). In other words, PsyCap is characterized by self-confidence *(self-efficacy)* to conduct the required activities to succeed in challenging tasks, positive reference *(optimism)* about success in the present and future, perseverance in reaching goals and changes in

paths towards goals *(hope)* for success, sustainability when the company faces problems and adversities, and backwardness and even beyond that *(resilience)* to achieve success (Ramsden, 2019).

This variable was measured as a set of 18 questions: **(a)** ***Self-efficacy*** with four items of "(1) carrying out duties in collective activities, (2) participating and commenting in critical debates, (3) determining life goals, (4) facing people to discuss around issues and problems"; **(b)** ***Optimism*** with four questions about "(1) try to show better performance in difficulties, (2) look at positive aspects, (3) optimistic to the future work, (4) achieving what is expected and desirable"; **(c)** ***Hope*** through five items of "(1) pursuing the business goals, (2) several ways for every problem, (3) be the most successful person at work, (4) finding many ways to achieve work goals, (5) coping with the work goals"; and **(d)** ***Resilience*** *with* five questions including "(1) having the ability to solve the work`s problems and obstacles and continue, (2) managing various problems, (3) having the ability to do all activities alone at special circumstances, (4) overcoming work`s problems due to previous experiences, (5) reduce the vulnerability by diversifying duties and responsibilities" (Baluku *et al.*, 2016; Luthans and Youssef-Morgan, 2017). The questions were designed with a Likert scale including never (0), rarely (1), relatively (2), somewhat (3), and completely (4).

Hypothesis 1 (H_1): *The members of agricultural and non-agricultural knowledge-based companies are different in terms of the total amount of PsyCap and its four dimensions.*

Social Capital: It refers to the characteristics of collective action enabling people to cooperate and act more effectively with each other to achieve common goals. Various aspects of social capital with an organizational approach are considered in three dimensions. **(a)** ***Structural:*** The general pattern of contacts between individuals, including network relationships between individuals, network configuration, and appropriate organization; **(b)** ***Communication:*** The type of personal relationships that individuals have with each other based on their interactions, the most significant aspects of which are trust, commitment and mutual understanding; **(c)** ***Cognitive:*** The sources which provide interpretations and common meaning systems among groups. Cooperation and common values are the most critical aspects of the cognitive dimension (Hughes *et al.*, 2007; Fandiño *et al.*, 2015). Social capital was measured with 27 questions ranged from completely disagree (1), disagree (2), not agree nor disagree (3), agree (4), and completely agree (5).

Hypothesis 2 (H_2): *The members of agricultural and non-agricultural knowledge-based companies are different due to the social capital.*

Hypothesis 3 (H_3): *Social capital has a positive and direct effect on PsyCap of agricultural and non-agricultural knowledge-based companies.*

Entrepreneurial Orientation: This variable is defined by five dimensions of **(a)** ***Innovation*:** The desire to introduce new and emerging things through experimentation and creative processes for developing new products, services, and new processes; **(b)** ***Pioneering:*** As one of the characteristics of a market leader who has the foresight ability for using opportunities in predicting future market demands; **(c)** ***Aggressive competition:*** *M*eans numerous efforts to surpass industrial competitors which is characterized by an aggressive situation or reaction to improve a position or overcome a threat in a competitive market; **(d)** ***Risk-taking***: Means making decisions and taking action without awareness on the possible results; and **(e)** ***Independence:*** Independent action by an individual or team to present a business concept or vision until the work is completed (Satar and Natasha, 2019; Covin *et al.*, 2020). This variable was measured with a set of 33 questions (nine items for innovation, five questions for pioneering, seven items for aggressive competition, eight ones for risk-taking, and four items for independence) ranged from completely disagree (1), disagree (2), not agree neither disagree (3), agree (4), and completely agree (5).

Hypothesis 4 (H_4): *The members of agricultural and non-agricultural knowledge-based companies are different due to their entrepreneurial orientation.*

Hypothesis 5 (H_5): *Entrepreneurial orientation has a positive and direct effect on PsyCap of agricultural and non-agricultural knowledge-based companies.*

Services and facilities of STP: All of the services and facilities provided by STP to the companies located in the park incubators. Such services include physical services (office and laboratory spaces, etc.), financial facilities (loan payment, assistance in access to loan from banks, investors, etc.), communication (relationship with internal and external customer networks, relationship with academic centers, creating network activities between companies inside and outside the incubator), information (training programs such as business training, insurance, tax, trade and marketing), human (introducing the workforce, identifying the management team and advisory boards and trainers), legal (familiarity with laws and regulations, consulting legal issues and intellectual property) and organizational (helping international trade, technology commercialization, etc.) (Pauwels *et al.*, 2016). This variable was measured with 36 questions in the form of a Likert scale as follows: Never (0), rarely (1), sometimes (2), often (3), and always (4).

Hypothesis 6 (H_6): *The members of agricultural and non-agricultural knowledge-based companies are different in terms of the services and facilities that have been benefitted from STP.*

Hypothesis 7 (H_7): *Services and facilities provided by STP has a positive and direct effect on PsyCap of agricultural and non-agricultural knowledge-based companies.*

Product Development Process: It normally follows a process in which a company pictures a new product idea and then studies, plans, designs, prototypes, and tests it before introducing to market. The PD process is required for creating the products which meet customer needs and differentiate the company from competitors (Kazimierska and Grębosz-Krawczyk, 2017; Sharma, 2019). This variable was measured with 12 questions ranged from never (0), rarely (1), sometimes (2), often (3), and always (4).

Hypothesis 8 (H_8): *The members of agricultural and non-agricultural knowledge-based companies are different due to the process of product development.*

Hypothesis 9 (H_9): *Product development process has a positive and direct effect on PsyCap of agricultural and non-agricultural knowledge-based companies.*

Results and discussion

Agricultural and non-agricultural companies had no significance differences in terms of STPs, EO, social capital and PD process (Table 1). Thus, due to the t-tests results, H_2, H_4, H_6 and H_8 of study were rejected.

Table 1. T-test results of variables among agricultural and non-agricultural companies.

Variable	Agricultural companies		Non-agricultural companies		T value	Sig.
	mean	SD	mean	SD		
SFSTP	66.78	28.56	62.35	28.45	1.18	0.238
EO	127.94	18.55	127.36	1.14	0.247	0.805
SC	108.89	16.88	110.17	15.34	-0.61	0.543
PDP	31.99	6.54	31.22	7.08	0.776	0.439
PsyCap	55.62	9.45	53.84	9.02	1.47	0.143
Self-efficacy	13.27	2.18	12.62	2.58	2.055	0.041
Hope	15.12	3.36	14.8	3.08	0.744	0.457
Resilience	14.79	3.09	14.74	2.98	0.131	0.896
Optimism	12.43	2.52	11.67	2.49	2.302	0.022

Scale: (SFSTP: 0-144); (EO: 1-165); (SC: 1-135); (PDP: 0-48); (PsyCap: 0-72); (Self-efficacy: 0-16); (Hope: 0-20); (Resilience: 0-20); (Optimism: 0-16).

Further, no significant difference was found between agricultural and non-agricultural companies in terms of PsyCap (Table 1). Regarding optimism (sig.=0.022) and self-efficacy (sig.=0.041)

indicating a significant difference. Since the mean of agricultural companies in both dimensions is more than non-agricultural companies, agricultural companies located in STPs have more self-confidence in making efforts to succeed in challenging activities (self-efficacy). In addition, these companies have a more positive attitude towards success in the present and future (optimism). Thus, H_1 of study was rejected which means the agricultural and non-agricultural companies were not different in term of total PsyCap, but these companies showed differences due to the self-efficacy and optimism dimensions (Table 1).

First group: Agricultural knowledge-based companies

In this group, 100 individuals were interviewed from the managers and personnel of agricultural knowledge-based companies which 61% of them were men and 39% were women. The mean of respondents` age of agriculture group were 35 years and their educational level`s mean were 18.66 years. Their mean of working background was 84.14 months (around 7 years) and the mean of their settling in the incubators of STP was 35.42 months (about 3 years). First, the conceptual model was examined for agricultural companies (Figure 2).

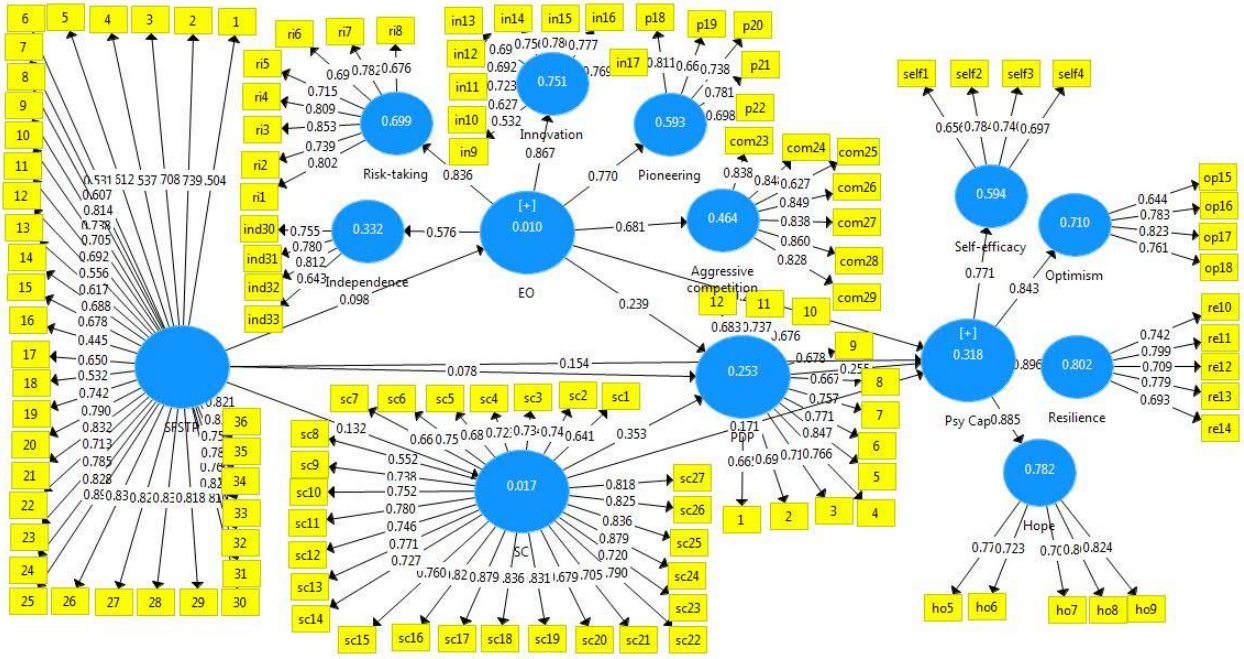

Figure 2. Agricultural knowledge-based companies' model.

Factor loadings: To evaluate the model reliability, the factor loadings of the items related to each variable were studied. If the value is equal to or more than 0.4, the reliability is acceptable. As it is shown in Figure 2, the factor loadings of all the items are higher than 0.4 (Davari and Rezazadeh,

2017), indicating one of the reasons for the reliability of the measurement model. The range of factor loadings of the variables were computed as below:

- SFSTP: 0.44 to 0.89
- PDP: 0.66 to 0.85
- EO: 0.53 to 0.86
- PsyCap: 0.64 to 0.82
- SC: 0.56 to 0.88

***Cronbach's alpha and composite reliability*:** All Cronbach's alphas are higher than 0.7 which is a good value, indicating the item reliability of the measurement model. The value of the composite reliability coefficients was more than 0.7, showing good composite reliability (Table 2).

Convergent validity: According to Table 2, the AVE value for all variables is more than or equal to 0.5, indicating the convergent validity of the model and the fit of the measurement model.

Divergent validity: Fornell and Larcker matrix method is used to evaluate the divergent validity. In this method, the correlation of a factor with its indicators is compared with the correlation of that factor with other variables. Table 3 shows that the AVE root value of all first-order variables is more than the correlation value between them, indicating the appropriate divergent validity and the optimal fit of the measurement model.

Table 2. Results of some indices of agricultural companies.

Variable	Cronbach`s alpha	Composite reliability	AVE	R^2	Q^2	Communality
PsyCap	0.91	0.91	0.57	0.32	0.12	0.41
Self-efficacy	0.69	0.81	0.52	0.59	0.25	0.52
Hope	0.82	0.87	0.58	0.78	0.45	0.58
Resilience	0.79	0.86	0.55	0.80	0.37	0.56
Optimism	0.74	0.84	0.57	0.71	0.40	0.57
EO	0.94	0.87	0.52	0.01	0.003	0.34
Independence	0.74	0.84	0.56	0.33	0.18	0.56
Innovation	0.87	0.90	0.50	0.75	0.37	0.50
Risk-taking	0.89	0.92	0.58	0.69	0.40	0.58
Aggressive competition	0.91	0.93	0.66	0.46	0.30	0.66
Pioneering	0.79	0.86	0.54	0.59	0.32	0.55
SC	0.97	0.97	0.58	0.017	0.008	0.57
SFSTP	0.97	0.97	0.53	-	-	0.53
PDP	0.92	0.93	0.52	0.25	0.12	0.52

***Structural equation model*:** To fit the structural model, the significance coefficients, R^2, and Q^2 are used. The second criterion for evaluating the fit of the structural model is the R^2 coefficients related to the latent endogenous variables of the model, showing the effect of an exogenous

variable on an endogenous variable. Three amounts of 0.19, 0.33 and 0.67 have been assumed for R^2 as weak, moderate and strong, respectively (Davari and Rezazadeh, 2017). Table 2 presents the R^2 value of all endogenous variables from the first order to the second order. Furthermore, Q^2 shows the predictability of the model regarding endogenous factors. Q^2 should be higher than zero. As for the intensity of the predictive power of the model regarding the endogenous variables, three values have been determined: 0.02, 0.15, and 0.35 (Davari and Rezazadeh, 2017).

Significant coefficients are among the items which are studied for fitting the structural model (Table 3). If t is more than 1.96, it is significant at the 5% level, but if t is more than 2.58, it is significant at the 1% level. Table 4 shows the t value, the effects of park services on entrepreneurial orientation (0.95), social capital (1.42) and product development process (1) are less than 1.96 and are not significant. In other words, the services provided by the incubators and STP have no direct effect on EO, social capital, and PDP. Further, the effect of social capital on PsyCap (1.66) is lower than 1.96 and insignificant. Thus, the social capital of companies has no direct effect on the PsyCap of agricultural companies.

Table 3. Divergent validity matrix of the variables for agricultural companies.

Variables	Independence	PDP	SFSTP	Self-efficacy	Optimism	Innovation	Hope	Pioneering	Aggressive Competition	Risk-taking	SC	Resilience
Independence	0.75											
PDP	0.32	0.72										
SFSTP	0.19	0.15	0.73									
Self-efficacy	0.25	0.29	0.15	0.72								
Optimism	0.27	0.39	0.21	0.53	0.75							
Innovation	0.35	0.30	-0.01	0.23	0.32	0.71						
Hope	0.30	0.40	0.21	0.58	0.67	0.35	0.76					
Pioneering	0.40	0.24	0.30	0.17	0.27	0.69	0.28	0.73				
Aggressive Competition	0.40	0.20	0.21	0.05	0.19	0.37	0.25	0.43	0.81			
Risk-taking	0.40	0.31	0.03	0.16	0.34	0.69	0.25	0.48	0.41	0.76		
SC	0.04	0.44	0.13	0.36	0.38	0.26	0.27	0.16	0.26	0.35	0.76	
Resilience	0.41	0.40	0.23	0.63	0.68	0.32	0.69	0.27	0.29	0.27	0.31	0.74

339 **Table 4.** Internal relationship in causal model of agricultural companies.

Internal relationship	Standard Error	T-Value	P-Value
PsyCap ⟶ Resilience	0.018	48.05	0.0001
PsyCap ⟶ Hope	0.028	32.98	0.0001
EO ⟶ Innovation	0.024	35.28	0.0001
PsyCap ⟶ Optimism	0.037	22.75	0.0001
EO ⟶ Risk-taking	0.029	28.6	0.0001
PsyCap ⟶ Self-efficacy	0.04	17.58	0.0001
EO ⟶ Pioneering	0.047	16.35	0.0001
EO ⟶ Aggressive competition	0.064	10.65	0.0001
EO ⟶ Independence	0.086	6.66	0.0001
SC ⟶ PDP	0.08	4.08	0.0001
PDP ⟶ PsyCap	0.108	2.34	0.021
EO ⟶ PsyCap	0.081	3.08	0.003
EO ⟶ PDP	0.086	2.79	0.006
SC ⟶ PsyCap	0.102	1.66	0.132
SFSTP ⟶ PsyCap	0.07	2.06	0.030
SFSTP ⟶ PDP	0.078	1.00	0.505
SFSTP ⟶ EO	0.103	0.95	0.547
SFSTP ⟶ SC	0.092	1.42	0.293

340
341
342 Table 5 and Figure 3 show the direct and indirect effects of independent and mediating variables
343 on PsyCap in agricultural companies. The services provided by the park have a direct and
344 significant effect (0.154) on PsyCap. (H_7 was approved). The more the number of services and
345 facilities of the STP, the more improved four dimensions of PsyCap of the active members in the
346 companies such as optimism, self-efficacy, hope and resilience. Providing facilities to companies
347 strengthens their spirit and hope for the continuity of their business activities. Moreover, the
348 support from the park is considered as confidence for the entrepreneurs of the incubator to be
349 resilient in crises. EO had a direct and significant effect (0.25) on PsyCap. (H_5 was approved). In
350 other words, the more the EO of company members, the stronger their PsyCap. The EO had a
351 significant indirect effect on PsyCap through affecting the PDP. When the entrepreneurs active in
352 incubators have higher dimensions of EO such as the innovativeness, pioneering, independence,
353 and competitiveness, they can produce better products and technologies, leading to the
354 improvement of the PsyCap dimensions such as hope, optimism, and resilience of the members
355 towards the continuity of their business activities in the future. The effective role of EO dimensions
356 in entrepreneurial activities was emphasized by Kashef Ganjdaredar *et al.* (2022).
357 SC had a significant indirect effect on PsyCap by affecting the PDP. So, H_3 was rejected, because
358 SC did not have direct effect on PsyCap but had some effects indirectly through PDP. Improving
359 the interactions and team contributions of entrepreneurs' results in increasing quality of the process

of product development, services provided by companies as well as the PsyCap of the members. The PDP has a direct and significant effect (0.255) on PsyCap. (H_8 was approved). In other words, the four dimensions of PsyCap for the members will be increased when the companies become more successful in presenting their products.

Table 5. The effects of variables on PsyCap of agricultural companies.

Variable	Direct effect	Indirect effect	Total effect	Sig.
SFSTP	0.154	0.050	0.204	0.030
SC	0.171	0.092	0.263	0.132
EO	0.250	0.06	0.310	0.003
PDP	0.255	-	0.255	0.021

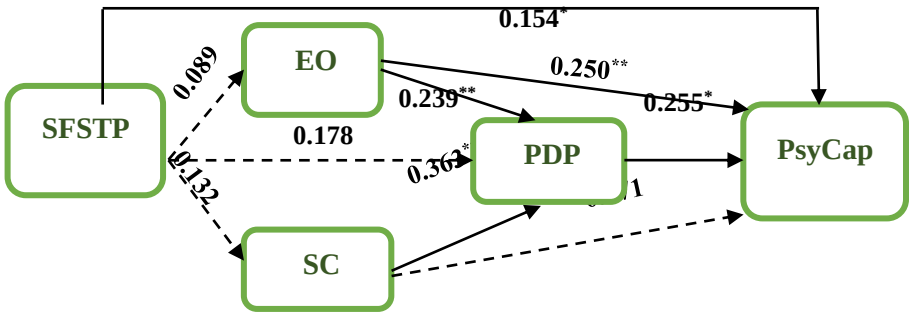

Figure 3. Causal model of factors affecting PsyCap of agricultural companies.

According to the model fit of causal model of agricultural companies, the fit measures were computed as below: SRMR was 0.80, D-G was 0.487, NFI was 0.94 that all of the measures were acceptable in compare with the suggested amounts. The GoF criterion is used for fitting the overall model. The fitting of the overall model can be controlled using this criterion after studying the fitting of the measurement and structural analysis of the model. This index is measured as the squared product of the mean coefficient of determination of the endogenous (latent) variables by the average shared values of the variables. Based on the values of 0.1, 0.25, and 0.36 which are considered weak, average, and strong values for GoF, the number 0.51 shows the overall strong fit of the model.

$$\text{GoF}=\sqrt{\overline{\text{communalities}}\times\overline{R^2}}=0.51$$

$$\overline{R^2}=0.48$$

$$\overline{\text{communalities}}=0.558$$

Second group: Non-agricultural knowledge-based companies

As for the description of the second group, 138 individuals were studied from the managers and other members of non-agricultural knowledge-based companies that 96 individuals (69.6%) of them were men and 42 ones (30.4%) were women. The mean of their age was equal 33.12 years and their educational level`s mean were 17.28 years. The mean of non-agricultural group`s working background was 79.45 months (around 6.5 years) and the mean of their settling in the incubators of STP was 36.87 months (about 3 years).

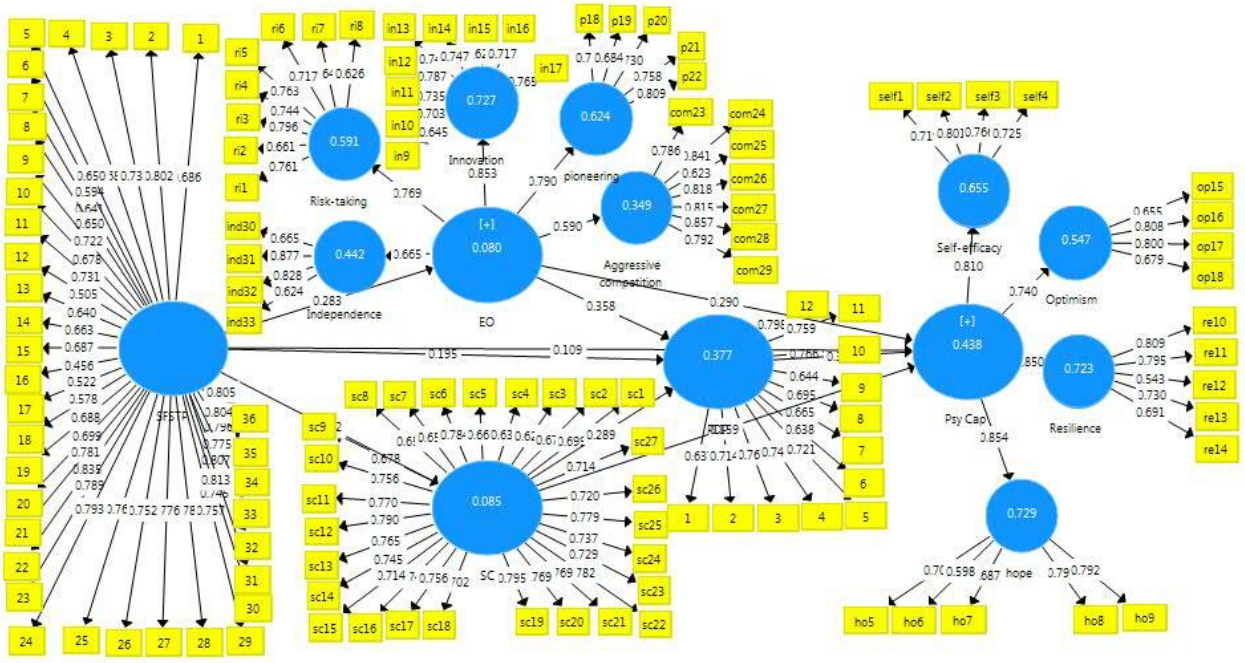

Figure 4. Non-agricultural knowledge-based companies' model.

***Factor loadings*:** As shown in Figure 4, the factor loadings of all variables are higher than 0.4 which is considered as one of the reasons for reliability. The range of factor loadings of the variables were computed as below:

- SFSTP: 0.45 to 0.83
- PDP: 0.64 to 0.80
- EO: 0.62 to 0.88
- PsyCap: 0.54 to 0.81
- SC: 0.62 to 0.79

Cronbach's alpha and composite reliability: All Cronbach's alphas are more than 0.7, which is a good value and shows the appropriate fit of the measurement models. The value of the composite reliability coefficients is more than 0.7, showing the favourable composite reliability (Table 6).

***Fitting the structural equation model*:** After evaluating the measurement models for fitting the structural model, R^2 and Q^2 were studied, the values of which are presented in Table 8, indicates a good fit of the structural model.

Table 6. Results of some indices of non- agricultural companies.

Variable	Cronbach`s alpha	Composite reliability	AVE	R^2	Q^2	Communality
PsyCap	0.89	0.89	0.81	0.44	0.15	0.35
Self-efficacy	0.74	0.84	0.51	0.65	0.30	0.57
Hope	0.76	0.84	0.51	0.73	0.37	0.51
Resilience	0.76	0.84	0.52	0.72	0.30	0.52
Optimism	0.72	0.83	0.54	0.55	0.31	0.54
EO	0.93	0.85	0.54	0.08	0.02	0.30
Independence	0.74	0.84	0.57	0.44	0.25	0.57
Innovation	0.88	0.90	0.52	0.73	0.37	0.52
Risk-taking	0.86	0.89	0.51	0.59	0.30	0.51
Aggressive competition	0.90	0.92	0.63	0.35	0.21	0.63
Pioneering	0.80	0.86	0.56	0.62	0.36	0.56
SC	0.96	0.97	0.53	0.08	0.04	0.53
SFSTP	0.97	0.97	0.51	-	-	0.51
PDP	0.91	0.92	0.51	0.38	0.18	0.51

Divergent validity: The AVE root value of all first-order variables is higher than the correlation value between them, indicating the appropriate divergent validity and the optimal fit of the measurement model (Table 7). Table 8 indicates internal relationship in causal model of non-agricultural companies.

Table 7. Divergent validity matrix of the variables for non-agricultural companies.

Variables	Independence	PDP	SFSTP	Self-efficacy	Optimism	Innovation	Hope	Pioneering	Aggressive Competition	Risk-taking	SC	Resilience
Independence	0.75											
PDP	0.35	0.71										
SFSTP	0.31	0.38	0.71									
Self-efficacy	0.26	0.49	0.26	0.71								
Optimism	0.26	0.41	0.29	0.45	0.73							
Innovation	0.57	0.45	0.27	0.38	0.29	0.72						
Hope	0.32	0.44	0.32	0.54	0.60	0.29	0.71					
Pioneering	0.44	0.46	0.19	0.42	0.39	0.66	0.45	0.75				
Aggressive Competition	0.27	0.25	0.90	0.02	0.18	0.27	0.20	0.31	0.79			
Risk-taking	0.36	0.29	0.19	0.26	0.25	0.49	0.35	0.49	0.43	0.71		
SC	0.13	0.44	0.29	0.43	0.33	0.25	0.27	0.33	0.08	0.18	0.73	
Resilience	0.43	0.51	0.29	0.66	0.45	0.47	0.60	0.45	0.18	0.32	0.32	0.72

Table 9 and Figure 5 present the path coefficients of the causal model variables related to the non-agricultural companies. The services provided by the park had no direct effect on PsyCap (H_7 was rejected), but had an indirect effect on PsyCap through affecting the mediating variables of EO and PDP. In other words, a variety of facilities and services provided by the park has made the entrepreneurs of incubators to produce better technological products with their innovation, competitiveness and higher risk. Finally, such an effect leads to companies with better PsyCap such as self-efficacy, higher optimism and hope, and resilience in difficult situations. The members of non-agricultural companies have succeeded in developing a higher quality product by having the facilities of the park and establishing stronger social networks with specialized consultants and other business owners in the market, leading to the strengthening of the four dimensions of PsyCap. EO has a direct and significant effect (0.290) on PsyCap. Thus, H_5 was approved. In this regard, PsyCap improves when the dimensions of EO such as innovation, pioneering, independence and competition are strengthened more among the members. EO has an indirect effect on PsyCap through the PDP. Innovative entrepreneurs with a higher spirit of competition, produce more technological and innovative products and the prosperity of their business result in the self-efficacy of members and improve their optimism, hope and resilience while facing challenges.

As observed in Figure 5, SC has no significant effect on PsyCap directly (H_3 was rejected), but has an indirect effect on this variable through the moderating variable of the PDP. Improving the dimensions of SC such as social cohesion, social trust, and social participation of active entrepreneurs in incubators results in strengthening the development process for their products and improving their PsyCap level. Eventually, the PDP has a direct, significant and relatively strong effect (0.320) on PsyCap (H_8 was approved). This result is also confirmed in the study of Kashef Ganjdaredar *et al.* (2022). Companies with a stronger R&D would have more purposeful and detailed plans for their product development. Thus, they will have members with high self-efficacy and are more optimistic about the continuity of their future business activities and have more resistance while facing professional ups and downs.

Table 8. Internal relationship in causal model of non-agricultural companies.

Internal relationship	Standard Error	T-Value	P-Value
PsyCap ⟶ Resilience	0.026	32.53	0.0001
PsyCap ⟶ Hope	0.025	36.66	0.0001
EO ⟶ Innovation	0.038	22.30	0.0001
PsyCap ⟶ Optimism	0.049	14.96	0.0001
EO ⟶ Risk-taking	0.046	16.55	0.0001
PsyCap ⟶ Self-efficacy	0.029	28.18	0.0001
EO ⟶ Pioneering	0.036	21.57	0.0001
EO ⟶ Aggressive competition	0.089	6.58	0.0001
EO ⟶ Independence	0.530	12.51	0.0001
SC ⟶ PDP	0.079	3.39	0.0001
PDP ⟶ PsyCap	0.102	3.10	0.001
EO ⟶ PsyCap	0.098	2.95	0.002
EO ⟶ PDP	0.085	4.51	0.0001
SC ⟶ PsyCap	0.081	1.95	0.075
SFSTP ⟶ PsyCap	0.064	1.68	0.111
SFSTP ⟶ PDP	0.087	2.24	0.031
SFSTP ⟶ EO	0.090	3.08	0.001
SFSTP ⟶ SC	0.078	3.73	0.0001

Table 9- The effects of variables on PsyCap of non-agricultural companies.

Variable	Direct effect	Indirect effect	Total effect	Sig.
SFSTP	0.109	0.199	0.389	0.111
SC	0.159	0.09	0.249	0.075
EO	0.290	0.110	0.400	0.002
PDP	0.320	-	0.320	0.001

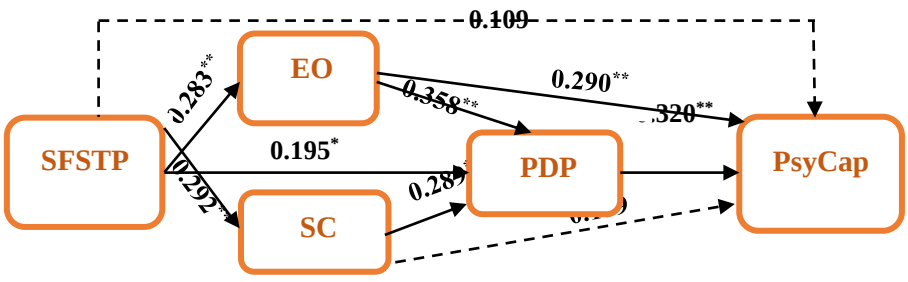

Figure 5. Causal model of factors affecting PsyCap of non-agricultural companies.

Due to the model fit of causal model, the fit measures were computed as below: SRMR was 0.78, D-G was 0.567, NFI was 0.97 that all of the measures were acceptable in compare with the suggested amounts. Then, the GoF criterion was calculated to fit the general model in case of non-agricultural companies. The obtained number of 0.51 indicates the strong fit of the model.

$$GoF = \sqrt{\overline{communalities} \times \overline{R^2}} = 0.51$$

$$\overline{R^2} = 0.489$$

$$\overline{communalities} = 0.54$$

Conclusions

Evaluating the knowledge-based companies in the field of agriculture and non-agriculture located in STP incubators indicates the difference in the effect of provided services in these two groups. The services provided to agricultural companies have no effect on the entrepreneurial orientation, product development process and social capital of these companies, which indicates the inefficiency of incubators and STPs in providing a space for networking and constructive communication to enhance entrepreneurial orientation, social capital, and product development process directly. Regarding the PsyCap, services only have a direct effect on the PsyCap of companies. On the other hand, there is no significant relationship between social capital and PsyCap in agricultural companies. Meanwhile, the situation is highly different for non-agricultural companies. The provided services for the active non-agricultural companies have a direct effect on entrepreneurial orientation, product development process, and social capital. However, such services have an indirect significant effect on the PsyCap of non-agricultural companies through the product development process, social capital and entrepreneurial orientation. In non-agricultural companies, the services provided in incubators and parks have no direct effect on PsyCap unlike agricultural companies. Due to the homogeneity of services provided between two groups of agricultural and non-agricultural companies, the services provided to agricultural companies or the strategy of providing such services is not appropriate for agricultural activities because of the difference in the nature of activities by agricultural companies and non-agricultural companies in the function and activities of product development process.

Since agricultural activities need a wider physical space, the construction of incubators and specialized STPs in the field of agriculture can be beneficial. After having an appropriate space for agricultural activities, evaluating the services required by companies based on their needs is another activity which can be fulfilled in line with the objectives of establishing incubators and STPs which is helping knowledge-based companies. The production of agricultural products and the development process of such products do not merely need the services which are currently provided to companies with many limitations. Agricultural companies require various

management and planning for support than non-agricultural companies due to being involved with different factors such as weather, drought, pests, diseases, as well as expected and unexpected factors in agriculture. Establishing a strong internal and external information and communication network between companies located in parks incubators with the institutions outside the parks can be effective in the improvement of social capital of companies and their entrepreneurial orientation. Such an increase in social capital and entrepreneurial orientation with its effect on product development process and economic consequences resulting from product development process has an effect on the PsyCap of companies and increases the performance and continuity of activities in the companies by increasing hope, resilience, self-efficacy and optimism.

Currently, all companies, both agricultural and non-agricultural, receive almost the same services, while the support needs of companies are different based on their field of activity, and the services provided to companies in incubators should be based on the needs of settled companies, so that resources are not wasted. The conditions of agricultural activities are different from companies that are active in non-agricultural fields. For example, agricultural activities require a lot of space. It may not be possible to provide this space completely, but in the case of other services, it can be planned in the right way so that these facilities are properly provided to the mentioned companies. In this regard, some instances are such as support for the preparation and supply of inputs, or legal and scientific consultation regarding the company's goals and products. Therefore, according to the findings of the causal model, the implications of the study are that any effort to improve the social capital of the companies, along with providing the necessary facilities to increase the motivation and entrepreneurial orientation of their members, as well as strengthening the product development process of these companies and finally supporting marketing and market making for their products will improve the psychological capital of entrepreneurs. Considering the significance of agricultural activities from different aspects such as food security and employment, it is highly recommended that knowledge-based companies in this field receive special attention since these companies can improve the agriculture sector and the life quality of the stakeholders through applying the latest knowledge in agricultural science.

Limitations

- Coinciding the data collection of study with the COVID-19 pandemic was the main limitation of current study. Closure of many offices of companies, shifting of personnel and lack of full-time attendance of employees had caused hard access to the samples.
- Visiting some companies settled at the incubators in other counties of Fars province was costly and time-consuming.
- Measuring some indices of study was challenging due to the interdisciplinary nature of the research subject. The scale measurement of PsyCap, SC and EO was extracted from the standard scales of other disciplines that needed to localize and adapted with the cultural context of research cases in Iran.

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تحلیل علی-مقایسه ای عوامل مؤثر بر سرمایه روانشناختی شرکت های دانش بنیان: نقش میانجی گرایش کارآفرینانه و سرمایه اجتماعی

سوزان زندآذر، کوروش رضایی مقدم، و مهسا فاطمی

چکیده

امروزه توجه ویژه ای به کارآفرینی و شرکت‌های دانش‌بنیان می‌شود. در این پژوهش به شناسايي عوامل مؤثر بر سرمایه روان‌شناختی در بین دو گروه شرکت‌های دانش‌بنیان کشاورزی و غیرکشاورزی از پارک علم و فناوری فارس در ایران، پرداخته شد. جامعه آماری، شرکت‌های مستقر در مراکز رشد و مؤسسات پارک علم و فناوری استان فارس بود که داده‌ها از طریق پرسشنامه از 238 نفر (100 نفر از شرکت‌های کشاورزی و 138 نفر از شرکت‌های غیرکشاورزی) به عنوان نمونه آماری اخذ گردید. طبق یافته‌ها، اختلاف بین دو گروه شرکت‌های کشاورزی و غیرکشاورزی در تأثیری که خدمات ارائه‌شده توسط مراکز بر سایر متغیرهای پژوهش می‌گذارند، محسوس بود. خدمات ارائه‌شده در پارک، تأثیر معنی‌داری بر گرایش کارآفرینانه، سرمایه اجتماعی و فرآیند توسعه محصول در شرکت‌هاي کشاورزي نداشت، اما بر سرمایه روان‌شناختی به صورت مستقیم، تأثیر معنی‌داری را نشان داد. در مورد شرکت‌های فعال در حوزه غیرکشاورزی، خدمات ارائه‌شده در پارک اثر مثبت و معنی‌داری بر گرایش کارآفرینانه، سرمایه روان‌شناختی و فرآیند توسعه محصول داشت، اما تأثیر مستقیمی بر سرمایه روان‌شناختی نشان داده نشد. با توجه به اهداف تأسیس مراکز رشد و هزینه و سرمایه‌گذاری که در این خصوص صورت گرفته است، عدم بهره‌وری کامل از این مراکز، خصوصاً در رابطه با شرکت‌های کشاورزی که می‌توانند با بکارگیری فناوری‌های نوین در تأمین امنیت غذایی مثمثمر واقع شوند، کاملاً محسوس است. با توجه به تأثیرگذاری خدمات و امکانات ارائه‌شده از سوی پارک‌های علم و فناوری بر کارکرد شرکت‌های مستقر در مراکز رشد، پیشنهاد می‌شود تا این نوع خدمات و امکانات، تخصصی‌تر شده و تقویت گردد. همچنین، لزوم اقدامات آموزشی و عملیاتی برای تقویت گرایش کارآفرینانه، سرمایه اجتماعی و سرمایه روان‌شناختی اعضا نیز مورد تأکید است