Article

The Impact of Industry Clusters on the Performance of High Technology Small and Middle Size Enterprises

Tong Tong 1,2, Norzalina Binti Zainudin 3, Jingwen Yan 2 and Azmawani Abd Rahman 2,*

1 Department of Literature, Sichuan Minzu College, Kangding 626000, China
2 School of Business and Economics, Universiti Putra Malaysia, Serdang 43400, Malaysia
3 Department of Resource Management and Consumer Studies, Faculty of Human Ecology, Universiti Putra Malaysia, Serdang 43400, Malaysia
* Correspondence: azar@upm.edu.my

Abstract: Based on the theory of independent innovation and competitive advantage, this paper takes industry cluster as the independent variable, long-term high-technology small and middle size enterprises (high-tech SMEs) performance and short-term high-tech SMEs’ performance as the dependent variable, and introduces independent innovation as the mediator variable to explore the impact of industry cluster on high-tech SMEs’ performance. SPSS 22.0 was used to test the reliability and validity of the questionnaire distributed to 310 high-tech SMEs in Sichuan, China. SPSS is used for statistical analysis, integrating data entry, organization, and analysis functions. Its basic functions include data management, statistical analysis, chart analysis, and output management. A confirmatory factor analysis was conducted. Amos 24.0 is the structural equation model analysis software. After using Amos 24.0 to construct the SEM (Structural Equation Modelling) to verify the hypothesis, it was found that industry cluster has a significant positive impact on long-term and short-term high-tech SMEs’ performance, independent innovation has a significant positive impact on long-term and short-term high-tech SMEs’ performance, and independent innovation plays a mediator role in the relationship between industry cluster and high-tech SMEs’ performance. Based on the research results, this paper puts forward the following suggestions: (1) attach importance to independent innovation, introduce relevant technical talents, and improve innovation; and (2) accelerate the formation of clusters to improve the high-tech SMEs’ performance of the whole industry.

Keywords: industry cluster; independent innovation; high-tech SMEs; high-tech SMEs’ performance

1. Introduction

With the development of economic globalization, the competition and cooperation between countries and regions in the world are intensifying, and the strengthening of mutual economic exchanges has promoted the formation of industrial clusters [1]. The economic development of regions with frequent information exchange and capital concentration has witnessed rapid development. Relevant research shows that industry cluster is an important factor in promoting the comprehensive development of the regional economy [2] and has a significant impact on the behavior and high-tech SMEs’ performance of enterprises [3]. Small and medium-sized high-tech enterprises in China (high-tech SMEs) refer to scientific and technological personnel as the main body engaged in scientific and technical research, developing activities, obtaining independent intellectual property rights, and into high-tech products or services to achieve sustainable development. In 2000, China Ministry of Science and Technology of High-tech Enterprises issued the National High-tech Conditions and Measures for the Identification of High-tech Enterprises in Technological Industrial Development Zones have been revised. The revised Measures mainly have the following standards for the identification of high-tech enterprises:

1. Engaged in the research and development, production, or technical services of one or more high-tech and products.
2. Scientific and technical personnel with a college degree or above account for more than 20% of the total number of employees in enterprises, and scientific and technical personnel engaged in research and development of high-tech products should account for more than 10% of the total number of employees in enterprises [1].

3. The annual funds for research and development of high-tech and its products should account for more than 5% of the total income of the enterprise in that year.

4. The sum of technical income and sales income of high-tech products should account for more than 60% of the total income of the enterprise in that year; the investment of newly established enterprises in high-tech fields should account for more than 60% of the total investment.

5. The main person in charge of enterprises should have a strong sense of science and technology and intellectual property protection, be familiar with the research and development, production, and operation of their products, and pay attention to technological innovation and research and development of high-tech products.

In this research, high-tech SMEs are defined as: Enterprises that research, develop, produce, and sell high-tech products or use high-tech on a large scale have development potential or competitiveness in the Chinese market and the future international market. With employee less than 2000, and total assets are less than ¥400 million yuan [2].

High-tech SMEs are an important force in China’s technological innovation. High-tech SMEs are enterprise organizations based on high technology. Compared with traditional enterprises, it includes basic characteristics such as high risk, high innovation, high input additionally, high periodicity, and high system integration, which are helpful to analyze the uniqueness of core competence of high-tech SMEs and identify their competence.

In the process of globalization, most of the regions with rapid economic development are regions with developed industry cluster levels [4]. For example, the semiconductor industry of Silicon Valley in the United States, the agricultural regions of Lazio and Marche in Italy, and the Japanese animation industry in Tokyo have become successful models of industry clusters relying on a good basic environment and sufficient scientific and technological talents in their regions [5]. With the gradual emergence of the advantages of agglomeration regions, China has also incorporated industry clusters into its development strategy and gradually launched relevant pilot cities [6]. Taking Sichuan as an example, the high-tech industry cluster in Sichuan Province will achieve an annual operating income of 2.65 trillion yuan in 2020, up 12.3% year on year [7]. The number of industrial enterprises above the designated size included in the statistics of high-tech industries in Sichuan Province reached 3833, a net increase of 362 over the end of 2021. The province’s high-tech industries in the field of industries above the designated size achieved an operating income of 1.98 trillion yuan, up 6.0% year-on-year, 2.4 percentage points higher than the overall growth rate of industries above the designated size; The proportion of industries above the designated size has maintained a steady increase throughout the year, reaching 36% throughout the year, contributing 58.1% to the growth of operating revenue of industries above designated size. A total of 1.1 million people were employed, 31,000 more than in the same period last year [8,9]. The high-tech enterprise clusters in Sichuan have greatly promoted the innovative development and economic growth of high-tech industries in these regions. In this context, it is significant to study the industry cluster’s impact on the high-tech enterprises’ high-tech SMEs’ performance.

Industry cluster refers to many enterprises in core industries and related industries within a geographical range [10,11]. Enterprises in the industry are interconnected and interact with each other to give play to the economic effect of aggregation, reduce production costs, and maximize profits. Porter’s competitive advantage theory points out that the industrial clusters generated by various industries in a specific geographical location are the source of national competitiveness [12,13], and the peer competition and learning effects generated by industry cluster behavior can improve their own, regional and national innovation capabilities [14,15].
The research results of Dhliwayo, S et al. show that the external industry cluster has significantly improved industrial efficiency [16,17]. This is because the external effects of industrial accumulation, such as the competition effect, knowledge spillover effect, learning effect and financing effect, can improve the innovation ability and level of enterprises. In contrast, enterprise innovation can reduce production costs and product differentiation, shorten the development cycle, improve labor productivity, and so on, to improve industrial upgrading and increase industrial profits.

Falk, M et al. pointed out that the competitive effect of industrial clusters led to the intensification of competition among enterprises in the same industry in the cluster area, which prompted enterprises to accelerate the improvement of R&D capabilities and competitiveness [18,19]. According to the innovation theory, innovation capability is a new development capability generated by the enterprise’s re-integration of existing production factors [20,21]. On the one hand, innovation can encourage enterprises to develop new products, occupy new markets and expand the scope of business. On the other hand, innovation can achieve product differentiation, improve technological content and quality, and form the core competitiveness of enterprises [22,23]. Freeman, C. also pointed out that continuous innovation can maintain existing customers, attract new customers, expand market share, and comprehensively improve high-tech SMEs’ performance [24,25].

To sum up, it can be seen that in the process of improving enterprise performance by industry cluster, scholars have no conclusion about the mechanism through which industry cluster affects the improvement of enterprise performance and what role innovation plays in this process, which is still worth studying. Therefore, this study takes industry cluster as an independent variable, independent innovation as a mediator variable, and high-tech SMEs’ performance as a dependent variable and puts the three into one framework for research.

According to the above logic, this study will adopt quantitative research and express the research questions in terms of quantity. We analyze, test, and then explain. In quantitative research, questionnaire is an important means of collecting data, and this study will use nonprobability sampling. Sekaran and Bougie pointed out nonprobabilistic sampling is mostly used for exploratory research and preliminary research, as well as research with unclear overall boundaries and difficult-to-implement probabilistic sampling. It proposes a structural model to solve research questions: Does industry cluster positively impact long-term and short-term high-tech SMEs’ performance? Does industry cluster affect independent innovation? Does independent innovation positively impact long-term and short-term high-tech SMEs’ performance? Does independent innovation mediate in industry clusters and high-tech SMEs’ performance?

This study collects data through questionnaire distribution. The questionnaire is distributed online and offline. The questionnaire is distributed offline by visiting local enterprises, and the questionnaire is distributed online by a questionnaire star. A total of 350 valid questionnaires are collected. This paper is divided into six main parts: The first part is the introduction, which seeks the theoretical explanation for the current situation of high-tech industry agglomeration and leads to the content of this paper; the second part is a literature review and hypothesis, reviewing the relevant literature and theory, and putting forward the hypothesis of this paper; the third part is variable measurement and research methods, which explains the design and data source of the questionnaire, and gives a preliminary description of the questionnaire data; the fourth part is data analysis and hypothesis testing, which uses mathematical statistical analysis to analyze the samples obtained in this study to verify the hypothesis of this paper; the fifth part is the research conclusion and inspiration, which describes the research conclusion, significance and inspiration of this paper; and the sixth part is the limitation and prospect of the research, and puts forward the limitation of this paper and the prospect of future research.
2. Literature Review and Hypothesis

2.1. Enterprise Performance

Since the late 20th century, most economies have entered the “innovation-driven” stage. Innovation is the most effective way for organizations to obtain a competitive market advantage and realize sustainable development. Innovation is the process of generating innovative ideas and implementing creative behavior. Its essence is reflected in organizational innovation performance.

Enterprise performance is a multi-level concept, an important indicator to measure the effectiveness and efficiency of the organization’s operation, and a general description of all the results achieved by the enterprise’s production and operation activities [26,27]. The two indicators that reflect the operating status of an enterprise are the company’s profit level (accounting performance) and market value. Accounting performance measures the operating results of enterprises in a short period. Return on assets (ROA), return on net assets (RON), etc., are important indicators to reflect the accounting performance of enterprises.

However, accounting performance alone can only reflect the historical performance of the enterprise [28,29]. Financial indicators cannot measure the future performance of the enterprise. Therefore, long-term performance should also be considered. The long-term performance of an enterprise is usually expressed by the company’s market value, which reflects the expected situation of the enterprise and is the embodiment of the long-term operating results [30,31]. From this point of view, this study analyzes the short-term and long-term performance results simultaneously.

Porter’s competitive advantage theory points out that the peer competition and learning effect generated by industry clusters can improve the innovation ability of enterprises, even of regions and countries [32,33], and can effectively promote and maintain the rapid growth of the enterprise economy, thus promoting the improvement of enterprise performance. As the most typical spatial feature of economic activities, the industry cluster is a global economic phenomenon [20]. The research results of Ning Kang show that the competitive effect of the industry cluster itself significantly improves enterprise performance [34]. Doeringer pointed out that the competitive effect of industrial clusters led to the intensification of competition among enterprises in the same industry in the cluster, stimulated the vitality of enterprises, and further promoted the improvement of enterprise performance [35].

Shengnan Cui found in his research on industry clusters and regional economic growth that industry clusters can significantly improve regional economic benefits through the intermediary role of technological innovation [36]. Industry cluster shortens the geographical distance and is conducive to communication between enterprises. The knowledge spillover effect of the industry cluster promotes the dissemination and absorption of new knowledge, helps to improve the technological innovation of enterprises, and thus promotes regional economic growth. Rui Baptists research on the relationship between industry clusters and manufacturing industry performance shows that technological innovation is one of the beneficial externals of industry clusters [37]. At the same time, compared with the industry cluster, it has its own unique technological innovation effect, which can reduce industry costs, improve industry income, and play an intermediary role in agglomeration and industry performance.

Scholars also found that the external generated in the process of industry cluster can effectively improve the R&D capabilities of enterprises [38]. Fung found that an industry cluster, as a regional innovation model, has not only innovation resources but also has a mechanism to enhance the interaction between innovation entities [39]. Cook found through research that clustering provides a mechanism for exchanging tacit knowledge [40]. When workers with special skills in enterprises move to the region, they can promote the diffusion of knowledge. Enterprises can enhance the overall regional competition and R&D capabilities by absorbing and transforming the knowledge in the cluster, thus improving innovation performance [41].
With the in-depth study, scholars found that the impact of industry clusters on enterprise performance is not obvious. By introducing mediator variables to study industry clusters and enterprise performance, the impact of industry clusters on enterprise performance can be significantly improved. This may be due to the external effect of the industry cluster itself, which leads to the spillover and diffusion of knowledge. An industry cluster is more conducive to the dissemination, digestion, and absorption of knowledge. Relevant enterprises in the park can maximize the absorption of knowledge, thus improving the innovation ability of enterprises and further promoting the improvement of enterprise performance [42]. Rui Baptists shows that technological innovation is a beneficial external of industry cluster [37]. At the same time, compared with the industry cluster, it has its own unique technological innovation effect. It can reduce industry costs and improve industry income, and plays a certain role in the research of industry cluster and industry performance.

All the above studies have pointed out that as a strategic resource, independent innovation capability cannot only reflect the competitiveness of enterprises’ products but also the ability of enterprises to absorb capital, which is the essential power of enterprise development [43]. The innovation capability can increase sales revenue by adding new products and then increase enterprise operating profit [44]. Other scholars believe that the positive effect of innovation capability on enterprise performance is mainly that it will generate good investment information in the capital market. The more patents an enterprise has, the more it can attract investors’ attention to obtain timely external financial support [45]. The number of patents owned by enterprises reflects the efficiency of innovation output. It affects the degree of commercialization of enterprise innovation results, which has been considered an important manifestation of independent innovation capability [46]. The level of patent quality reflects the level of innovation output, which can improve enterprise profits through the advantages of price and demand and is also an important embodiment of independent innovation [47]. The irreplaceable nature of innovative products and the monopolization of the market have helped enterprises win strategic advantages to a certain extent and brought opportunities for enterprise development in the fierce market competition [48].

To sum up, the theory of competitive advantage believes that the learning effect of industry clusters can improve the innovation ability of enterprises [49], effectively promote and maintain the rapid growth of the enterprise economy, and thus promote the improvement of enterprise performance. Scholars also found that the knowledge spillover effect of industry clusters can promote the faster transformation and absorption of knowledge, thus stimulating the motivation of innovation and further promoting performance improvement. Therefore, in the path of the impact of industry clusters on performance, it is, in essence, the strong innovation ability generated by the industry cluster that promotes performance improvement [50]. This study will study the relationship between industry clusters and enterprise performance under the mediation of independent innovation.

2.2. Hypothesis
2.2.1. The Relationship between Industry Cluster and Performance

In the study of the factors affecting enterprise performance, there have been studies that have proved that industry cluster has an impact on enterprise performance. Audretsch, Audretsch et al. show that industrial clusters provide enterprises with many conditions conducive to their development, such as opportunities for mutual exchange, learning from each other and mutual spillover of knowledge and technology [51]. So that enterprises can achieve the goal of improving performance through these advantages. In addition, the competition among enterprises in the cluster is gradually intensified, which forces the innovation ability of enterprises in the cluster to be enhanced, and the performance of enterprises will be improved to a certain extent [52]. Research on the relationship between entrepreneurship, enterprise cluster and performance concluded that the knowledge-based agglomeration of enterprises positively impacts enterprise performance [53]. Li, Xiaoying
takes high-growth enterprises as an example and studies the impact of an industry cluster in high-tech zones on enterprise productivity in China. The results show that industry clusters in high-tech zones can significantly improve enterprise total factor productivity, indirectly reflecting the positive correlation between industry clusters and enterprise performance [54]. Therefore, this study puts forward the following hypothesis:

**Hypothesis 1 (H1a). Industry Cluster Has a Significant Positive Effect on Long-Term High-Tech SMES Performance.**

**Hypothesis 1 (H1b). Industry Cluster Has a Significant Positive Effect on Short-Term High-Tech SMES Performance.**

2.2.2. The Mediator of Independent Innovation

Industry cluster intensifies competition among enterprises in the same industry in the cluster and promotes enterprises to accelerate technological innovation and improve competitiveness [55]. Industrial clusters form cluster areas. It is easy for enterprises in the same industry in the cluster to understand each other’s innovation and development potential. This will generate a sense of urgency and pressure, thus forcing enterprises to continue to innovate and enhance their vitality and competitiveness. The external technological theory believes that the spatial agglomeration of the same industry is conducive to the spillover and dissemination of knowledge [56]. The industry cluster has brought the distance between enterprises and employees closer, promoting the exchange and communication between enterprises and employees and accumulating rich social resources. The knowledge spillover within the cluster will promote the innovation of ideas and the renewal of knowledge among enterprises, thus stimulating the vitality of innovation and creating new products to improve competitive advantage [2]. Organizational learning and knowledge creation are the source of the enterprise’s competitive advantage. The essence of independent innovation is the mutual exchange of information and knowledge to break through the original barriers and form new technologies, which is bound to provide enterprises and technicians with a platform for frequent contact. The industry cluster zone can provide such a platform with close distance, fewer obstacles, and more contacts [37] and promote mutual exchange among enterprises with similar industry nature to increase the innovation ability of enterprises.

At the same time, in the enterprise development process, the enterprise’s independent innovation ability affects the enterprise’s technological transformation, transfer and diffusion, as well as the research and development of new products. It determines the completion, market expansion, possession, and income of the enterprise’s products, thus constituting the most critical factor of its core competitiveness [57]. On the one hand, the external effects of industry cluster, such as the competition effect, knowledge spillover effect, and learning effect, promote the independent innovation ability of enterprises [16]. On the other hand, the independent innovation ability of enterprises can improve the competitiveness of enterprises’ products by reducing production costs and product differentiation, shortening the development cycle, and improving labor production efficiency to improve industrial performance [3]. Therefore, this paper puts forward the following hypothesis:

**Hypothesis 2 (H2). Independent Innovation Plays an Intermediary Role in The Process of High-Tech Industry Agglomeration Promoting Enterprise High-Tech SMES Performance.**

2.2.3. The Relationship between Independent Innovation and High-Tech SMES Performance

In studying the factors affecting enterprise performance, scholars have proved that independent innovation impacts enterprise performance. Salavo, through the study of Greek service industry enterprises, believes that enterprises with strong innovation capabilities have more advantages in market competition and stronger enterprise performance [58]. Prajogo found that independent innovation can bring profit growth points for manufac-
turing enterprises and an important factor affecting the profit of service enterprises [59]. Pain and Becker take the heavy industry enterprises in the U.K. as the research sample, and the empirical results show that R&D investment positively impacts enterprise performance [5]. Increasing R&D investment can improve enterprise performance by increasing innovative products. Falk believes that the intensity of R&D investment reflects enterprises’ importance to innovation activities [18]. Enterprises with more R&D investment are more willing to innovate, stimulate the vitality of enterprise innovation, form market advantages through technological output, and thus have a positive role in promoting enterprise performance. Guo and Han believe that the depth of innovation and opening up is the further development and optimization of existing innovative products, and the financial strength of new enterprises is relatively weak [60]. The in-depth development of innovative products can reduce not only the investment cost of R&D funds but also meet the market demand, can generate cash flow in time, and has a more significant role in promoting the growth performance of enterprises. Yin, and Ximing believed that the CEO’s experience would affect their innovation-decision and that the more innovation investment, the better the enterprise performance [61]. Li and Yan, through the study of panel data found that technological innovation is the source power of sustainable development of enterprises, and the development of innovative products can help enterprises to attract new customers continuously, establish a good brand image, and lead the direction of industrial development [62]. However, technological innovation requires a large amount of capital investment, and the financing capacity of enterprises affects the level of R&D investment. Enterprises with stronger financing capacity tend to be more willing to carry out innovative R&D, and their financial performance is also better [14]. Therefore, this paper puts forward the following hypothesis:

**Hypothesis 3 (H3a). Independent Innovation Has a Significant Positive Effect on Long-Term High-Tech SMES Performance.**

**Hypothesis 3 (H3b). Independent Innovation Has a Significant Positive Effect on Short-Term High-Tech SMES Performance.**

The theoretical model of this paper can be constructed, as shown in Figure 1.

![Figure 1. Theoretical Framework.](image)

3. Variable Measurement and Research Method
3.1. Procedure and Sample

This study takes Sichuan Hi-tech Zone as a sample and collects data through a questionnaire survey. According to the data of the National Bureau of Statistics, since 2015, Sichuan Province has set up five high-tech clusters and encouraged technology-based en-
enterprises to settle in the parks through ten laws, including low-interest loans, tax reduction, provision of corporate land, and establishment of expert database guidance [63]. By 2022, Sichuan Hi-tech Zone will have 62 new gazelle enterprises, up 40.8%, 14,500 high-tech enterprises, up 42.3%, and 18,700 small and medium-sized technology-based enterprises, up 26.2%. The operating revenue of the science and technology information service industry was 464.5 billion yuan, up 11.7% year on year, and that of the high-tech industry was 2.6 trillion yuan, up 11.8% year on year [64]. It ranks first in the country. Therefore, this study selects the high-tech industry cluster in Sichuan, China, as the research sample.

The questionnaire was prepared in three steps. First, we conducted in-depth interviews with the managers of high-tech enterprises living in different industries in the High-tech Zone. We collected first-hand information on the benefits and impacts of an industry cluster in the High-tech Zone. Secondly, based on the information obtained through interviews and the existing high-level literature, we prepared an English questionnaire, which was then translated into Chinese by two Chinese doctoral candidates in management who are proficient in both languages. To ensure accuracy, two professional translators re-translated the Chinese version of the questionnaire into English. Third, we selected 15 high-tech enterprises in the high-tech zone cluster in Sichuan and conducted a pilot test on 20 managers of these small and medium-sized enterprises. We improved the questionnaire again and then finalized it according to the pilot test results.

All questionnaires were distributed in two ways. First, we distributed 350 questionnaires through a professional data company named Survey-Star in China. Secondly, relying on the personal relationship between the research team members and the high-tech zone managers, we distributed 200 questionnaires by e-mail. The questionnaire distribution process lasted two months, with 550 questionnaires. Finally, we received 350 available questionnaires, and the effective response rate was 78.5%. The sample data of Chengdu and Mianyang Hi-tech Clusters accounted for 72.2% of the total sample, while Luzhou, Nanchong, and other Hi-tech Clusters accounted for 27.8% of the total sample. Chengdu, Mianyang, Luzhou, and Nanchong are cities in Sichuan Province, they are cities with a key distribution of high-tech enterprise clusters.

3.2. Variable Measurement

This study includes four main structures: industry cluster, independent innovation, long-term high-tech SMEs’ performance and short-term high-tech SMEs’ performance. The measurement project is adapted from the existing literature. Considering that the questionnaire survey is mainly conducted among well-educated people such as senior managers and business owners, the more the level, the better the reliability and effectiveness. If the later data are not ideal, there is room for degradation. The 7-point system is adopted, and the numbers 1 to 7 represent the respondents’ agreement with the project. The larger the number, the higher the consistency between the respondents’ views and the content of the question. The specific meanings of numbers 1 to 7 are 1—obvious disagreement, 2—disagreement, 3—slight disagreement, 4—uncertainty, 5—slight agreement, 6—agreement, and 7—same agreement. The industry cluster is an independent variable in this study. A five-item scale was adapted from [53], including the innovation ability and resources of enterprises in the cluster. Independent innovation is the mediator of this study. A five-item scale adapted from [65], such enterprises often develop and launch new products and services. The dependent variable is enterprise high-tech SMEs’ performance, measured by multiple indicators [66].

In this study, the measurement method of short-term and long-term high-tech SMEs’ performance of enterprises is based on Wu et al. [67]. The short-term performance is reflected in the financial statements, and the long-term performance is reflected in the competitive advantage. Specifically, the enterprise’s current operating status and past operating results are mainly reflected by the return on investment and profit growth rate, which are suitable for measuring short-term performance. Product development speed,
internal operation efficiency, and product market share is used to measuring long-term performance. See Appendix A for details of measurement items.

Controls: Considering the study’s context and outcome variable (performance), we included two firm-level variables and one industry-level variable, including firm size, firm age, and competitive intensity. The natural logarithm of the number of employees measured firm size. Firm age was measured by the years the firm has been in operation.

4. Data Analysis and Hypothesis Testing

This paper uses spss22.0 and amos24.0 to conduct factor analysis on the data, including exploratory and confirmatory factors. SPSS is used for exploratory factor analysis. After exploratory factor analysis is completed, confirmatory factor analysis is needed to verify whether the obtained factor structure is reasonable. At the same time, AMOS can also be used for path analysis of structural equations. At present, most mainstream structural equation papers use SPSS to conduct statistical analysis in conjunction with AMOS. Then SEM analyzes through four steps: model construction, fitting, evaluation, and correction. Reliability is generally through Cronbach’s α. However, α the reliability of the questionnaire is too harsh; Construct Reliability (C.R.) should be used for measurement [68]. In terms of the validity test, because the items used in the scale are adapted from maturity scales with high citations, this paper will use convergent and discriminant validity to measure the validity of the questionnaire. Table 1 shows that the factor load of all observed variables is greater than 0.5, reaching the acceptance standard, the C.R. (Construct Reliability) value meets the threshold requirement of greater than 0.7, and the AVE (Average Variance Extracted) value also reaches the acceptance standard of 0.5, indicating that the questionnaire has good convergent validity as a whole. The test results of convergent validity are shown in Table 1. Then, we evaluated the discriminant validity of the measures using the AVE method. Table 2 indicates that the square roots of AVE of all constructs (diagonal elements in bold) were much higher than the corresponding inter-construct correlations, providing strong support for discriminant validity. The test results of discriminant validity are shown in Table 2. To sum up, the scale in this paper meets the requirements regarding reliability and validity.

Table 1. Standardized item loading, AVE, C.R., and Cronbach’s α.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Standardized Loading</th>
<th>AVE</th>
<th>C.R.</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-IC</td>
<td>T1</td>
<td>1.776</td>
<td>−0.795</td>
<td>−0.506</td>
<td>0.838</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T2</td>
<td>1.714</td>
<td>−0.893</td>
<td>−0.104</td>
<td>0.872</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>T3</td>
<td>1.773</td>
<td>−0.894</td>
<td>−0.277</td>
<td>0.827</td>
<td>0.71</td>
<td>0.82</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>T4</td>
<td>1.647</td>
<td>−0.963</td>
<td>0.124</td>
<td>0.842</td>
<td></td>
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<tr>
<td></td>
<td>T5</td>
<td>1.741</td>
<td>−1.034</td>
<td>0.145</td>
<td>0.852</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M1</td>
<td>1.547</td>
<td>−0.42</td>
<td>−0.602</td>
<td>0.63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M2</td>
<td>1.503</td>
<td>−0.375</td>
<td>−0.545</td>
<td>0.873</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F2-LTP</td>
<td>M3</td>
<td>1.496</td>
<td>−0.429</td>
<td>−0.502</td>
<td>0.823</td>
<td>0.64</td>
<td>0.89</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>M4</td>
<td>1.457</td>
<td>−0.385</td>
<td>−0.48</td>
<td>0.816</td>
<td></td>
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<tr>
<td></td>
<td>M5</td>
<td>1.587</td>
<td>−0.542</td>
<td>−0.319</td>
<td>0.823</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>M6</td>
<td>1.523</td>
<td>−0.435</td>
<td>−0.31</td>
<td>0.815</td>
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<tr>
<td></td>
<td>M7</td>
<td>1.522</td>
<td>−1.472</td>
<td>1.75</td>
<td>0.841</td>
<td></td>
<td></td>
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<tr>
<td>F3-STP</td>
<td>M8</td>
<td>1.493</td>
<td>−1.311</td>
<td>1.449</td>
<td>0.817</td>
<td>0.66</td>
<td>0.9</td>
<td>0.87</td>
</tr>
<tr>
<td></td>
<td>M9</td>
<td>1.525</td>
<td>−1.319</td>
<td>1.351</td>
<td>0.9</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>M10</td>
<td>1.406</td>
<td>−1.358</td>
<td>1.844</td>
<td>0.66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q1</td>
<td>1.695</td>
<td>−0.165</td>
<td>−1.063</td>
<td>0.823</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>1.609</td>
<td>−0.34</td>
<td>−0.89</td>
<td>0.82</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>1.691</td>
<td>−0.363</td>
<td>−0.827</td>
<td>0.851</td>
<td>0.67</td>
<td>0.88</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>1.693</td>
<td>−0.337</td>
<td>−0.77</td>
<td>0.769</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: C.R. = Construct Reliability; AVE = average variance extracted.
Table 2. Descriptive statistics and correlation matrix.

<table>
<thead>
<tr>
<th>Variable</th>
<th>F1-IC</th>
<th>F2-LTP</th>
<th>F3-STP</th>
<th>F4-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1-IC</td>
<td>0.71</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>F2-LTP</td>
<td>0.117 *</td>
<td>0.64</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>F3-STP</td>
<td>0.111 **</td>
<td>0.095 **</td>
<td>0.66</td>
<td>N/A</td>
</tr>
<tr>
<td>F4-II</td>
<td>0.142 **</td>
<td>0.112 **</td>
<td>0.122 *</td>
<td>0.67</td>
</tr>
<tr>
<td>√AVE</td>
<td>0.84</td>
<td>0.80</td>
<td>0.81</td>
<td>0.82</td>
</tr>
</tbody>
</table>

Notes: N = 320; * p < 0.05; ** p < 0.01; N/A not suitable for analysis.

SEM can properly deal with many latent variables that cannot be accurately or directly measured in management [4]. At the same time, it also has a measurement model that can deal with multiple dependent variables simultaneously, allow greater elasticity, and deal with independent and dependent variables, including measurement errors.

It has many advantages, such as estimating the factor structure and factor relationship and estimating the reasonable degree of the whole model. The statistical analysis is carried out through model construction, fitting, evaluation, and correction. See Table 3. for the commonly used indexes and SEM’s fitting degree evaluation range.

Table 3. Fitting degree evaluation range.

<table>
<thead>
<tr>
<th>Name</th>
<th>Range</th>
<th>Judgment Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>χ²/df</td>
<td>-</td>
<td>p &lt; 3</td>
</tr>
<tr>
<td>CFI</td>
<td>0–1</td>
<td>&gt;0.09</td>
</tr>
<tr>
<td>IFI</td>
<td>0–1</td>
<td>&gt;0.09</td>
</tr>
<tr>
<td>TLI</td>
<td>0–1</td>
<td>&gt;0.09</td>
</tr>
<tr>
<td>SRMR</td>
<td>0–1</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0–1</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

Using AMOS24, the initial structural equation model is analyzed, and the fitting degree between the correlation mode between variables and the actual data are judged by the operation results. As shown in Table 4, the χ² value of the initial model fitting is 2.259 (degree of freedom DF = 646), so the fitting effect is good; At the same time, the TLI value and CFI value of the initial model are 0.910 and 0.925, which all meet the standard that the value is greater than 0.9; RMSEA value is 0.061, SRMR = 0.81 which all meet the standard that the value should be less than 0.8. The initial model fitting index shows that the initial model fits well with the sample data. Meanwhile, the relevant test results of the initial SEM model are shown in Table 5. All hypotheses are supported.

Table 4. The recommended and actual values of fit indices.

<table>
<thead>
<tr>
<th>χ²/df</th>
<th>RMSEA</th>
<th>NFI</th>
<th>RFI</th>
<th>NFI</th>
<th>IFI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.272</td>
<td>0.019</td>
<td>0.950</td>
<td>0.955</td>
<td>0.90</td>
<td>0.952</td>
</tr>
</tbody>
</table>

Table 5. The results estimated by AMOS.

<table>
<thead>
<tr>
<th>Estimate</th>
<th>S.E.</th>
<th>C.R.</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4 ← F1</td>
<td>0.468</td>
<td>0.053</td>
<td>8.835 ***</td>
</tr>
<tr>
<td>F2 ← F4</td>
<td>0.577</td>
<td>0.062</td>
<td>9.379 ***</td>
</tr>
<tr>
<td>F3 ← F4</td>
<td>0.228</td>
<td>0.043</td>
<td>5.275 ***</td>
</tr>
<tr>
<td>F2 ← F1</td>
<td>0.208</td>
<td>0.047</td>
<td>4.429 ***</td>
</tr>
<tr>
<td>F3 ← F1</td>
<td>0.209</td>
<td>0.038</td>
<td>5.509 ***</td>
</tr>
</tbody>
</table>

Note. *** p < 0.01.

5. Results

This study analyzes the relationship between industry clusters and high-tech SMEs’ performance, and analyzes independent innovation as a mediator effect. We found that the
industry cluster has a positive correlation with high-tech SMEs’ performance. It verifies that independent innovation has a mediator role between industry cluster and high-tech SMEs’ performance.

The empirical results show that the standardized path coefficient of high-tech cluster and long-term high-tech SMEs’ performance is 0.208 ($p < 0.001$). The empirical results show that the standardized path coefficient of high-tech cluster and short-term high-tech SMEs’ performance is 0.209 ($p < 0.001$), which shows that high-tech cluster has a significant positive effect on the long-term and short-term high-tech SMEs’ performance, which is similar to Yang Jiaoping, who concluded that knowledge-driven cluster of high-tech enterprises has a positive impact on enterprise performance [53].

Industrial clusters form an industrial zone, forming benign competitiveness among the same enterprises in the zone, promoting enterprises to stimulate internal vitality, and improving high-tech SMEs’ performance. Frequent exchanges in industrial zone are conducive to acquiring resources and information, which can be transformed into the endogenous power of enterprise development. At the same time, the information exchange in the zone is more convenient. Enterprises can receive market information faster and react to the market on time, which is conducive to promoting the improvement of high-tech SMEs’ performance.

The empirical results show that the standardized path coefficient of the high-tech cluster and independent innovation is 0.468 ($p < 0.001$). Industry cluster has a significant positive impact on independent innovation capability, which is similar to Wang, et al. [69], who proposed that the competitive effect of an industry cluster can stimulate innovation vitality and enhance the independent innovation ability of the whole enterprise in the cluster zone. The knowledge spillover effect of the industry cluster will form rich social resources, which is conducive to promoting the exchange and communication between enterprises and promoting the innovation of ideas and the renewal of knowledge among enterprises; the learning effect of the industry cluster encourages enterprises to communicate with each other, expand knowledge and thinking, and help enterprises develop new products.

The empirical results show that the standardized path coefficient of independent innovation and long-term high-tech SMEs’ performance is 0.577 ($p < 0.001$). The empirical results show that the standardized path coefficient of independent innovation and short-term high-tech SMEs’ performance is 0.228 ($p < 0.001$). It shows that independent innovation is effective for enterprises’ long-term and long-term performance, but more effective for improving long-term performance. The reason is that long-term performance is mainly reflected in the competitive advantage of enterprises. Independent innovation enables enterprises to have more ownership of intellectual property rights, and the cost of investment and innovation increases in the short term. However, in the long term, enterprises can break through technological monopoly through independent innovation and strive for a more favorable market position and competitive advantage, and it can improve the long-term survival rate and anti-risk ability of enterprises.

Independent innovation plays a mediator role between industry clusters and high-tech SMEs’ performance. Based on the empirical analysis, it can be seen that an industry cluster can directly promote enterprise high-tech SMEs’ performance when an industry cluster on enterprise high-tech SMEs’ performance is difficult to achieve the expected value. However, introducing independent innovation can maximize the impact of industry clusters on high-tech SMEs’ performance to a certain extent.

6. Discussion

6.1. Contributions

This paper puts forward management countermeasures based on the empirical research on industry cluster, independent innovation and high-tech SMEs’ performance. Enterprises should choose a suitable gathering area. There are rich resources and complex network structures in the cluster area, which can provide better resources and information for enterprises. The government in the cluster can provide a healthy development environ-
ment for enterprises, and the industrial park can provide more channels for enterprises to obtain knowledge, information, and technology. In the development process, enterprises should pay attention to the ability of independent innovation, improve the competitiveness of enterprises, increase the strength of technological innovation based on the initial development, and make enterprises glow with new vitality. However, it is necessary to focus on different innovation directions in different periods of development, find innovation points according to market trends, R&D investment, organizational efficiency, and other aspects, and convert the limited resources of enterprises into maximum profits to maximize them high-tech SMEs’ performance. Enterprises should pay attention to the importance of knowledge sharing. The conclusion of this paper shows that the knowledge spillover effect of industry clusters forms rich social resources, which is beneficial for enterprises to communicate and learn from each other. Enterprises of the same nature in the park compete and promote each other, which is beneficial to stimulate the internal vitality of enterprises and promote the improvement of innovation ability.

6.2. Limitations

Although this study has drawn some useful limitation, there are still some shortcomings. Firstly, this paper has not conducted a more detailed study of high-tech SMEs’ performance. In future research, it should further explore the development model of enterprise innovation and relevant influencing factors and analyze the models and factors that enterprises should adopt at different stages of development. Secondly, the variables in this study are not subdivided into its dimensions. The role of industrial agglomeration in different stages of the company’s development should be considered more. With the company’s development, industrial agglomeration should be considered in multiple dimensions. Thirdly, the data collection of this study only uses a combination of online and offline questionnaires for empirical analysis. To improve the accuracy of the research conclusions, future research can consider using qualitative methods combined with in-depth enterprise surveys.

7. Conclusions

The study concludes in several ways with respect to the literature. First of all, it was affirmed that the gathering of high-tech industries promotes independent innovation, and the role of high-tech industry clusters in promoting innovation is manifested in the following aspects: firstly, the gathering of numerous enterprises and institutions is conducive to obtaining innovation resources, making it easier it is to obtain innovative resources, and the more advantageous innovation becomes. The high-tech industry cluster provides a favorable institutional environment, technical support environment, and helps to form a research network for technological innovation within the area, which is conducive to the improvement of the innovation ability of the high-tech industry cluster. Secondly, it is conducive to the flow of talent. The role of human resources in high-tech industrial clusters is increasingly prominent, becoming an important driving force for independent innovation in high-tech industries. The accumulation and flow of high-end human capital in the industrial cluster reduces the information distortion of tacit knowledge formed in the process of technological innovation in the dissemination process, thus improving the efficiency of innovation technology diffusion. In addition, due to geographical proximity, there are increased opportunities for enterprises to communicate through various formal or informal channels, making the knowledge within the cluster particularly valuable. Secondly, after the formation of high-tech industry clusters, closely adjacent enterprises within the cluster have shortened the competition process due to their common location, stimulated the development of local suppliers, and accelerated the emergence of new competitors in related industries. Due to the inherent demand for technological innovation and the competitive pressure of external markets, combined with the advantages of innovation resources within the cluster area, enterprises have been forced to form various driving mechanisms to promote technological innovation.
Thirdly, it is important to clarify that the agglomeration of high-tech enterprises affects the long-term and short-term performance of enterprises through independent innovation. Enterprises are the main body and basic unit of high-tech industrial clusters. The foundation of the development of high-tech industrial clusters is the development of enterprises. Only when enterprises are vibrant can industrial clusters have vitality. Especially high-tech industry enterprises, influenced by industry characteristics, must engage in continuous technological innovation to improve their independent innovation capabilities. Only with the independent innovation of enterprises within high-tech industry clusters will drive the optimization and upgrading of the technological level and industrial structure of the entire industrial cluster, thereby enhancing the vitality of the agglomeration area and strengthening the formation and development of industrial clusters. In addition, technological innovation is the guarantee for the formation of high-tech industrial clusters and the improvement of their competitiveness. Technological innovation capability is the key to maintaining a long-term competitive advantage in a high-tech industry cluster. In a market economy, every economy faces extensive and fierce competition, especially in the field of high-tech industries. Which enterprise has strong technological strength will be in a favorable position in competition. Therefore, every enterprise continuously carries out technological innovation according to market demand, while also improving the competitive advantage of high-tech industry clusters, becoming a powerful guarantee for the competitiveness of high-tech industry clusters.

**Author Contributions:** Conceptualization, T.T.; methodology, T.T.; software, T.T.; validation, N.B.Z.; formal analysis, J.Y.; investigation, A.A.R.; resources, A.A.R.; data curation, J.Y.; writing—original draft preparation, T.T.; writing—review and editing, J.Y.; visualization, N.B.Z.; supervision, A.A.R.; project administration, A.A.R. All authors have read and agreed to the published version of the manuscript.

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**Appendix A**

### Table A1. Measuring items for long-term performance.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Topics</th>
<th>From</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-tech cluster</td>
<td>1. The Park where the company is located can bring entrepreneurial opportunities to the company.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The company can often identify business opportunities and use them effectively.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Enterprises can effectively use resources in the zone.</td>
<td>[53]</td>
</tr>
<tr>
<td></td>
<td>4. Enterprises can often exchange and benefit from other enterprises in the same industry.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The company attaches great importance to protecting patents, intellectual property rights and trade secrets.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Enterprises often develop and launch new products and services.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7. Enterprises will commercialize new products and services.</td>
<td>[53,65]</td>
</tr>
<tr>
<td>Independent innovation</td>
<td>1. Compared with major peers, the company’s operating revenue growth rate is higher.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The company’s profit growth rate is higher than major peers.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Compared with major peers, the company has a higher return on investment.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Compared with major peer enterprises, the company’s return on equity is higher.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Compared with major peer enterprises, the company’s R&amp;D efficiency is higher.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. The company’s product market share is high compared to major peer enterprises.</td>
<td>[70–72]</td>
</tr>
<tr>
<td></td>
<td>7. Compared with major peer enterprises, the company’s profit from similar products is higher.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8. Compared with major peers, the company has a mature R&amp;D team</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9. The company has more patented technologies than major peer enterprises.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10. Compared with major peer enterprises, the company’s products are launched to the market faster.</td>
<td></td>
</tr>
</tbody>
</table>
References


64. Li, C.; Gao, X.; He, B.-J.; Wu, J.; Wu, K. Coupling Coordination Relationships between Urban-Industrial Land Use Efficiency and Accessibility of Highway Networks: Evidence from Beijing-Tianjin-Hebei Urban Agglomeration, China. *Sustainability* 2019, 11, 1446. [CrossRef]


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