Research on the Mechanism of Innovation Driven Growth of Small and Medium Sized High Tech Enterprises

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Abstract. "Innovation driven" is the party's eighteen put forward in the new period development strategy, small and medium-sized high-tech enterprises is an important carrier of "innovation driven", how to use innovation to drive its growth has attracted much attention. The enterprises based on the perspective of ecology, starting from the characteristics of driving the growth of small and medium-sized high-tech enterprises innovation, analyzes the small and medium-sized high-tech enterprises innovation driven growth of four mechanisms (innovation needs a mechanism, supply mechanism of innovation and innovative cooperation mechanism and innovation mechanism of Catalysis), by issuing questionnaires and collected data to the 197 in small and medium-sized high-tech enterprises, and the use of structural equation model to carry out an empirical test.

Introduction

"Innovation driven" refers to the situation that against the background of global technological revolution, innovative technology, talents, organizations, commercial models, and institutions are made full use of in order to integrate tangible resources like capital and intangible resources such as data to form in internal driven power of economic development. The 18th National Congress of the Communist Party of China made innovation driven the grand strategy as the route to advance China’s technology and achieve social economic transformation. As the piloting organizations in this process, small and medium enterprises are playing an increasingly important role.

Innovation driven has brought new opportunities for small and medium high and new tech enterprises. Then which innovation driven factors play an important role during these small and medium high and new tech enterprises? How do these factors connect with each other to push forward the sustainable development of small and medium-sized high-tech enterprises? The answer of these questions can be all found in the innovation driven system and institution, making this study theoretically and practically meaningful.

Literature Review

As innovation driven is a relatively new concept, studies on small and medium sized new and high tech enterprises are rare. Oakey R. and Cooper S.(2010)chose 49 small and medium sized new and high tech enterprises in Inchon as their samples, using deep interview and classic case study to investigate their growth experiences. They found out that establishing a set of innovation- oriented technology development and technology-productivity transformation system can forcefully help these enterprises develop and grow[1]. Kogut B.(2010)followed up the growing process of 5 big high and new tech enterprises and 7 small and medium sized ones in Kyusyu Silicon Island. He made 8 rounds of questionnaire surveys altogether and through the regress analysis he concluded that innovative talents has the strongest driving power on small and medium sized new and high tech enterprises and the quantity of financial capitals has a strong driving power on large high tech enterprises, demonstrating the difference of mechanism of action in different enterprises[2]. Saxenian A. (2014)supported Kogut B.’s opinion in his case study of 2 high and new tech enterprises in Silicon Valley which are of different scales. According to Saxenian A. organizational structure and managing system has strong impact on the larger enterprise while for the smaller one
the growing impetus comes from the betterment of manufacturing process and development of new products. Rugman P. (2014) applied the comparative study to investigate the 128 Road and 32 mall and medium sized new and high tech enterprises in the scientific city of Tsukuba, the results showed that while the American enterprises’ development is driven by efficient marketable ownership and incubation, the Japanese enterprises are driven by such soft powers as enterprise culture, the creativity of the entrepreneur and his whole team. Ma Liyi and Yang Yi (2013) discussed high and new tech enterprises growing mechanism from the perspective of constructing financial network. Their study shows that the technological and financial networks established within these enterprises fasten their speed of development. Enterprises financing mechanism and the information transferring mechanism serve as very helpful driving power for enterprises’ growing.

A glimpse of the literature shows that studies on high and new tech small and medium sized enterprises are not profound. On the whole (1) domestic researches do not take into consideration the enterprises’ growing mechanism under the condition of innovation driven. (2) Though foreign scholars have mentioned the role played by technology innovation mechanism, marketable ownership mechanism, most of them studied the innovation driven growing mechanism from a single dimension without a integrated system.

**Four Innovation Driven Development Mechanisms of Medium and Small High and New Tech Enterprises**

**The Concept Model for Medium and Small High and New Tech Enterprises’ Innovation Driven Development**

From the perspective of corporate ecology four features characterize the innovation driven development of medium and small high and new tech enterprises:

1. As an ecology body, the development of medium and small high and new tech enterprises have to meet the demand of consumers or clients which is the very value of a company. The innovation of technology and its transfer to productivity are the fundamental route to achieve this goal.

2. In the course of medium and small high and new tech enterprises’ development they need to absorb considerable nutrition from outside including human capital, technological capital, financial capital and social capital, all of which provide enterprises with the innovative factors they need.

3. Fierce competition always exists among companies. However, since there is higher level of flexibility of and openness to innovation in the medium and small high and new tech enterprises, a more complicated relationship forms among these enterprises which are mutually beneficial, mutually dependent, cooperate and coexistent. Such relationship help them better grow and advance.

4. The development period of innovative products in the medium and small high and new tech enterprises is long, and their investment risk is relatively high compared with the average enterprises, therefore they need more external stimulation such as marketable ownership, incubation system, entrepreneurship and corporate culture to promote their internal development.

**Innovation-Demanding Mechanism**

The development and growth of medium and small high and new tech enterprises require them to have the capability to constantly meet the demands of customers. Hence the innovation-demanding mechanism serves as their pulling power to promote the development of medium and small high and new tech enterprises. As is shown in figure 1 the innovative market demand and innovative technology demand contained in the innovation-demanding mechanism are interactive, have effects on each other.
Innovation-Demanding Mechanism of Medium and Small High and New Tech Enterprises.

Innovation-Providing Mechanism

The basic function of innovation-providing mechanism is to maintain the constant development of medium and small high and new tech enterprises. It helps enterprises to achieve development through providing them with resources like personnel, capital, technology and social relationship. For instance social capital facilitates enterprises’ adopting rare social rare social resources by building a relationship network. It stimulates innovation with internal social capital being the core capital and external capital being the medium. Besides talents, capital and technology are indispensable innovative factors and “nutrition”.

Innovation Competition-cooperation Mechanism

High and new tech enterprises are not isolated from the social economic eco system, in their growing and development they always meet their related enterprises and other enterprises of their own sort. All of these enterprises form a relatively open biosphere. In order to maintain their own places in the sphere medium and small high and new tech enterprises have to constantly renew their products, and technologies to obtain competitive advantage by having full or partial monopoly of living resources. On the other hand Cooperating with proper partners in innovation through knowledge share in enterprise groups helps enterprises achieve mutual advantages and mutual development.

Innovation Catalyzing Mechanism

High and new tech enterprises especially medium and small ones need more catalyze than ordinary enterprises to develop and grow. Innovation catalyzing mechanism is to stimulate the smooth development of medium and small high and new tech enterprises through factors in exterior environment, including marketable ownership, incubation system, entrepreneurship and enterprise culture.

Empirical Test of the Innovation Driven Development of Medium and Small High and New Tech Enterprises

Design of Questionnaire

Referring to previous studies, we made operational definitions of relevant concepts and their measurement. In the questionnaire we used the “origin integration” of Likert to measure all questions based on the numerical value of answers range from 1-7 to test the goodness of fit between the real situations of enterprises and the questionnaire.

Innovation-demanding mechanism: 2 subjects are chosen to measure this dimension, that is demand for innovative technology and demand for innovative market. Innovation-catalyzing mechanism: 4 subject questions are used to measure this mechanism, which are marketable ownership, incubation system, entrepreneurship and enterprise culture.

The growing situation of medium and small high and new tech enterprises: Referring to the study of Horbach J.(2007)[6], 2 subject questions are used, one is the growing scale of the medium and small high and new tech enterprises, the other is their growing speed.
Collection of Data

To testify the innovation driven development mechanisms of medium and small high and new tech enterprises, questionnaires are used to collect related data. Since the testifying of this mechanism requires universality the research group conducted two rounds of survey covering telephone survey, paper questionnaire and e-survey after which effective samples from 197 enterprises are taken back, with the validity rate reaching 82.08%.

Reliability and Validity Analysis of the Scale

The Statistics Software SPSS20.0 and AMOS19.0 are used to make validity and reliability analysis of the questionnaire. The Cranach’s α value of each variable range from 0.802-0.905, demonstrating a high reliability and validity. The average variation to extract value (AVE) of each variable is above 0.6, the combination reliability is above 0.9, again showing high validity and reliability of each concept.

The Construction and Test of Structural Formula Model

The Construction of Structural Formula Model. AMOS19.0 is applied to construct structural formula model and testify the previous hypothesis mentioned above.

Model Matching Test. As Table 1 shows all matching index conform to the accuracy requirement, demonstrating that the matching result is good and the structural formula model meet the required standard, so the scale has overall constructing validity.

Table 1. The Degree of Matching.

| Matching Index   | CMIN/DF | GFI   | AGFI  | IFI   | CFI   | RMSEA | NNFI  |
|------------------|---------|-------|-------|-------|-------|-------|-------|
| Matching Results | 2.857   | 0.943 | 0.929 | 0.831 | 0.805 | 0.072 | 0.885 |
| Matching Accuracy| 2.3     | >0.9  | >0.9  | >0.8  | >0.8  | <0.09 | >0.8  |

Conclusion and Policy Suggestions

The results of this research lead to the following policy suggestions: first of all marketable ownership can be applied to the whole process of the growth and development of medium and small high and new tech enterprises according to their different stages of innovation. Secondly the constant incubation of high, new and piloting technological enterprises should be attached great emphasis. Efficient and feasible mechanism should be established to follow up, check and serve their incubation. Thirdly the core role of human capital in the high and new tech industry should be high-lightened. A talents introduction mechanism and a more humane enterprise culture can be built so as to cater to talents in different categories of enterprises. Last but not least innovative ways should be found to better guide enterprises to compete and cooperate properly. Innovative cooperation and coordination among enterprises of expertise and technological advantages should be strengthened. The forms and contents of innovation knowledge sharing should be expanded so as to maintain the balance between cooperation and competition.

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Reference

[1] Oakey R., Cooper S. High technology industry, agglomeration and the potential for peripherally sited small firms [J]. Regional Studies, 2010, 23 (4): 347-360.
[2] Kogut B. Designing global strategies: comparative and competitive value-added Chainc, Sloan management review [J]. Development Theory, 2010, 42(6):15-28.

[3] Saxenian A. Regional advantage: culture and competition in silicon valley and route 128[M]. Camhridge: Harvard University Press, 2014, 17-19.

[4] Rugman P. Development, geography and economic theory [M]. Cambridge: MIT Press, 2014:37-42.

[5] Qi Shunsheng, Li Guowei, “Study On The Growth Mechanism Of High And New Tech Enterprises Based On The Renting Theory” [J]. Technological Advancement And Policy. 2007, 24(7): 24-27.

[6] Horbach J. Determinants of environmental innovation—New evidence from German panel data sources [J]. Research Policy, 2007, 18(1): 112-123.