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The Driving Factors Research for Industrial Structure Evolution: Based on the Simulation Analysis of the High Technology Industry

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Abstract: From the perspective of the evolution of industrial structure, this study constructs the theory hypothesis model of industrial structure evolution driving factors. On this basis, using hierarchical regression and factor analysis method to simulation analysis the influence of high technology in our country industrial structure evolution of the driving factors. Research conclusion will fully understand the impact of the driving factors of industrial structure evolution; realize our country's high technology industry's rapid development has a guiding significance.

Key words: High technology industries, industrial structure evolution, the driving factors, hierarchical regression, factor analysis

INTRODUCTION

Industrial structure rationalization and grade is the basic premise of industry development, directly affects the regional economic, the progress of science and technology, even the improvement of people's living standards. In order to suggest effective guidance for the reasonable and healthy development of the national industrial structure, scholars have carried on a lot of research on industrial structure, researching areas cover the development of the industrial structure condition and so on multi-dimensional evolution trend and influence factors.

The direct effects and characterization of industrial structure evolution reflected in the industrial structure rationalization and grade. Industrial structure rationalization can adjust and improve the unreasonable factors of industrial structure, promote the coordinated development of industry; Industrial structure upgrading is in turn transfer process of the industry focus, the industrial concentration and product form. Industrial structure rationalization and grade as the important content of industrial structure evolution, helping to push optimization processes and evolution structure change of industrial. Driving factors of industrial structure evolution is the leading element which can grasp the industry development direction and evolution law, promote the dynamic mechanism of industrial structure evolution.

Scholars have carried on the related research on industrial structure evolution driving factor and achieved certain results but about the definition of industrial

structure evolution drivers did not reach a consensus, did not form system and the unified theory analysis framework, has relatively less literature which use simulation analysis method to study the driving factor of the industrial structure evolution. The paper on the basis of reference related literature, follows the principle of unity and system, is dividing the driving factors of industrial structure evolution into intrinsic motivation and external thrust, the intrinsic motivation include supply and demand driven, external thrust include government policy and market driven. This paper takes the most can represent the national innovation ability of high-tech industry as an example, uses hierarchical regression analysis and factor analysis to simulation analysis, refines high-tech industrial driving factors of industrial structure evolution and drive source.

THEORETICAL HYPOTHESIS

External thrust and Intrinsic motivation: The research of Cesaroni (2004) shows that the infrastructure services environment directly affects the industry related enterprise applications and the access to information technology requirements, loose environment helps to realize the diversification of enterprise products. Therefore, puts forward the assumption 1: Market driving factors has positive and significant effect on demand driving factors.

Albino *et al.* (2008) points out that government policies driving factors as the important external environment factors, formulating the innovation policy

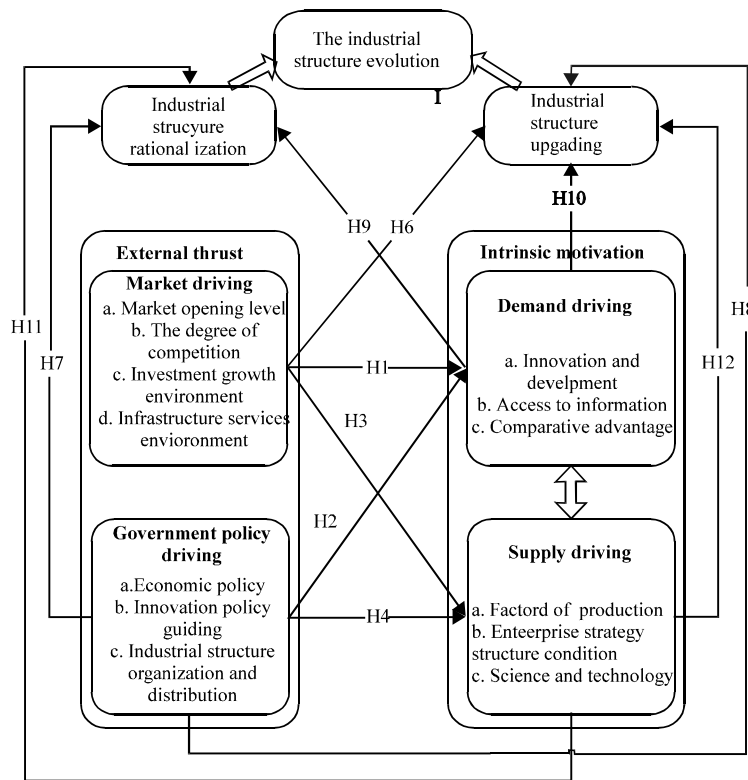


Fig. 1: High technology industrial structure evolution theory hypothesis model of driving factors

can encourage innovation and industry development demand. Therefore, puts forward the assumption 2: Government policy driving factors has positive and significant effect on demand driving factors.

Kohli and Jaworski (1990) argues that market driving factors refers to the enterprises understand and react to the preferences and behave of the behavior main body in dominant market structure, changing the industrial structure and enterprise main body behavior as a goal, having a direct effect on the heart of the enterprise or industry production conditions. Therefore, put forward assumption 3: Market driving factors has positive and significant effect on supply driving factors.

The study of Du and Zhao (2005) shows that the government policy driving factor is the dynamical mechanism of the development of industry, promoting the development of factor market, helping the growth of new technology and enterprises, taking adjust of industrial policy which is not suitable for the behavior and then improving the infrastructure condition of region. Therefore, put forward assumption 4: Government policy driving factors has positive and significant effect on supply driving factors.

External thrust and Industrial structure evolution: The research of Wu (2003) shows that the expansion of the market size can promote the manufacturing industry

structure rationalization development of Jiangsu province, concurrently, lower transaction costs and investment environment in a large extent, promote the development of manufacturing industry specialization. Therefore, puts forward the assumption 5: Market driving factors has positive and significant effect on industrial structure rationalization.

McDonough (2000) suggests that the market services environment and Market opening level can promote industrial upgrade and development. Therefore, puts forward the assumption 6: Market driving factors has positive and significant effect on industrial structure upgrading.

Chang (1999) research has shown that the structure of the governmental economic policies can affect the industry status and the industrial structure rationalization process. Therefore, puts forward the assumption 7: Government policy driving factors has positive and significant effect on industrial structure rationalization.

Feenstra and Hanson (2005) study found that, in trade, industrial policy and the characteristics of the host country has important influence to the industrial structure upgrading. Therefore, puts forward the assumption 8: Government policy driving factors has positive and significant effect on industrial structure upgrading.

Intrinsic motivation and Industrial structure evolution:

Malerba (2002) argues that the differences of demand is the main driving factor for the industrial evolution, the process of industrial evolution is the process of leading technology to replace, the demand for information technology is the important driving factor of industrial structure and its evolution. Therefore, puts forward the assumption 9: Demand driving factors has positive and significant effect on industrial structure rationalization.

Kong and Luo (2007) pointed out that the low interest rates of high technology industry profit have impact on industrial structure adjustment, the changes in the demand of comparative advantage plays an important role in industrial structure upgrading. Therefore, puts forward the assumption 10: Demand driving factors has positive and significant effect on industrial structure upgrading. Gamba and Kodama (2001) points out that the diversification of the supply conditions can affect the industrial structure of Japan. puts forward the assumption 10: Demand driving factors has positive and significant effect on industrial structure upgrading.

Zhao and Zhang (2008) points out that from the perspective of industrial structure optimization steps of the optimization is the industrial supererogation first, followed by the structure supererogation, the industrial supererogation is to develop the high technology industry, the structure supererogation mainly through technology diffusion and spillover of industrial supererogation to promote the traditional industry, the prominent role of science and technology foundation is the important cause of high-level industry implementation. Therefore, puts forward the assumption 12: Supply driving factors has positive and significant effect on industrial structure upgrading.

THE SIMULATION ANALYSIS BASED ON HIGH-TECH INDUSTRY

Variable declaration and data selection: This study choose the indexes such as shown in Table 1. Select relevant data from 26 provinces of China for simulation analysis (Delete the data which five provinces missing).

Table 1: Variables and instructions

Driving factors	The introductions of variables
Industrial structure rationalization	Shows by the proportion of "Output value of primary industry, secondary industry ,tertiary industry " by region and "Total output value" by all-region.
Industrial structure upgrading	Shows by the proportion of "Output value of primary industry "and "Output value of secondary industry" by region; the proportion of "Output value of secondary industry" and "Output value of tertiary industry" by region.
Market	
Market opening level	Shows by the proportion of "Total amount of import and export of goods" by region and "Total output value " by all-region; "Actual foreign direct investment" by region and "Total output value " by all-region.
The degree of competition	Shows by the square of the proportion of "Prime operating revenue of high technology industry" by region and "Prime operating revenue" by region; "Total profit of high technology industry" by region and "Prime operating revenue" by region.
Investment growth environment	Shows by "Amount of investment of high technology industry" by region; "Savings deposit of urban and rural households at year-end" by region.
Infrastructure services environment	Shows by "Length of transport routes(railway, navigable and highways)" by region ; "The amount of internet broadband access port" by region.
Government policy	
Economic policy	Shows by "Growth rate of fiscal spending on science and technology" by region ; " Non-state-owned rate(the proportion of non-state-owned industrial output value by region and total industrial output value by all-region)" ;the proportion of "Fiscal spending" by region and "Total output value " by all-region.
Innovation policy guiding	Shows by "Growth rate of national policy education funds investment amount" by region ; "Growth rate of the proportion of government funds and Rand D expenses internal budget" by region ; Whether issued financial, economy and monetary policies that conducive to the development of high technology industry by region.
Industrial structure, organization and distribution	Shows by "Growth rate of the output value of secondary industry ,tertiary industry and high technology industry" by region; the proportion of "Output value of high technology industry" by region and "Total output value of high technology industry" by all-region; the amount of Chinese-foreign Equity Joint Ventures, Chinese foreign contractual joint venture and Foreign-owned enterprises in high technology industry by region.
Demand	
Innovation and development	Shows by "Growth rate of the amount of new product development projects in high technology industry" by region; "Growth rate of enterprise R&D spending in high technology industry" by region; R&D regional in high technology industry" by region.
Access to information	Shows by "Growth rate of the spending of technology introduction, digestion and absorption" by region; "Growth rate of the spending of technology introduction" by region; "Growth rate of R&D expenses internal budget" by region.
Comparative advantage	Shows by "Accrual of Profit increase on the previous year in high technology industry" by region; "Accrual of technical income increase on the previous year in development areas in high technology industry" by region; "Accrual of the spending of technology introduction, digestion and absorption" by region.
Supply	
Factors of production	Shows by "Personnel of average in high technology industry" by region; "Full-time equivalent of R and D regional in high technology industry" by region; "Amount of enterprises in high technology industry" by region.
Enterprise strategy structure condition	Shows by "Growth rate of annual export volume of trade in high technology industry" by region; "Growth rate of fixed investments in high technology industry" by region; "Growth rate of R&D expenses in high technology industry" by region.
Science and technology	Shows by "The number of patents application accepted" by region; "The number of patents granted" by region; "Transaction value in technical market" by region; "Total amount of R and D expenses internal budget" by region.

Table 2: Regression calculations of the theory hypothesis

The positive effect relationship between hypothesis (driving factors)	R	R ²	F	Sig.	Standardized coefficients Beta	The introductions theory of regression results
Market--demand	0.335	0.112	12.872	0.001<0.05	0.335>0	significant positive effect
Government policy--demand	0.229	0.053	5.669	0.019<0.05	0.229>0	significant positive effect
Market--Supply	0.865	0.748	302.246	0.001<0.05	0.865>0	significant positive effect
Government policy--supply	0.865	0.748	149.768	0.001<0.05	0.23>0	significant positive effect
Market--Industrial structure rationalization	0.642	0.412	35.345	0.002<0.05	-0.614<0	significant negative effect
Market--Industrial structure upgrading	0.489	0.239	15.885	0.001<0.05	-0.473<0	significant negative effect
Government policy--Industrial structure rationalization	0.642	0.412	35.345	0.002<0.05	0.238>0	significant positive effect
Government policy--Industrial structure upgrading	0.489	0.239	15.885	0.001<0.05	0.093>0	significant positive effect
Demand--Industrial structure rationalization	0.416	0.173	10.544	0.002<0.05	0.072>0	significant positive effect
Demand--Industrial structure upgrading	0.393	0.155	9.231	0.002<0.05	0.072>0	positivebutnotsignificanteffect
Supply--Industrial structure rationalization	0.416	0.173	10.544	0.002<0.05	-0.469<0	significant negative effect
Supply--Industrial structure upgrading	0.393	0.155	9.231	0.002<0.05	-0.421<0	significant negative effect

Data from< statistical yearbook of China>, <statistics yearbook on high technology of China>and statistical yearbook of science and technology of China>since, 2007 to 2011.

The simulation analysis process: According to the principle of KMO test value is greater than 0.6, spherical Bartlett test value is less than 0.01, the selected variables are suitable for factor analysis. Based on the formula of characteristic root is greater than 1, the common factor accumulative total variation is greater than 50%, this study uses varimax orthogonal rotation method, in combination with Factor loading figure and Scree plot, draws a composite score of industrial structure rationalization and grade, market driving factors, government policy driving factors, demand driving factors and supply driving factors, applies hierarchical regression method and the SPSS16.0 software to calculate the regression coefficient of theory assumes, gets the theory hypothesis of regression model calculation results such as Table 2.

According to the regression results, all Durbin-Watson numerical are near 2,so regression model of the residual item there is no autocorrelation, overall effective regression model is established. After further analysis, market driving factors and government policy driving factors both have positive and significant effect on demand driving factors and supply driving factors; Market driving factors have negative influence on the industrial structure rationalization and grade and the government policy driving factors have positive and significant effect on the industrial structure rationalization and grade; Demand driving factors have significant positive effect on the rationalization of industrial structure but have positive but not significant effect relation on the high-level industrial structure, supply driving factors have significant positive effect on industrial structure rationalization and grade.

CONCLUSION

According to the simulation analysis of the theoretical hypothesis model, get the following results. Market and government policy driving factors both have positive and significant effect on the high technology industry structure evolution process, so the theory hypothesis 1 to 4 pass the inspection. The conclusion shows that, related industry enterprises and government departments should set up suitable high technology industries development strategy and industry support policy, open market competition, cultivate reasonable investment environment, promote the development of basic service environment, keep the good development momentum of market, carry out practical related industrial economic policy, innovation policy and so on, in order to create synergistic effect between each element of intra-industry, promote the optimization and upgrading of regional industrial structure, achieve long-term development of industrial demand and supply.

Market driving factor has negative effect on the high technology industry structure evolution process but government policy driving factor has positive and significant effect on the Industrial structure rationalization and upgrading, so the theory hypothesis 5 and 6 do not pass the inspection, the theory hypothesis 7and 8 pass the inspection. The conclusion shows that, we should fully understand the market factors as the weaknesses in the high-tech industrial structure evolution, intensify efforts to address the market drivers for high-tech industrial structure evolution of the restrictive function, pay attention to each link of market factor to effect the industrial structure evolution, develop new market, encourage market becomes opener and more competitive, optimize the distribution of elements, promote infiltration and cross between different industries, create a investment growth and infrastructure services environment which is suitable for the development of high technology industry.

Demand driving factor has positive and significant effect on the Industrial structure rationalization, has negative and non-significant effect on the Industrial structure upgrading; Supply driving factor has negative effect on the Industrial structure rationalization and upgrading, so the theory hypothesis 9 and 10 pass the inspection but the theory hypothesis 11 and 12 do not pass the inspection. The conclusion shows that, we should realize supply factor as the weakness of the structure evolution in high technology industry, introduce and train of a large number of high technology industry science and technology talent, strengthen the communication and collaboration between enterprises related high technology industries, enhance the overall quality of regional science and technology, increase the funding of science and technology, speed up the development and utilization of new technologies, promote the evolution and transformation of traditional technology, provide inner Infrastructure security for high-tech industrial structure evolution. In addition, we should speed up the new industrial system architecture, attaches great importance to the high technology industry structure change and its impact on industry as a whole and enhance the demand of the industry for innovation and development, access to information and requirements of comparative advantage, increase the goal of high technology industry structure evolution, improve the development effect of industrial structure rationalization and upgrading from the interaction of supply and demand, express the promoting effect of industrial structure evolution from supply and demand driving factors.

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