Research on the Innovation Mechanism and Process of China's Automotive Industry

Xingda Qi, Xianjun Li, Siyu Yan, Shijin Shuai
State Key Laboratory of Automotive Safety and Energy, Tsinghua University, Beijing , China

Abstract--**This paper launches a study on the innovation mechanism and process of China's automotive industry based on the theory of Sectoral System of Innovation (SSI). To explore the influence of innovation mechanism and process on the industrial innovation capability, a theory model is proposed, in which the innovation mechanism is divided into three parts consisting of forcing mechanism, management mechanism and learning mechanism, and the innovation process being divided into three phases including accumulation process, transformation process and diffusion process. The innovation capability is evaluated from input, output and collaboration side. Further, empirical tests are conducted to support the analytical model, adopting the method of questionnaire survey and Structural Equation Modeling (SEM). The findings show that the forcing mechanism plays the dominant role in stimulating innovation input, the management mechanism mainly supports the industry innovation for China's automotive industry, and the learning mechanism is a long-term process, which could promote innovation inputs fundamentally. Innovation process considered, the accumulating process contributes most to the effective organizing and collaborating of automotive industry, the transforming process is the core element of industry innovation, which is the necessary condition for high quality innovation input and output. Taking into account of the conclusions above, some policy recommendations from the sight of innovation mechanism and process are put forward in the end.**

I. INTRODUCTION

With the rapid development of automotive industry during the past decade, China has occupied the 1St place in the world since 2009 in the amount of production and sales. However, the current predicament of "being large but not strong" in the automotive industry hasn't been substantially improved [5]. The strategy of "Trade market for technology" in the last thirty years has achieved little effect. Although manufacturing capacity has been cultivated, the core technology development capacity is still defective. The promotion on industry innovation capability from the perspectives of industry innovation mechanism and process needs to be further studied.

Malerba, Italian scholar, put forward the analysis framework of SSI (Sectoral System of Innovation) [6]. Basing on the specific development background of the automotive industry in China, this paper analyzes the development characteristics of China's automotive industry innovation from the perspective of mechanism and process. Through the establishment of innovation mechanism and process theory framework, the influence of innovation mechanism and process on our automotive industrial innovation capability will be revealed. Industrial innovation system theory provides a favorable tool, which contributes to the comprehensive understanding of (1) the industrial structure and function; (2) the mutual effect mechanism of different participants in the system; (3) the specific role of learning and innovation process on the industry [2]. For industry innovation system, the mechanism is the guarantee of the normal operation of the system, and the operation and evolution of the system possess obvious procedure. There are certain defects within the mechanism and process in the development China's automotive industry for decades. On the aspect of innovation mechanism, we pay more attention to the incentive mechanism and ignore the constraint mechanism [10]. Furthermore, the implementation and security rules of the policy are insufficient [9], and the performance-testing network is not perfect. As for the innovation process, we should take the automotive production enterprise as the principal part, realize the combination of production and research, and promote the effective production and spread of the industrial development knowledge and technology [7].

This paper applied Structural Equation Modeling (SEM) method to quantify and discuss the impact degree of innovation mechanism and process on innovation capability. Through the established model, hypothesis, questionnaire inquiry, and mathematical statistic methods, this paper examines the action mechanism and specific forms of innovation mechanism and process in the automotive industry innovation system. This research is carried to solve the defects in innovation mechanism and process in China's automotive industry for decades, guide the participants of the innovation system to develop industrial innovation strategy, implement the industrial innovation policy at the national level, promote independent brand enterprises to effectively improve industrial innovation, and enhance the international competition ability of Chinese automotive industry.

II. CONCEPTUAL MODEL— THEORY HYPOTHESIS

A. Related concepts

(1) Automotive Industry Innovation Capability

Industrial innovation mechanism and innovation process eventually need to be transformed into industrial innovation ability and play the function on the industry. The innovation ability of the automotive industry reflects not only the basic strength, also the enthusiasm of automotive enterprise innovation. Based on the industrial innovation system, this paper divided the innovation ability of the automotive industry into three parts of innovative input ability, collaboration ability and innovation output ability. Innovative input ability refers to the human, material, financial resources that create basic conditions for innovation activities. Collaboration ability includes the effective organization of

the innovation system, the synergy between the network participants, as well as innovation combination of other industries outside the innovation system, which develop a broader market space. Innovation output ability refers to the output capability on the innovative knowledge, technology, products, systems, management methods that possess business value.

(2) Automotive Industry Innovation Mechanism

Innovation mechanism refers to that the interaction between different subjects in the innovation constantly evolves in the time and space to achieve the relationship between the innovation capacities [4]. The innovation mechanism of China's automotive industry includes forcing mechanism, management mechanism and learning mechanism. The forcing mechanism of industrial innovation refers to the external driving force or pulling effect of the main part of innovation [7]. Under this effect, the innovation subject will generate the innovation desire and demand, and carry out innovative activities aiming at pursuing interests and profits. Combined with the existing research, the forcing mechanism is divided into five dimensions including market demand, entrepreneurship, technology introduction, competitive structure and related industries support [6]. Industrial innovation management mechanism refers that the industry accepts policy adjustment, integrates resources to carry out the industrial innovation mechanism, including the incentive mechanism and restraint mechanism, which can be studied from two dimensions of government functions and investment and financing environment. Industrial innovation learning mechanism could promote the knowledge and technology diffusion between different subjects, which is divided into three dimensions of intellectual property system, technology sharing platform and innovative culture.

(3) Automotive Industry Innovation Process

Industrial innovation process refers to the gradual realization of innovative target under the circumstance of continuous flow of innovative elements, including three development stages of the accumulation process, the transformation process and the diffusion process [2]. The accumulation process mainly refers to the generation and accumulation of knowledge. The transformation process refers to transforming the basic science research knowledge into commercialization technology through the network collaboration of government-industry-university-institute under the guarantee of policies and systems. Or the introduced sophisticated technology is transformed into their own re-innovative results. Diffusion process refers to the process of technical learning and realization of industrial innovation within the industry or other enterprises by means of product promotion or technology diffusion.

B. The Analytical Model of China's Automotive Industry Innovation Mechanism and Process

Combined with the previous analysis, this paper establishes the automotive industry innovation mechanism and process model, as shown in Fig. 1.

Among which, the respective composition and innovation process of the three parts of the innovation mechanism are the potential variables can not be directly observed. This paper uses the explicit variable to express the meaning, and the corresponding relationship is shown in Table 1 and 2

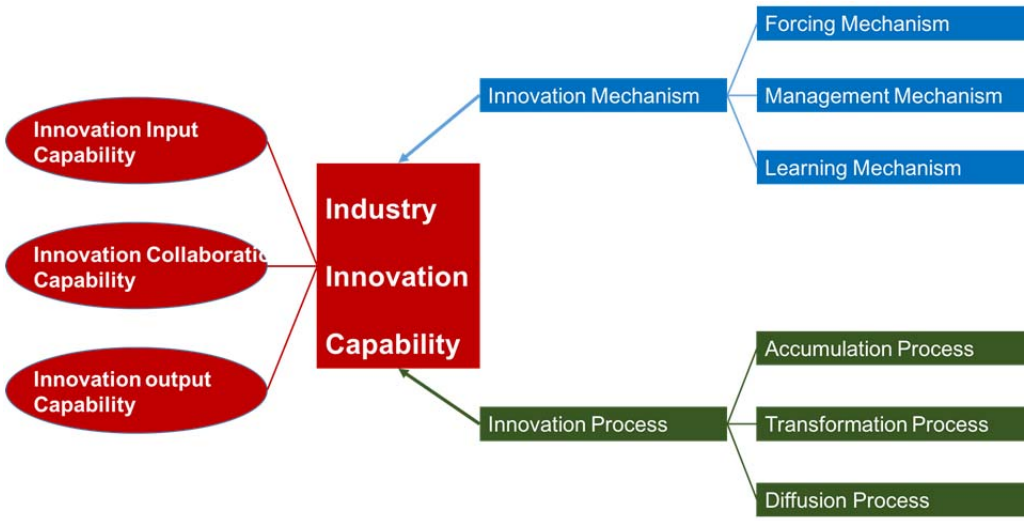

Fig.1 The analytical model of China's Automotive Industry Innovation Mechanism and Process

TABLE 1 RELATED VARIABLES OF INNOVATION MECHANISM

Latent Variable	Dominant Variable	Network Participant
Forcing Mechanism	Market Demand Entrepreneurship Technology Import Competition Structure Related Industry Support	user single enterprise Multi-National Corporation Multiple enterprises correlative industry
Management Mechanism	Governmental Functions Investment and Financing Channels Intellectual property system	Government Financial institution Scientific Institution
Learning Mechanism	Technological sharing platform Innovation Culture	Educational institutions, enterprises

TABLE 2 RELATED VARIABLES OF INNOVATION PROCESS

Latent variable	Dominant variable	Elements of industrial innovation system
Accumulation Process	Knowledge Dissemination	Knowledge
Transformation Process	Policy Optimization Technology Transfer	Participant Network, System
Diffusion Process	Technology Learning	Knowledge Technology

C. Theoretical Hypotheses

1) The influence of automotive industry innovation mechanism on the innovation ability

The automotive industry innovation forcing mechanism includes five dimensions of the market demand, the entrepreneur spirit, the technology introduction, the competition structure and the related industry support. According to Rothwell, the market demand has a significant stimulating effect for driving innovation [9], especially for the giant market like China. Under the driven of huge profit, the auto companies put much effort on competing on improving the innovation ability to provide better products and cut the cost. The entrepreneurship, the nature of which is the spirit of continuously innovating, is an important force to determine the enterprise business and enhance the innovation capability of the enterprises [1]. The technology introduction provides external technology resources to improve innovation ability, and further supports the whole innovation process. Take Japan and Korea as the examples, the key factor of the first successful step for their automotive industries is the appropriate technology introduction. Speaking of the competition structure, neither the perfect competition nor the oligopoly is suitable for the benign development of the industry innovation [13], making the sound competition structure very important for the industry innovation vitality. And the related industry collaborative innovation development provide protection for industrial innovation. From the analysis above, the five aspects of forcing mechanism have certain influence in different ways, and based on the influence of forcing mechanism on industrial innovation investment capability, collaboration capability and innovation capability, we put forward the following assumptions:

H1a: the forcing mechanism has a positive effect on innovation investment capability;

H1b: the forcing mechanism has a positive effect on the collaboration capability;

H1c: the forcing mechanism has a positive effect on innovation output capability.

The management mechanism of automotive industry innovation includes two dimensions of the government functions and the investment and financing environment. The government function is the most important part of management mechanism, especially in China. The government played the dominant role in almost each stages of China's auto industry development, from the protection monopoly to the establishment of joint ventures, and the openness to private funding. The government could contribute to the improvement of basic research, healthy investment environment and the construction of technology and information network [14]. And a favorable investment and financing environment is a prerequisite for the development of any industry. Based on the effects of them on the industrial innovation capability, we put forward following hypothesizes:

H2a: management mechanism has a positive effect on innovation investment capability;

H2b: management mechanism has a positive effect on collaboration capability;

H2c: management mechanism has a positive effect on the capability of innovation output.

The learning mechanism of automotive industry innovation includes three dimensions of intellectual property protection, technology sharing platform and innovation culture. The intellectual property protection is the prerequisite to encourage innovation. In recent years, contradictions between the auto companies about the intellectual property become quite normal with the intensifying competition, and the intellectual property protection has become more necessary to ensure companies and research institutions could have broad and deeper collaboration and improve the innovation capability. Technology sharing platform is the

favorable approach to promote the effective allocation of innovation resources. China's auto industry has almost zero base in establishing technology sharing platform and is in great need of a sufficient platform to improve the innovation capability [15]. The cultivation of innovative culture can promote the fundamental realization of the national innovation, and the innovation development of the industry. Based on the important functions of learning mechanism, we put forward the following assumptions:

H3a: learning mechanism has a positive effect on innovation investment capability;

H3b: learning mechanism has a positive effect on collaboration capability;

H3c: learning mechanism has a positive effect on the capability of innovation output.

2) The influence of innovation process of automotive industry on the innovation capability

The accumulation process of industrial innovation is dependent on the accumulation of knowledge, including the theoretical knowledge of independent research, non-commercialization technology or the relevant knowledge brought by the introduced sophisticated technology. The effective formation and efficient dissemination of knowledge within the industry is the foundation of the formation of industrial innovation capability, and the realization of this process can ensure the overall improvement of industrial innovation capability. Therefore, the accumulation process involves two aspects of innovation investment capability and collaboration capability. Based on the above analysis, we put forward the following hypothesis:

H4a: the accumulation process has a positive effect on innovation investment capability;

H4b: the accumulation process has a positive effect on the collaboration capability.

The key of automotive industry innovation is technological innovation. Therefore, the technical transformation process is the key to realize industrial innovation. Technical transformation process can reflect the industrial innovation output capability, increase industry ongoing innovation input power, and promote the formation of collaboration capability. Based on the above analysis, we present the following assumptions:

H5a: the transformation process has a positive effect on innovation investment capability;

H5b: the transformation process has a positive effect on the collaboration capability;

H5c: the transformation process has a positive effect on the capability of innovation output.

For the automotive industry, diffusion process refers that the enterprise imitates the products and service of previous innovation enterprise according to specified channel through their own efforts, and expand the results of industrial innovation. Innovation diffusion process can promote individual enterprises innovation output, drive the innovation output of the whole industry, and improve the output capability of industrial innovation [16]. In addition, the process of technological learning can promote the capability of innovation network organization. What's more, in such process, the starter of the innovation could acquire the majority of the profit from the innovation, which would encourage other competitors to join the innovation activities, resulting in the virtuous v circle of the industry innovation.

Based on the above analysis, we present the following assumptions:

H6a: the diffusion process has a positive effect on the collaboration capability;

H6b: the diffusion process has a positive effect on the innovation output capability.

III. EMPIRICAL ANALYSIS

A. Sample Selection and Data Collection

The sample data collection of empirical analysis was conducted by questionnaire, and the data obtained was operated using structural equation modeling. Focusing on the main network participants in innovation system of automobile industry, the research subjects were divided into 3 sections, enterprises, research institutions and government. Enterprises here consist of automobile companies, consulting firms, and financial services companies. To ensure the quality of the research, both self-owned brands and joint venture brands are taken into consideration, and officers from both central government and local government are invited for interviews.

Questionnaires via e-mails, written surveys, telephone interviews and other forms were carried out to sample agencies, in which the respondents were mainly agency leaders or employees with more than ten years working experience in the automotive industry. The questionnaire is designed based on the theoretical model and revised according to the experts' suggestions. Questionnaire is made of 20 questions, likert five-point scale measurement was applied to rate each question, in which 1 point stands for "Completely Disagree" and 5 points mean "Completely Agree", while other scores indicates the extent of agreement between those two above. The whole questionnaire is divided into 4 sections. The 1st section is the basic information of interviewees, the 2nd section is about the innovation mechanism including 12 questions from forcing mechanism, management mechanism and learning mechanism side. The 3rd section consists 4 questions about accumulation process, transforming process and diffusion process, and other factors including knowledge, technology, innovation network and institution are also taken into consideration. The 4th section mainly focuses on the innovation capability, which is evaluated from input, output and collaboration side. From the analysis above, the explicit variables are used to express the meaning of the different parts of innovation process and mechanism, which are reflected in the questionnaires and the

analysis below.

In this survey, 277 questionnaires out of 300 distributed copies were returned, containing 6 invalid questionnaires, which leads to a valid return rate of 92.3%. Among 271 valid questionnaires, enterprises occupied 172 copies, research institutions took 72 copies, and 27 samples came from government.

This paper adopts structural equation model (SEM) to test and analyze the above theoretical hypothesis. SEM is a validation model based on covariance structure, which is suitable for the analysis of complex relation model of the multiple independent variables and dependent variables containing various reasons and structures. Aiming at the research method of SEM, many kinds of statistical analysis software have been developed. This research will adopt AMOS17.0 to analyze the sample data.

B. Reliability and Validity Test

To ensure reliability, stability and consistency of data, this article applies Cronbanch α coefficient as standard to evaluate internal reliability of questionnaires while questionnaire analysis was examined by structural validity. SPSS13.0 software is employed to carry out Cronbanch α coefficient test, factor analysis and structural validity test. The results are shown in following Table 3.

Based on the Table 3, the value of Cronbach α belonging to total, each latent variable and dominant variable are all greater than0.7, which demonstrates the questionnaire data possess high reliability, enough to pass the test. To determine the validity of data, innovative mechanisms, innovation process and innovative capabilities should be tested by KMO Test and Factor Analysis. Main factors were extracted by Principal Component Method, and rotated by Varimax Method. Consequence is shown in the following Table 4 and 5.

TABLE 3 RESULTS OF THE RELIABILITY TEST

Latent Variable	Dominant Variable	Cronbach α if item Deleted	Cronbach α
Innovation Mechanism—forcing mechanism	Market Demand	0.867	0.781
	Entrepreneurship	0.853	
	Technology Import	0.852	
	Competition Structure	0.860	
	Related Industry Support	0.859	
Innovation Mechanism—Management Mechanism	Governmental Functions	0.850	0.820
	Investment and Financing Channels	0.849	
Innovation Mechanism—Learning Mechanism	Intellectual Property System	0.849	0.793
	Technological Sharing Platform	0.851	
	Innovation Culture	0.865	
Innovation Process—Accumulation Process	Knowledge Dissemination	0.850	0.850
Innovation Process—Transformation Process	Policy Optimization	0.845	0.830
	Technology Transfer	0.851	
Innovation Process—Diffusion Process	Technology Learning	0.850	0.850
Innovation Capability—Innovation Input Capability	R&D Investment	0.854	0.854
Innovation Capability—Collaboration Capability	Collaboration Capability within the Industry	0.853	0.847
	Collaboration Capability among Industries	0.863	
Innovation Capability—Innovation Output Capability	New Products	0.849	0.849
Total			0.865

TABLE 4 RESULTS OF THE KMO AND BARTLETT'S TEST F INNOVATION MECHANISM VARIABLES

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.808
Bartlett's Test of Sphericity	Approx. Chi-Square	394.743
	df	45
	Sig.	.000

TABLE 5 FACTOR ANALYSIS RESULTS

factor	Initial Eigenvalues			Extraction of characteristic value		
	Total	Contribution rate	accumulative contribution	Total	Contribution rate	accumulative contribution
1	3.233	32.335	32.335	3.233	32.335	32.335
2	1.185	11.852	44.187	1.185	11.852	44.187
3	1.084	10.843	55.030	1.084	10.843	55.030
4	.909	9.087	64.117			
5	.763	7.626	71.743			
6	.702	7.021	78.764			
7	.607	6.066	84.831			
8	.555	5.548	90.379			
9	.519	5.190	95.569			
10	.443	4.431	100.000			

TABLE 6 RESULTS OF THE KMO AND BARTLETT'S TEST F INNOVATION PROCESS VARIABLES

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		**.696**
Bartlett's Test of Sphericity	**Approx. Chi-Square**	**132.815**
	df	**6**
	Sig.	**.000**

TABLE 7 FACTOR ANALYSIS RESULTS

factor	Initial Eigenvalues			Extraction of characteristic value		
	Total	**Contribution rate**	**accumulative contribution**	**Total**	**Contribution rate**	**accumulative contribution**
1	2.003	50.066	50.066	2.003	50.066	50.066
2	.889	22.216	72.282			
3	.621	15.536	87.818			
4	.487	12.182	100.000			

TABLE 8 RESULTS OF THE KMO AND BARTLETT'S TEST F INNOVATION CAPABILITY VARIABLES

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.629
Bartlett's Test of Sphericity	**Approx. Chi-Square**	102.518
	df	6
	Sig.	.000

TABLE 9 FACTOR ANALYSIS RESULTS

factor	Initial Eigenvalues			Extraction of characteristic value		
	Total	**Contribution rate**	**accumulative contribution**	**Total**	**Contribution rate**	**accumulative contribution**
1	1.793	44.836	44.836	1.793	44.836	44.836
2	1.063	26.582	71.418	1.063	26.582	71.418
3	.609	15.215	86.633			
4	.535	13.367	100.000			

As can be seen from the table, KMO=0.808>0.6, Sig. value of Bartlett test is smaller than 0.001，which prove that minimal factors extracted can explain most variance regarding sample data. Three main factors obtained from Factor Analysis occupy accumulation contribution rate of more than 55%, indicating validity of the data.

As the table indicates，KMO=0.696>0.6, Sig. value of Bartlett Test is lower than 0.001, proving that minimal extracted factors can explain most variance corresponding to sample data. One main factor from Factor Analysis presents calculative contribution rate of more than 50%, indicating the validity of data.

As the table conveys, KMO=0.629>0.6, Sig. value of Bartlett test is smaller than 0.001，which prove that minimal factors extracted can explain most variance regarding sample data. One main factor obtained from Factor Analysis has accumulation contribution rate of more than 50%, indicating the data valid.

C. Structural Equation Model Analysis

According to previously established theoretical models and assumptions，Structural equation model of this article consists of 9 latent variables, the corresponding 18 dominant variables and the corresponding error variable composition. The following Table 10 shows the corresponding relationship.

TABLE 10 RELATED VARIABLES

Latent Variable	Dominant Variable	Variables	Questions
Innovation Mechanism—forcing mechanism	Market Demand	X1	A1
	Entrepreneurship	X2	A2
	Technology Import	X3	A3
	Competition Structure	X4	A4
	Related Industry Support	X5	A5
Innovation Mechanism—Management Mechanism	Governmental Functions	X6	B1、B2
	Investment and Financing Channels	X7	B3、B4
Innovation Mechanism—Learning Mechanism	Intellectual Property System	X8	C1
	Technological Sharing Platform	X9	C2
	Innovation Culture	X10	C3
Innovation Process—Accumulation Process	Knowledge Dissemination	X11	D1
Innovation Process—Transformation Process	Policy Optimization	X12	D2
	Technology Transfer	X13	D3
Innovation Process—Diffusion Process	Technology Learning	X14	D4
Innovation Capability—Innovation Input Capability	R&D Investment	Y1	E1
Innovation Capability—Collaboration Capability	Collaboration Capability within the Industry	Y2	E2
	Collaboration Capability among Industries	Y3	E3
Innovation Capability—Innovation Output Capability	New Products	Y4	E4

Tested and adjusted, a final structural equation model and test results are shown in Table 11 and Fig. 2.

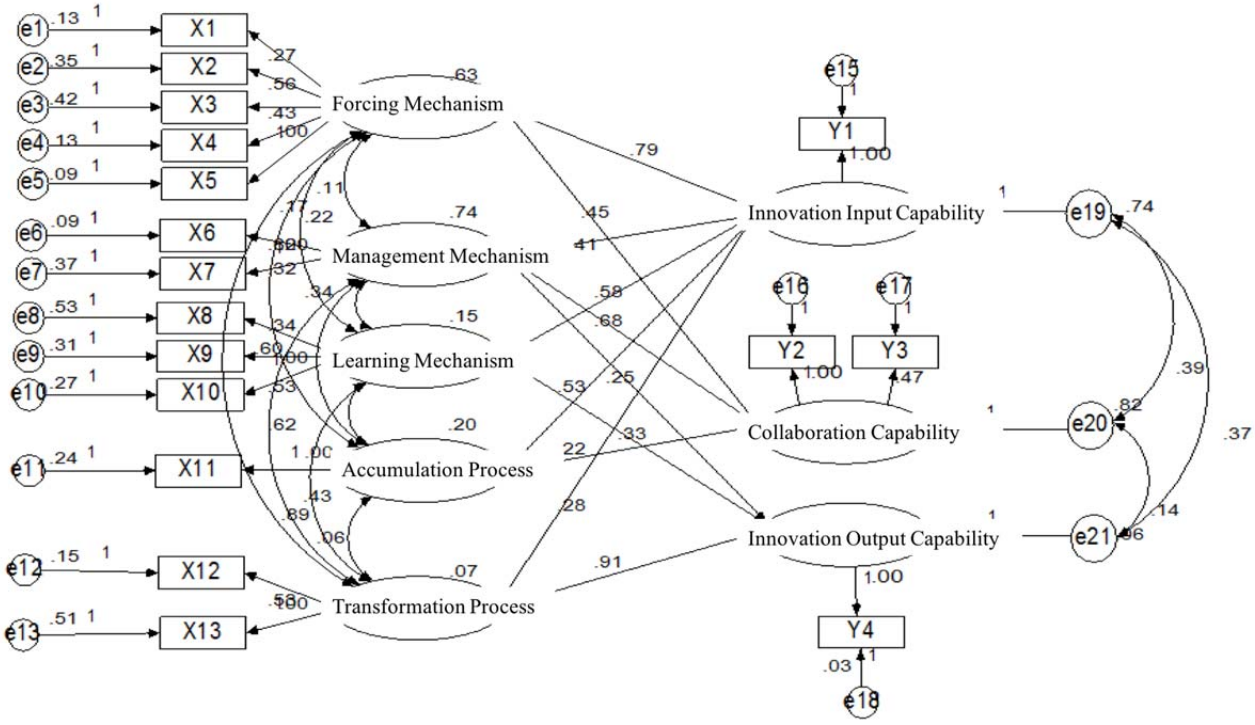

Fig.2 The Structural Equation Model

TABLE 11 RELATED RESULTS

Path	Standardized path coefficient	C.R.	P	Hypothsis	Result
Innovation Input Capability<---Forcing mechanism	0.792	4.328	0.000	H1a	Positive
Collaboration Capability<---Forcing mechanism	0.448	1.766	0.305	H1b	Negative
Innovation Input Capability<---Management Mechanism	0.410	4.117	0.000	H2a	Positive
Collaboration Capability<---ManagementMechanism	0.684	7.350	0.000	H2b	Positive
Innovation Output Capability<---ManagementMechanism	0.251	5.429	0.000	H2c	Positive
Innovation Input Capability<---LearningMechanism	0.577	6.334	0.000	H3a	Positive
Innovation Output Capability<---LearningMechanism	0.332	1.268	0.208	H3c	Negative
Innovation Input Capability<---Accumulation Process	0.534	1.407	0.136	H4a	Negative
Collaboration Capability<---Accumulation Process	0.218	5.320	0.000	H4b	Positive
Innovation Input Capability<---Transformation Process	0.283	6.441	0.000	H5a	Positive
Innovation Output Capability<---Transformation Process	0.912	8.260	0.000	H5c	Positive

Note: Through the critical ratio test (greater than 1.96) and P value test (less than 0.05), eight assumptions passed the test, while three were rejected

DoF test, the absolute goodness of fit index, increment goodness of fit index and approximate error index, these indicators of model passed inspection at the same time. In standardized estimates, in addition to a single dominant factor variables (estimated value defaults to 1), the remaining parameter estimates were between 0.5-0.95. Standard Errors were less than 0.500, the critical ratio and P values also passed inspection. Seen from the path coefficients, the forcing mechanism has strong impact to innovation investment capability, so does transformation to innovation output capability. The rest of the paths did not pass inspection, diffusion process did not participate in the test, thus the model was deleted in the identification process.

D. Results Analysis

Integrating industrial innovation mechanism and the impact method of innovative process to innovation capability, following eight affecting path are obtained:

H1a: Innovation Dynamical Mechanism↑→Innovation Investment Capability↑→Industrial Innovation Capability↑

H2a: Innovation Management Mechanism↑→Innovation Investment Capability↑→Industrial Innovation Capability↑

H2a: Innovation Management Mechanism↑→Organizational Coupling Competence↑→Industrial Innovation Capability↑

H2b: Innovation Management Mechanism↑→Innovation Output Capability↑→Industrial Innovation Ability↑

H3c: Innovative Learning Mechanism↑→Innovation Investment Capability↑→Industrial Innovation Capability↑

H4b: Innovative Accumulation Process↑→Organizational Coupling Competence↑→Industrial Innovation Capability↑

H5a: Innovative Transformation Process↑→Innovation Investment Capability↑→Industrial Innovation Capability↑

H5c: Innovative Transformation Process↑→Innovation Output Capability↑→Industrial Innovation Capability↑

IV. CONCLUSION

On the basis of literature review, experts interviews, combined with theoretical analysis framework of industrial innovation system, this article analyzed the impact to industrial innovation capability from innovative mechanism and innovative process respectively and further established theoretical model of innovative mechanism and innovative process regarding automobile industry in China. Using structural equation modeling statistical methods, theoretical models were empirically tested, and eventually amended empirical model was obtained. The theoretical hypothesis was then tested via empirical model.

Through research, it is seen that the automobile industry innovation forcing mechanism can promote innovative investment capability, acting as the most direct and powerful factor. Innovation management mechanism has positive effects to both organizational coupling capability and innovative input-output capability. Innovative management mechanism oriented by government has significant influence to all parts in industrial innovative capability forming. Innovative learning mechanism positively affects innovative input capability, indicated by its essentially drive to the entire

industry in investment enhancement. Innovative accumulation could improve the organizational coupling competence and further effectively promote synergies of participants within and outside the industry. Innovative transformation process also shows positive impact to innovative input-output capability. High investment as innovative transformation needs, it is also a necessary condition to achieve high innovative output.

From the aspect of innovative mechanism and process, more effort should be put in order to comprehensively promote the innovative capability of automobile industry.

Perfecting the innovative mechanisms need to further encourage automobile consumption, to expand market demand, to stimulate entrepreneurial innovative spirit, establishing conducive corporate culture; to conduct introduction of technology and technical cooperation that benefit innovation; to improve the competitive structure of the automobile industry, effectively implementing survival of the fittest competition mechanism; to improve upstream and downstream industry chain, promoting collaborative innovation between related industries. Play a leading role in the government, more innovative means to promote both input and output; bound to play the role of government to strengthen the innovation output, the effective use of innovative financial audit. Sound intellectual property system to protect the enterprise technological innovation enthusiasm; build a technology sharing platform to improve the efficiency of innovation; through education and training, establish a national innovation culture fundamentally.

Empirical research focusing on automobile industry development rarely gets industrial innovation system analysis framework involved, leading to insufficient research foundation. Hoping to expand and enrich the theory in industrial research in developing countries, we conducted this study. During the research process, limited by resources, the amount and structure of samples have large room to improve. Also, being confined to time, return visit questionnaire is hardly achieved to amended results to theoretical model and consequences from empirical research。 Representative figures in different categories of employment were supposed to undertake targeted interviews, by which theoretical model can be further amended to give a more practical research finding. A further step is expected to be taken in future research.

The government should play a leading role, adopting multiple methods to improve both input and output of innovation; meanwhile, the government should also play a restraint role, reinforcing the audit of the innovative product output and the efficiency of innovative fund utilization. Intellectual property system should be robust to protect enterprises' technological innovation enthusiasm; improve the efficiency of innovation through building a technology sharing platform; establish a national innovation culture fundamentally by educational training.

For improving the innovation process, the innovation accumulation process should be paid attention, including strengthening the research effort on fundamental research and focusing on the innovative accumulation; building an appropriate channel to promote the dissemination of knowledge. Meanwhile, the innovation transformation should also be conducted, including perfecting the mechanism about feedback adjustment of innovative policies, improving industry innovation with times; increasing the innovation input during the technical transformation process, which could practically enhance the technology absorption capability.

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