Simulation and Evaluation Research on Influence of Performance of Market Structure from Business Innovation Combinations

Zeng Wusheng[,1,2]**, He Haoming**[3]** , Zhao Qing**[3]**, Zhang Dingxiang**[4]**,Zhao Yulin**[1]

[1] Wuhan University of Technology, Wuhan 430070,

[2] Guizhou Yatai Vocational College, Guiyang 550025

[3]Wengfu(Group) Co., Ltd., Guiyang 550002

[4] Guizhou Commercial College,　　Guiyang 550004

Abstract

This paper argues the theory of 'Enterprises with market forces may make market outcomes inefficient' and tries to doctrinal correct the theory.　A assessment model is built to analyze the change effect of performance data from model structure caused by exogenous variables and the validation of the model is tested . This paper finds that positively correlated conduction mechanism of innovative combination of oligopolistic competition affects the performance of market structures and determined causation chains will have a fundamental impact on the evolution of industrial organization and prompt the organization development in the whole industry.

Keywords: innovative combination; market structure; theory of enterprises

1 Introduction

Joseph Schumpeter, the founder of the economics of innovation held the view that: the essence of economic development lies in innovation while monopoly virtually stands for the source of capitalist economic innovation. He broke the traditional static analysis, emphasized the importance of entrepreneurs and innovators who introduce 'new combinations' into new products or new technics. Innovation will generate excess profits in a short term while those in a long-term due to imitation of others will eventually disappear" (Mansfield, 1963). Samuelson and Nordhaus spoke highly of the original ideas of Schumpeter and put forward the issue about relationship between innovation and market forces and thought that imperfectly competitive enterprise viability is not only pricing, but also comes from the development of new products, new technologies and new markets which can be profitable in the future (Scherer, 1965). Waldman and Jensen believe that information is essentially different from a general commodity. Because of the high cost of production of information processing, and low cost by users, the relationship between innovation and ma3rket forces is complex (Scherer, 1965). Card and Pei Luofu believed that innovation activities and relationship between market structures have gone through many empirical studies, but the computational results are complex and the conclusion may not very reliable in that an omit of many important variables may cause the coefficient deviation or the erroneous conclusion. The conclusion can reflect sensitively the industry conditions. As a result, government has difficulty in making decisions which makes it necessary to consider basic conditions of innovative activities. The

latest research focus has changed into the basic conditions, such as market demand, technological opportunity and misappropriation conditions. History data and studies have shown that these factors are very critical, but there remains also a lot of work to be completed (Loury,1979). Therefore, the relationship between innovation and market structure and performance has been a hot and difficult problem in the economic and academic field. Thus the paper resorts simulation regression analysis method to research simulation assessment of impacts from enterprise innovative combination on market structure and performance.

Research on simulation assessment of impacts from enterprise innovative combination on market structure and performance aims at the modern theory and methods of industrial organization structure and performance measurement to determine related impact of systematic collaborative innovation behavior on the performance of the market structure; meanwhile the information engineering technology is used to make the tedium theoretical analysis and argumentation condensed and applicable. According to the judging system of model, the performance of market structures is taken into consideration; the absolute size of the market forces should be determined in accordance with the principles of social welfare maximization and consumer and producer surplus balanced principle to make a scientific calculation and weigh for the market forces. The users only need to enter the exogenous variable parameters of the assessment indicators into the system so that it can be able to provide users with data report on indicators changes. Research results involve doctrinal correction on the theory of "enterprises with market forces make market outcomes so inefficient"; the assessment model of information processing is used to solve

quantitative judgments in economic operation of information, such as: loss of social welfare caused by super profits tax of unreasonable resource due to monopoly and the reasons behind; excess profits generated by the resources obtained reasonably and innovation policy effects to regulate the market and promote innovation for the government; in addition, how many excess profits enterprise innovation combinations can obtain, whether they should give up the monopoly etc. were all studied so as to provide a reference for decision-making.

2 Judgment of assessment mode from impacts of innovative combination on market structure and performance

Research on assessment mode from impacts of innovative combination on market structure and performance (For the convenience of description, short for "assessment model") can resort to information engineering technology and database technology to achieve economic indicators data storage, computing, processing, output and query to provide an easy, applicable market efficiency assessment assisted analysis software for decision-makers and management staff in economic.

The judgment model aims to solve several problems:

(1). Through: Innovation causes the price elements and changes in the marginal cost of the oligarchs game model to quantitatively demonstrate "impacts of innovative combination on market structure and performance"; base: after the assumption of innovation that promotes market structure to become more reasonable so that the market efficiency can improve is proved: The theory of enterprises such as "monopolistic, oligopolistic, monopolistic competition with market forces will make market outcomes inefficient" is corrected.

(2). Free from the conceptual issues and problems in the interpretation of the classic SCP theory, the paper refers to modern theories and methods to sort and build a general theoretical framework, dredge with bottlenecks in exchanges and communion with mainstream economics in the same theoretical level, build theories and methods of structure and performance evaluation; A clear explanation on different empirical phenomena is done from general theoretical level.

(3). This assessment model is used to research on the market structure change and market efficiency improvement due to innovation so as to provide an empirical regression analysis.

(4). After the verification of "Assessment model", it may help government encourage business innovation and consider the market structure and performance; the absolute size of the market forces can be judged in accordance with principles of social welfare maximization and consumer and producer surplus principle to engage in scientific calculations and checks and balances; judging enterprises' market positioning through choices of reference data such as innovative and maintained super profit.

2.1 Building of structural performance evaluation model

Assessment model is established on the basis of existing research: In accordance with repeatedly steps such as discovering the laws → seeking the theory → empirical Analysis → modeling → empirical analysis → model correction → data calculation. Despite the variety of power which promotes technological innovation, the effect produced by the combination of innovation can be gained from formula in Table 2-1 (a) / (b) in the expression and reflected from the data in Table 2-3.

Whether there is a sound scientific assessment on impacts of innovative combination on market structure and performance, a systematic evaluation system must be firstly established. Here, market structure evaluation index system and market performance evaluation index system --the two parts are mainly built among which market structure involves three evaluation methods (Scherer, 1965): including comparison between assessment indicators CR, the Herfindahl Index (HHI) and Lerner Index (LI); market performance evaluation system (Loury, 1979) including total output (Q), price (P), profits (π), consumer surplus (CS), the producers remaining (PS) as well as the total social remaining (TS).

According to Cournot (oligopoly) model, assuming there are n (n> 4) symmetrical companies with product homogeneity (or different) and their cost functions are c (qc) = cqi, (i = 1, 2, ...; n) without considering the fixed costs of enterprises (in the short-term, fixed costs do not change as production) fixed costs do not affect the choice, so they are ignored.。 Anti-demand function of the market is p = a-bQ, wherein Q is equal to Q1 + ... + Qn. Take several phosphorus chemical enterprises which get engrossed in innovative combination in China as an example, (the impact of these behaviors are ultimately reflected by the marginal cost changes), they make the business units lower the marginal cost $\triangle$ C, that is, the marginal cost after innovation is C '= C-$\triangle$ C. In order to simplify the problem, it is assumed that innovative development and implementation costs of several enterprises are ignored in that they can yield higher profits relative to the unit marginal cost reduction. N companies are set, it is assumed that there are no impacts from new enterprises entering or exiting. There is no company engaging in innovation in n companies, g (g $\in$ [1, n-1]) companies, and n companies are innovative, then the numbers of companies and changes causing the output of a single

enterprise in the industry, the equilibrium price, the market concentration, the Herfindahl index, the Lerner index change comparison reflection, consumer surplus, producer surplus as well as total social surplus can be considered with innovation. In order to facilitate the analysis: it is assumed that the production of all enterprises are solvable in a business or in a number of enterprises, it must meet the following conditions: $\triangle c / (ac) = t$, it is assumed $n-1 < (ac) / \triangle c$, then $n < (1 / t_1)$.

When the oligopoly market structure, two homogeneous (or different) companies are in Cournot competition, apply the conclusion of the model to n manufacturers, then the balanced output for each vendor is $1 / (n+1)$ of the largest market demand, the total output is $n / (n+1)$ of the maximum demand in the market. In order to facilitate discussion and description, the quantitative impact from systematical and collaborative innovation behavior is merely considered: innovation marginal cost $C' = C - \triangle C$. The innovation portfolio measured is omitted, such as: R & D investment, patents, advertising investment and so on. The following will illustrate the innovation numbers in enterprises with innovative combination from three cases: 0 enterprise innovation in n companies in the industry, g ($g \in [1, n-1]$) innovative enterprises and n innovative enterprises. Assuming that they are all the same in innovation, then the impact on market structure and performance after innovation can be summarized in Table 2-1 (a) and 2-1 (b).

(1) Zero innovative enterprise. When there is no company engaging in innovation in n companies, the profit objective function of n companies due to the symmetric n companies is:

(2)

$\pi n = [a-b (q1 + ... + qi + ... + qn)] qi - cqi, i \in [1, n]$

Where: i represents the enterprise sort, c stands for unit marginal cost, q is the yield.

(3).g companies engage in innovation. When n companies g ($g \in [1, n-1]$, a positive integer) companies implement innovation, the marginal cost of the unit is reduced to $c-\triangle c$, profit objective function of n companies is:

$\pi gm = [ab (qg1 + ... + qg2 + ... + qgm)] qgm - (c-\triangle c) qgm, m \in [1, g]$

$\pi uk = [ab (qu1 + ... + qu2 + ... + qun)] quk - cquk, k \in [g+1, n]$

$\pi n = \pi gm + \pi uk$

In the formula: the first subscripts g, u denote the numbers of enterprises with and without innovation, the second subscript stands for the enterprise sort; c is unit marginal cost, $\triangle c$ represents changes value of the unit cost, q is yield.

(4). n innovative enterprises. When all n companies involve in innovation, profit objective function of the n companies is:

$\pi n = [ab (q1 + ... + qj + ... + qn)] qj - (c-\triangle c) qj, j \in [1, n]$

Where: j represents the enterprise sort, c is the unit marginal cost, $\triangle c$ stands for the changes value of the unit cost, q represents yield.

Table 2-1 (a) Math game model which market structure affects the evaluation index

Market structure indicators	numbers of enterprises engaging in innovation N(N∈[0,n])		
	N=0	N=g,g∈[1,n-1]	N=n
non-innovative enterprises yields Qk	$q_{0i} = \dfrac{a-c}{b(n+1)}$	$q_{gk} = \dfrac{a-c-g\Delta c}{b(n+1)}$	$q_{nj} = \dfrac{a-c-n\Delta c}{b(n+1)}$

Market structure indicators	numbers of enterprises engaging in innovation N(N∈[0,n])			
	N=0	N=g,g∈[1,n-1]		N=n
Innovative enterprise production Qm	0	$q_{gm} = \dfrac{a-c+(n-g+1)\Delta c}{b(n+1)}$		$q_{nj} = \dfrac{a-c+\Delta c}{b(n+1)}$
Market concentration CR	$\dfrac{4}{n}$	g∈[1,4] $\dfrac{4+gt(n-3)}{n+gt}$	g∈[5,n-1] $\dfrac{4+4t(n-g+1)}{n+gt}$	$\dfrac{4}{n}$
Herfindahl index HHI	$\dfrac{1}{n}$	$\dfrac{-(n+2)N^2t^2+\left(n^2t^2+2nt^2+t^2+2t\right)N+n}{(n+Nt)^2}$		$\dfrac{1}{n}$
Lerner Index LI	$\dfrac{a-c}{a+nc}$	$\dfrac{a-c+(n-N+1)\Delta c}{a+nc-N\triangle C}$		$\dfrac{a-c+\Delta c}{a+nc-n\Delta c}$

The model table parameters indicate: a-price variable constant, b-yield variable constant, c-unit marginal cost, n-numbers of enterprises in industries, N, g-innovative enterprises (N ∈ [0, n], g ∈ [1, n-1]), m, j- sort numbers of innovative enterprises, k, i- sort numbers of non-innovative enterprises, ∆ C-marginal cost of changes values, t = ∆ C / (ac) -comprehensive exogenous variable conditions

Table 2-1(b) the mathmatic gaming model showing the effect of marketing performance on evaluating indicator

Performance Indicators	The Number of Enterprises which Perform InnovationN (N∈[0,n])		
	N=0	N=g,g∈[1,n-1]	N=n
non-innovative enterprises yields Qk	$q_{0i} = \dfrac{a-c}{b(n+1)}$	$q_{gk} = \dfrac{a-c-g\Delta c}{b(n+1)}$	$q_{nj} = \dfrac{a-c-n\Delta c}{b(n+1)}$
Qm Innovative enterprise production Qm	0	$q_{gm} = \dfrac{a-c+(n-g+1)\Delta c}{b(n+1)}$	$q_{nj} = \dfrac{a-c+\Delta c}{b(n+1)}$
Total Quantity Q	$\dfrac{n(a-c)}{b(n+1)}$	$\dfrac{n(a-c)+N\Delta c}{b(n+1)}$	
Price P	$\dfrac{a+nc}{n+1}$	$\dfrac{a+nc-N\Delta c}{n+1}$	
Profit π	$\dfrac{n(a-c)^2}{b(n+1)^2}$	$\dfrac{n(a-c-\Delta c)^2}{b(n+1)^2}$	
Consumers' Surplus CS	$\dfrac{(na-nc)^2}{2b(n+1)^2}$	$\dfrac{(na-nc+N\Delta c)^2}{2b(n+1)^2}$	
Producer Surplus PS	$\dfrac{n(a-c)^2}{b(n+1)^2}$	$\dfrac{(a-c)^2\left[-(n+2)t^2N^2+\left(t^2n^2+t^2n+t^2+2t\right)N+n\right]}{b(n+1)^2}$	
Total Social Surplus TS	$\dfrac{(a-c)^2(n^2+2n)}{2b(n+1)^2}$	$\dfrac{(a-c)^2\left[\left(-2nt^2-3t^2\right)N^2+\left(2t^2n^2+4nt^2+2tn+2t^2+4t\right)N+2n+n^2\right]}{2b(n+1)^2}$	

The explanation to the parameters of model graphic: a- variable constant of price，，b-variable constant of outpu，c-unit marginal cost，n-the number of enterprises in an industry，N、g-the number of innovative enterprises（N∈[0,n]、g∈[1,n-1]），m、j-the sequence of innovative enterprises，k、i- the sequence of enterprises without innovation，△C- the range of unit cost，

t=△C/（a-c）-comprehensive external variable conditions.

Table 2-1(a)/(b) illustrates that the variable number of enterprises which caused by operating innovation and the effects of non-innovation enterprises which involves in production, total quantity, concentration , HHI, LI, Price, Consumers' Surplus, Producer Surplus, Total Social Surplus, profit, etc.

Table 2-2 shows the assessment mode from impacts of innovative combination on market structure and performance. It shows the effects among individual innovative combination and multiple innovative combination on market structure and performance.

Table 2-2 The mathematic gaming mode from impacts of innovative combination on market structure and performance

Market structure and performance Indicators	N=0	N=g,g∈[1,n-1]		N=n
non-innovative enterprises yields	$q_{0i} = \dfrac{a-c}{b(n+1)}$	$q_{gk} = \dfrac{a-c-g\Delta c}{(n+1)b}$		$q_{nj} = \dfrac{a-c-n\Delta c}{(n+1)b}$
Innovative enterprise production	0	$q_{gm} = \dfrac{a-c+(n-g+1)\Delta c}{(n+1)b}$		$q_{nj} = \dfrac{a-c+\Delta c}{b(n+1)}$
Concentration CN4	$\dfrac{4}{n}$	g∈[1,4] $\dfrac{4+gt(n-3)}{n+gt}$	g∈[5,n-1] $\dfrac{4+4t(n-g+1)}{n+gt}$	$\dfrac{4}{n}$
Herfindahl index HN	$\dfrac{1}{n}$	$\dfrac{-(n+2)t^2N^2+(t^2n^2+2nt^2+t^2+2t)N+n}{(n+Nt)^2}$		
Lerner Index LN	$\dfrac{a-c}{a+nc}$	$\dfrac{a-c+(n-N+1)\Delta c}{a+nc-N\triangle C}$		
Total Quantity QN	$\dfrac{n(a-c)}{b(n+1)}$	$\dfrac{na-nc+N\Delta c}{(n+1)b}$		
Price PN	$\dfrac{a+nc}{n+1}$	$\dfrac{a+nc-N\Delta c}{n+1}$		
Profit πN	$\dfrac{n(a-c)^2}{b(n+1)^2}$	$\dfrac{n(a-c-N\Delta c)^2}{b(n+1)^2}$		
Consumers' Surplus CSN	$\dfrac{(na-nc)^2}{2(n+1)^2b}$	$\dfrac{(na-nc+N\Delta c)^2}{2(n+1)^2b}$		
Producer Surplus PSN	$\dfrac{n(a-c)^2}{b(n+1)^2}$	$\dfrac{(a-c)^2[-(n+2)t^2N^2+(t^2n^2+2t^2n+t^2+2t)N+n]}{(n+1)^2b}$		
Total Social Surplus TSN	$\dfrac{(a-c)^2(n^2+2n)}{2(n+1)^2b}$	$\dfrac{(a-c)^2[(-2nt^2-3t^2)N^2+(2t^2n^2+4nt^2+2tn+2t^2+4t)N+2n+n^2]}{2(n+1)^2b}$		

The explanation to the parameters of model graphic: a- variable constant of price, , b- variable constant of outpu，c-unit marginal cost，n-the number of enterprises in an industry，N、g-the number of innovative enterprises（N∈[0,n]、g∈[1,n-1]）, m-the sequence of innovative enterprises，k- the sequence of enterprises without innovation ,i- the sequence of enterprises without innovation，j- the sequence of innovative enterprises △C- the range of unit cost，t=△C/（a-c）-comprehensive external variable conditions.

2.2 Datasheet of Machenism Performance Evaluating Model

According to the assessing model, we carried out the Statistical investigation of the data from phosphorous chemical industry for many years, and calculated the related data(external variables) through grafic 2-3, then finally we summarized the results as the data in grafic 2-3, in which the market machenism and performance data reflect variables of numbers for enterprises having cooperative innovation ranging from 0 to 8.

Datasheet 2-3

Indicator	N=0	N=1	N=2	N=3	N=4	N=5	N=6	N=7	N=8
non-innovative enterprises yields (Qk)	8.89	8.91	8.80	8.69	8.58	8.30	7.73	7.33	6.67
Total non-innovative enterprises yields (TQk)	71.11	62.38	52.80	43.44	34.31	24.90	15.47	7.33	0.00
Innovative enterprise production (Qm) (TQm) Total	0.00	10.51	11.20	11.29	11.28	11.16	11.13	10.93	10.67
Innovative Enterprise production (TQm)	0.00	10.51	22.40	33.87	45.11	55.80	66.80	76.53	85.33
Market Concentration (CR)	0.50	0.51	0.53	0.55	0.57	0.55	0.54	0.52	0.50
Herfindahl index HHI	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.12
Lerner Index LI	0.31	0.38	0.43	0.46	0.49	0.50	0.50	0.50	0.49
Quantity (Q)	71.11	72.89	75.20	77.31	79.42	80.70	82.27	83.87	85.33
Price (P)	14.44	13.56	12.40	11.34	10.29	9.65	8.87	8.07	7.33
Profit (π)	316.05	317.63	328.82	343.48	359.31	366.42	370.35	378.95	382.42
Consumers' Surplus (CS)	1264.20	1328.20	1413.76	1494.25	1576.97	1628.12	1691.95	1758.40	1820.44
Producer Surplus (PS)	316.05	333.17	357.76	379.90	401.53	414.70	431.66	445.27	455.11
Total Social Surplus (TS)	1580.25	1661.37	1771.52	1874.15	1978.51	2042.82	2123.61	2203.68	2275.56

It is essential to point out the fact that the external variables（a、b、c、n、N、g、k、$\triangle$C）in differentiated industries are distinct from one another. Although the datasheet 2-3 is just the indication of the characteristic in phosphorous chemical industry, it also emboodies the essential regulations between the data, and such is the conclusion: the cooperative innovative combination of oligarchic competing enterprises is positively correlated to market mechanism and performance, in another word, the more reasonable the market mechanism is, the more effective the market.

The correlation is illustrated by the fact that the cooperative innovation of enterprises leads to the alteration of external variables of gaming model of oligarchic completion, go a step further, resulting in the change of external variables, all of which can be judged by quantity. The conduct mechanism through which innovative combination between enterprises effects market mechanism and the evaluation on the performance of market mechanism form a positive correlation, which, would make a fundamental difference, promoting the general development of the

whole industry. The principle conclusion can be analyzed as follows.

2.3 The Data Analysis on Performance Evaluation

Based on the gaming model, the variables of output, price, market concentration, Herfindahl Index, Lerner Index after the innovation of no enterprise, g（g∈[1,n-1]）, n enterprises were analyzed with the cooperation with consumers' Surplus, producer surplus, total social surplus as well as profit to prove the correlation between them with the help of facts.

2.3.1 The output, price and profit effect with innovation

(1). The comparative analysis of output of innovative enterprises It is evident in graphic 2-2 that g out of n enterprises in the industry carried out innovation and the analytical results can be concluded as: (graphic 2-1) ① The output of innovative enterprises is larger than that of enterprises before innovation, that is to say $q_{gm} > q_{oi}$（$m∈[1,g]$, q_{oi} is the unit output of one enterprise without innovation）; ②the output of the enterprises without innovation at the moment is smaller than that of the enterprises before innovation $q_{gk} < q_{oi}$（$k∈[g+1,n]$; ③ When the enterprises are all under innovation, the output is still larger than that of all before innovation, $q_{nj} < q_{gm}$（$j∈[1, n]$, $g=n$）. Therefore, we can reach the conclusion that suppose the other factors remain the same, just taking the effect of innovation into consideration, the innovation of enterprises in an industry will lead to the change of established output, including both those of innovative enterprises and those without. On aforementioned conditions, the output of innovative enterprises will increase while those without, decrease, and the output of all enterprises will appear balanced when they all participate in innovation. CR8 is the optimum number of oligarchic competing enterprises. With the increase of the number of the enterprises in an industry (all innovative), the output of the enterprise would decrease progressively.
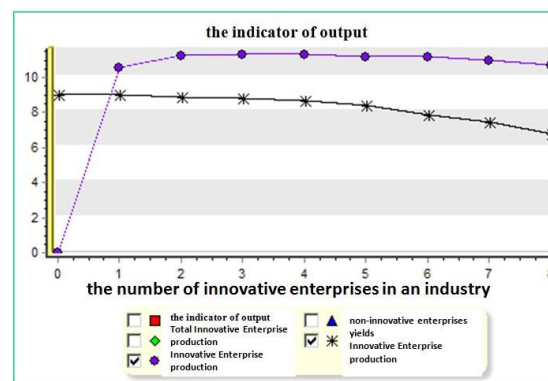

Figure 2-1the unit output of enterprises
(the upper is that of innovative enterprises, the underlaid is that of enterprises without innovation)
Explanation：The indicator of output The number of innovative enterprises in an industry Output
Total non-innovative enterprises yields
Total Innovative Enterprise production
non-innovative enterprises yields
Innovative Enterprise production

(2). The Comparative analysis of global output. It can be known by the comparation in graphic 2-2 that under aforementioned supposed conditions, g in n enterprises performed innovation, and their global output is larger than that of all before innovation $Q_{qm} > Q_{oi}$（$m∈[1,g]$, Q_{oi} is the global out of n enterprises before innovation）; with the expansion of innovation in the industry, and after all enterprises carry out innovation, the output of individual enterprise is likely to decrease according to the points of curve in grafic.(The reason is unknown), which also indicates that the global output would increase continuously.(The middle curve in graphic 2-2).
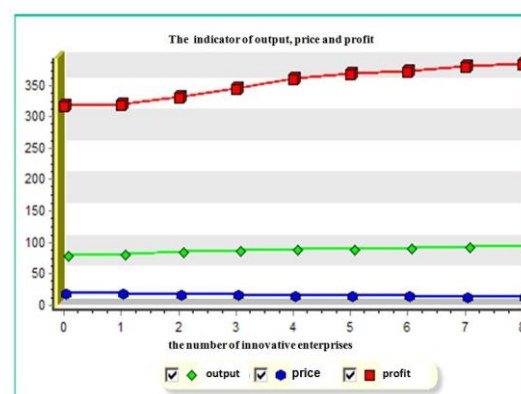

Figure 2-2 (the upper-profit, the middle-output, the

264

unerlaid-price)

Explanation:

the indicator of output, price and profit

the number of innovative enterprises

output

price

profit

(3). The Comparative Analysis of Price It is made obvious by the comparation in graphic 2-2 that under aforementioned supposed conditions, g in n enterprises performed innovation, their prices are smaller than those of enterprises before innovation Pqm＜Poi（m∈[1,g]，Poi 为 is the prices of n enterprises before innovation）. with the expansion of innovation in the industry, the balanced prices would decrease continuously(the underlaid curve in graphic 2-2), which proved the theory of Schumpeter.

(4). The Comparative Analysis of Profit It is evident by comparison in graphic 2-2, g in n enterprises performed innovation, and their profit is larger than those without, π qm＞π oi（m∈[1,g]）；suppose all n enterprises carry out innovation, and their profit is smaller than that of g enterprises with innovations π nj ＜π qm（j∈[1,n]），innovative profit would appear new balance(grafic 2-2 the upper curve), which proved the theory of Schumpeter.

2.3.2 The Market Mechanism Effect of Innovation

（1） The market centrality of first four enterprises CR4. Suppose n>4, it is known by comparison in graphic 2-2 that under aforementioned conditions, when 4 enterprises carry out innovations, the market centrality t CR4 is the largest(the upper curve in graphic 2-3); when n enterprises carry out the same innovations, the market centrality is CRn4=CR04=4/n, when the innovation excerts no influence on market centrality CR4.
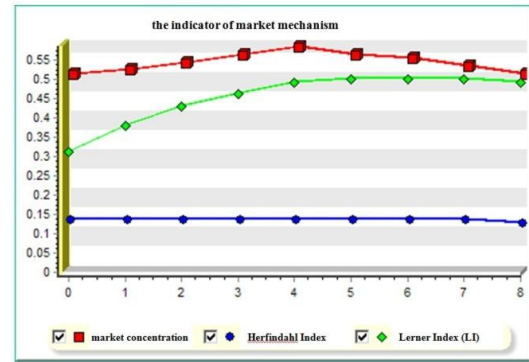

Figure 2-3 (the upper-CR, the middle-HHI, the unerlaid-LI)

Explanation :

the indicator of market mechanism

the number of innovative enterprises

market concentration

Herfindahl Index

Lerner Index (LI)

(2). Herfindahl Index HHI It is evident by comparison in graphic 2-2, under aforementioned conditions, g in n enterprises performed innovation, and their Herfindahl Index is larger than that of the enterprises before innovation HHIqm＞Hoi（m∈[1,g]）. with the expansion of innovation in the industry, the Herfindahl Index will increase before its decrease, during which there is a Maximum point lying above N*=n/(t+2) or nearby it.(the middle curve in graphic 2-3)

(3). Lerner index (LI). As is shown in Table 2-2, in the foregoing preconditions, within n enterprises in the same industry, there are g enterprises implementing innovation whose Lerner index is greater than that of those without innovation LIgm＞LIoi（m∈[1,g]. When all of n enterprises implement innovation, LIgm＜LIoi tends to decrease (the curve at the bottom of Figure 2-3). The degree of market power in the competitive market and monopoly market tends to compete.

2.3.3 The Effect of Innovative Market Performance

(1). The Comparative Analysis of Consumer Surplus (CSN). Table 2-2 shows that, in the aforementioned presupposition, g out of the n enterprises in the same

industry implemented innovation, and their consumer surplus is greater than that of those without innovation, i.e. CSgm＞CSoi（m∈[1,g]）. With the expansion of innovation in the industry, the consumer surplus continues to increase (the middle curve in Figure 2-4).

(2) The Comparison of Producer Surplus (PSN). As is indicated in Table 2-2, in the foregoing presupposition, g out of the n enterprises in the same industry implemented innovation, and their producer surplus is greater than that of those without innovation, i.e. PSgm＞PSoi（m∈[1,g]）(the curve at the bottom of Figure 2-4). With the expansion of innovation in the industry enterprises, the producer surplus continues to increase, reducing beyond the maximum point (The law of diminishing marginal effect)
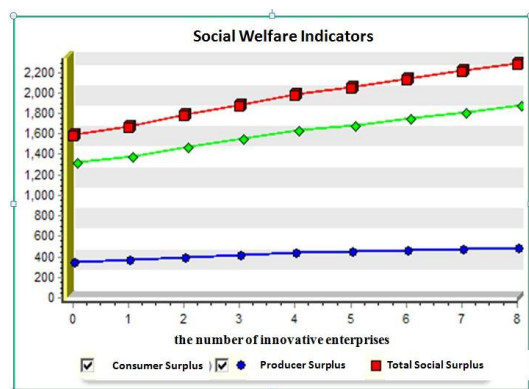

Figure 2-4 (the Upper line-TS, the Mid line-CS, the Lower line-PS)

(3) The Comparative Analysis of the Total Social Surplus Effect. As is shown in Table 2-2, in the foregoing presupposition, g out of the n enterprises in the same industry implemented innovation, and their total social surplus is greater than that of those without innovation, i.e. TSgm＞TSoi （m∈[1,g]）(the curve at the top of Figure 2-4). With the expansion of innovation in industry enterprises, when all of the n enterprises implement innovation, consumer surplus and producer surplus achieve the new equilibrium of the principle of maximization of social welfare.

2.3.4 The Analysis of Industrial Organization State

The state of the industrial organization should be in accordance with the principle of maximization of social welfare and the equilibrium principles of consumer surplus and producer surplus. To achieve this goal, we must consider how the number of oligarchs has effect on the outcomes of market and its equilibrium.

It should be mentioned that there are 4 types of market structures such as monopolies, oligopolies, monopolistic competition and perfect competition coexisting in China's market structure. Although anti-monopoly law has been introduced with the development of economy, it is a reality that oligopoly has become more and more important part of the economical operation in China. We have seen that powerful composite force makes China's economic lifeline industries oligopolies, and various doubts become more and more out of commission. Profit of the effect of enterprise size is growing gradually, especially in the fields of energy, telecommunication. Fixed costs in these fields are so huge that giant barriers come into being, while the marginal cost becomes smaller when one more client is served.

From a comparative point of view, the oligopoly is a market where only a few sellers offer similar products. It is impossible to avoid expectations, but it sure is better than monopoly, which can bring higher efficiency than monopoly, so that it can provide better products at relatively low price for consumers, and introduce industry-standard which can make consumers' lives more convenient. However, the oligopoly can reap excessive profits at the expense of harming consumers and damaging economic progress. It can weaken the competition, which can indisputably optimize market allocation of resources. Thus, weighing the pros and cons, only the equilibrium of the oligopolies has to be considered.

Although an oligopoly hopes to become Cartel to earn excess monopoly profits, but that is often impossible. The antimonopoly law takes prohibition of disclosure agreement between oligopolies as the focus of public policy. Hence, sometimes, owing to carving up profits, the battle between the oligopoly members makes the agreement impossible. From the results of each

communication oligopoly in Chine respectively produces and services, it seems that they reached certain equilibrium. The equilibrium can be inferred from several oligopolies not ultimately making different decisions which urge to benefit people, that is to say, several interactive economic bodies choose to assume that the other one has established the strategy, then choose their own optimal strategy. Hence, the Nash equilibrium comes into being.

The example of communication oligopolies illustrates the conflict between cooperation and self-regard. The results of cooperation and achieve a monopoly can make oligopoly's situation better. However, as they pursue their own self-interest, they cannot achieve the monopoly or maximize their share of profits at last. Each oligopoly cannot resist temptation of expanding production and grabbing a larger market share. When each of them tries to do so, the invisible hand will make the total output increase, and the price will drop. Meanwhile, self-benefiting doesn't always mean competition of the market, the oligarchs, just like the monopolist, realize that the more products they produce, the cheaper their prices become, therefore, they won't follow the rules of competitive enterprises(i.e. Products are produced at the marginal cost). As a whole, the oligarchs choose the best output which is larger than the competitive output and smaller than the monopolistic output, which could make the profit maximization. Oligopoly price is lower than monopolistic price and higher than the competitive price(marginal cost).

2.4 Conclusion of the Structure and Performance Assessment Model

Innovation Portfolio of Oligopolistic Enterprises positively correlates with its effect on Market Structure and Performance, which can be referred to Innovative Market Structure Effect in 2.3.2. The competitive market structure verifies Joseph Schumpeter's views [2]from Samuelson's literature. Those views are the more rational the market structure is, the more effective the market becomes; this effect is realized by changes of Endogenous variable

parameters, affected by changes of exogenous variables parameters in Oligarch Competitive Model and this exo-changes are caused by Innovation Portfolio of Enterprise. These changes and effects can be studied and determined by quantitative analyses; The chain of causation(i.e. The transmission mechanism from Innovation Portfolio of Enterprise to Market Structure positively correlates with Market Structure and Performance Relation)would affect the evolution of industrial organization fundamentally, promoting the development of the whole industrial organization. The conclusions are analyzed as follows:

(1) Extension of Enterprise Innovation Portfolio would affect Market Concentration which varies regularly towards the balance between monopoly and competition so as to do the allocation of resources good. In light of the invariability of the other conditions, if the enterprises in this industry have the same initial cost function and the cost function varies accordingly after the same(single) innovation, the Market Concentration never changes.

(2).In light of the invariability of the other conditions, if there are at least 2 enterprises in a market having exogenous sunk costs, the price requested varies between monopolistic price and competitive price.

(3) Market Concentration Rate Index(CRN) doesn't varies the same with Herfindahl-Hirschman Index(HHIN), but the positive correlation is reflected between the concentration level and price; Market Concentration Rate is the Endogenous Variable determined by industry characteristics(pricing, advertising, research and development costs), therefore, CRN index's determination to the market structure should be considered. As a whole the market size varies accordingly with the concentration rate in a market having exogenous sunk costs; the market size has a negative correlation with the concentration rate in all the industries except for the most competitive ones. With the increase of the Innovation Portfolio Enterprises, the variation of the two indexes that they first increase and then decrease does the market competition good.

(4) Lerner Index(LIN), doesn't vary the same with Market Concentration Rate Index(CRN) and Herfindahl-Hirschman Index(HHIN) under the same conditions, which means LIN is effective to measure the market structure. As a whole, with the increase of the Innovation Portfolio Enterprises, the variation of LIN that it first increases and then declines does the market competition good.

(5) Extension of Innovation Portfolio in its industry and its Innovation Intensity(Asymptotic type, mutant type, radical type) affect Market Output, Consumer Surplus, Producer Surplus, Total Social Surplus (social welfare) and Profit. Under the assumed conditions, the market price would decline continuously with the increase of the number of Innovation Portfolio enterprises, Market Output increases continuously, the profit increases, Consumer Surplus and Total Social Surplus (social welfare) increase continuously, but Producer Surplus first increases and then declines. Changes in producer surplus correlates with Demand Functions, Enterprise Original Cost Function and Marginal Costs of Reduction caused by Innovation Portfolio. Consumer Surplus, Producer Surplus, Total Social Surplus (social welfare) and Profit are higher than those not affected by Innovation Portfolio Extension, Social Welfare Maximization Principle and a new Nash Equilibrium between Consumer -Producer Surplus and Market Forces are realized, the huge conflict between Producer and Society is alleviated.

(6) Prices of the crude oil and the products from CNPC, Sinopec Group and CNOOC are consistent with the international market prices, which creates enormous Producer Surplus. The way in which the three corporations get the excess profits explains the way to observe differently, where both the international market and domestic market are involved. People think it is fair to earn money from the international market on condition that the domesticate need is provided, the key point lie in that to whom the excess profits are given. As far as the consumers are concerned, the sounder quality the goods have or the more considerate service people get, the better if the same money are paid for that. The same is true for

Perfect Competition, Monopolistic Competition, Oligopoly and Monopoly.

(7) Market Structure Conditions Positively Correlates with Market Performance Condition. Under the assumed conditions, when all the enterprises in this industry innovate, the Market Concentration Rate and Market Force have the minimum value, however, Consumer Surplus and Total Social Surplus (social welfare) have the maximum value. That is to say, with the increase of Innovation Portfolio enterprises, the market structure goes from concentration to separation, the market force declines accordingly, but market performance improves continuously, the producer gets innovative excess surplus if we see from the aspects of Consumer Surplus and Total Social Surplus (social welfare). Therefore, being affected by Innovation Portfolio, CRN ,HHIN and LIN positively correlate with Market Performance.

(8) Innovation Portfolio Enterprises give pressure to the other non-innovation-enterprises, whose outputs and profits are less. Competition Mechanism is created, promoting the non-innovation-enterprises to change, the behavior of enterprises in this industry change accordingly. Corporate behavior within the industry will change as well, the causal chain of enterprise innovation behavior or actions affecting the market structure and market performance will lead to the development of the industry as a whole organization. This result is one of the main connotation goals for which the innovation-oriented country is longing.

(9) The state of industrial organization should determine the absolute size of market forces in accordance with the principle of maximization of social welfare and the homeostatic principles of consumer surplus and producer surplus[14], otherwise the monopolies should be broken up to maintain the long-term state of equalization. The principle is to achieve equalization between oligarchs, and the evolution of the number of oligarchs should head for the direction of monopolistic competition and perfect competition.

(10) Innovative enterprises should pay the government excess surplus that comes from innovation benefits generated by government's incentive policies. There is

nothing wrong that the performance of enterprises and governments take the maximization of value as a goal. Enterprises' pursuing profit maximization should be based on keeping their hold on the market; to pursue the interest maximization for ordinary people, governments should focus their functions on justice and stabilization.

(11) The uniform conclusion and qualitative judgment of 4 kinds of market structure such as perfect competition, monopolistic competition, oligarch, and monopolization and their performance can be described as following: as for consumers, among the goods or services obtained at the same cost, high-quality products are better than normal products, which are better than low-quality products, which are better than adulterations, and which are better than no-quality products. The pros and cons among perfect competition, monopolistic competition, oligarch, and monopolization are in the similar way. The combined effect of systematic collaborative innovation behavior formed from innovative combination can make such 4 kinds of market structure and their performance accelerate evolution to achieve upgrade industries on a

healthy track.

3 References

[1] MANSFIELD E. Size of firm, market structure and innovation [J]. Journal of Political Economy，1963,71

[2] SCHERER FM. Size of firm, oligopoly, and research: a comment[J]. Canadian JournalofEconomics and PoliticalScience ，1965,31（2）：256-266.

[3] SCHERER FM. Firm size, market structure, opportunity, and the output of patented inventions, American Economic Review ，1965,55（5）：1097-1125.

[4] Loury. Market Structure and Innovation [J]. Quarterly Journal of Economic，1979，（93）：395-410

[5] Kamien I, Schwartz N L. Market structure and innovation: a survey[J], Journal ofEconomic Literature，1975,13（1）：1-37

[6] Scherer. Industrual Market Structure and Economic Performance. 2d ed[M], Chicago: Rand- Mcnally，1980.

[7] Cohen and Levin. Innivation and Market Structure, In Handbook of Industrial organization[M]. by R. Schmalensee and R.Willig.Amsterdam:North-Holland，1980.