An Empirical Test of SCP Hypothesis in World Telecom Manufacturing

Chang Yaozhong

Institute of Industrial Economics, Chinese Academy of Social Sciences, Beijing 100088, China
yzhchang@263.net

Abstract - In order to verify different SCP hypothesizes of industrial organization, relations among market structure, R&D conduct and performance in world telecom manufacturing are empirically tested. As found in research, in middle-low oligopoly market of telecom manufacturing, there are significant influence of market concentration and R&D conduct on performance, vice versa. The result shows that S (concentration degree), P (gross profit rate and revenue), C (R&D intensity) represent bidirectional causality chain in middle-low oligopoly market, which partly supports conduct determination hypothesis and structure determination hypothesis respectively. As also found, technology standard regulation evidently influences performance and market structure, macro economy remarkably influences market structure, performance and R&D intensity, and R&D intensity significantly promotes macro economy. It's suggested to utilize advantage of scale from market concentration and avoid its disadvantage, and to promote R&D input for long-term performance and macro economy.

Index Terms - R&D intensity, Market structure, Performance, Macro economy, Technology standard regulation.

I. Introduction

A. Debate on SCP normal formulas

From 1930s to 1970s, Harvard school put forward SCP (Structure, Conduct, and Performance) normal formulas. Debates on it are mainly focused on what is first factor in structure and conduct, and on whether market power should be regulated [1]. Harvard School insist on "structure precedence": there is causality chain from structure to conduct, then from conduct to performance, structure dominates conduct and performance, environment (basic status, public policy) affects every link in the chain, and conduct and structure have feedback on structure and basic status respectively. They consider that monopoly and oligopoly are non-efficiency and should be regulated by government [2] [3] [1]. But Chicago school persist in "conduct precedence": they believe free competition, and oppose government regulation. They believe that market structure roots in enterprise efficiency and high profit of high concentration results from efficiency. Free entrance to market could reduce concentration and monopoly profit, and market conduct determines market structure [4] [5] [1]. Baumol's "contestable markets" theory suggests government to promote free entrance to market to ensure market efficiency [6]; In Leibenstein's X-theory, he thought welfare loss led by oligopoly was far less than it led by enterprise's internal non-efficiency, and competition pressure would facilitate efficiency [7].

B. Related empirical research

After study of 20 years' data of 68 industries in America, Stigler indicated that linear positive correlation between concentration and profit rate was not significant. Profit rates were closed in competitive markets, but unevenly distributed in oligopoly markets [8]. Demsetz's research on 95 industries showed rates of return sometimes decreased with rise of concentration when the market shares of four largest corporations is lower than 50%, but increased when more than 50% [9]. Research of 44 industries in China indicated that market performance determinated market structure under background of economic transition [10]. Market concentration showed significant negative correlativity between concentration and return of asset for China's bank industry with oligopoly market [11]. But positive effect between them existed in China's middle-low oligopoly market of car industry [12]. There was oligopoly market with three super companies and many big companies in American coal industry, in which market performance was greatly improved under complete market conduct [13]. Currently, research on SCP hypothesis over world market is lacking, especially in world telecom manufacturing market, because of complex status cross countries, difficulty of analysis on huge product system and numerous companies and neglect for indistinctive oligopoly. Besides, policy factor lacks empirical study for difficulty in its quantification.

In brief, there exist arguments on what's resource of high profit, oligopoly power or corporation efficiency, and on what's resource of performance, concentration or technology and management. Since related research on world telecom market is scarce, verification of two kinds of hypothesizes in this industry will help us understand the characters and relations of structure, conduct and performance of it, and provide reference for industry and companies to make development decision and form regulation rules.

II. World Telecom equipment market summary

A. Basic status

Since 1960's, telecom technology as switching technology, transmission technology and mobile communication technology developed rapidly. Since telecom network is antecedent and critical infrastructure with great driving force on economy and society, each country invest hugely on it in priority. After regulation loosening of telecom operation market and establishment of WTO, the market scale extended quickly [14]. With big network and complex system,

operators have high requirements on technology, stability and post-sale services. Equipment vendors with integrated product line, leading technology, good services and cost advantage possess large competition advantage, and could provide comprehensive, reliable, high performance-price rate and evolving products to operators. With rapid development of market after 1990, seller's market became buyer's market gradually. Because of vehement competition, late-comers' catching-up and several economic crisis, telecom manufacturing companies became differentiated and consolidation cases happened more.

In conclusion, world telecom equipment market has following characteristics: First, high market entrance doorsill for being high density of technology and capital; Second, large scale of companies and numerous kinds of products to meet all demands of big operators with scale economy and scope economy; Third, vehement competition with complex mechanism which extends performance gap and leads to further concentration. In addition, there are also arguments in company's conduct and performance because scale expansion by consolidation does not improve performance while later-comers improve their performance without far less consolidation, which reflect the value of research on "structure precedence" and "conduct precedence".

B. Research Sample Selection

Two important categories need be defined for selecting research clues and objects. First, telecom network product category: Telecom product used in telecom operation with strict requirement in performance, quality, technology and stability, not general IT communication product[1], and also main equipment and terminal of telecom network being important and comprehensively used by operators[2], which are in the scope of products of telecom equipment vendors. Second, telecom equipment manufacturer category: Companies mainly produce above telecom equipment and terminal and provide corresponding service, not companies mainly provide IT hardware and software. Clarification of objects and subjects will help to select and analyze basic data precisely and ensure internal and external validity. Finally, ten companies are selected which cover important multi-nation companies[3] based mainly on telecom manufacturing and providing telecom equipment and terminal[4] since 1990s. These companies' basic status and revenue raking (top 10) are listed in Table I.

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[1] For example, personal computer and its software.

[2] The telecom product listed here includes mobile terminal, network equipment, mobile infrastructure, transmission equipment, public switching equipment, access equipment, communication cable, corresponsive service and software, etc., and do not include assistant equipment and establishment outside of telecom network. This scope also ensures consistency with statistics data provided by Idate.

[3] Relatively small telecom manufactures mainly focused in their domestic markets are not included here.

[4] Some important IT multi-national companies such as NEC and IBM, also sell telecom main equipment with low percentage in their total revenues and occupy lower position in telecom manufacturing than selected companies.

TABLE I   Sample Companies' Status and Revenue Ranking

Company	Headquarters	Founded Year	Telecom Product Sale Ranking				
			1998	1999	2002	2003	2009
Motorola	North America	1928	3	3	4	4	7
Lucent	North America	1877	1	1	8	10	-
Nortel	North America	1895	5	4	9	9	8
Cisco	North America	1984	9	9	2	2	1
Ericsson	Europe	1876	2	2	6	5	2
Alcatel	Europe	1898	4	6	5	6	3
Siemens	Europe	1847	6	5	3	3	-
Nokia	Europe	1865	7	7	1	1	4
Huawei	Asia	1987	-	-	-	-	5
ZTE	Asia	1985	-	-	-	-	10

Resource: Idate and Official networks of above enterprises

C. Industry Market Pattern

Market concentration (CR4 and CR8) and Herfindahl-Hirschman Index (HHI) are frequently applied in describing market structure. Since the samples covers companies with prior four market shares, CR4 is used as the leading index, and market shares of prior eight companies in the sample (F8) and approximate HHI calculated by revenues of sampling companies and total market capacity (HHI10) are used as assistant indexes, showed in Table II.

TABLE II   Industry Concentration (1997-2011)

Year	1997	1998	1999	2000	2001	2002	2003	2004
CR4(%)	39.48	43.55	42.02	37.83	34.58	35.50	52.39	54.49
F8(%)	58.63	67.33	68.76	66.23	62.12	56.67	79.03	80.14
HHI10	506	633	646	573	496	445	935	971
Year	2005	2006	2007	2008	2009	2010	2011	average
CR4(%)	51.86	50.29	48.19	46.05	40.48	45.76	46.65	44.61
F8(%)	73.73	67.95	63.16	62.25	56.17	60.97	58.93	65.47
HHI10	861	774	752	703	549	649	619	674

Resource: collative data from samples' annual report, Idate statistics, etc.

According to measure method of industry oligopoly and competition type [15], CR4 is in the value scope of middle-low oligopoly market, which F8 also supports. According to Herfindahl-Hirschman standard, HHI10s are less than 1000, lower limit of oligopoly market, and HHI values are close to and a little more than 1000 if other important companies are included in 2003 and 2004. It could be summarized that world telecom manufacturing is of middle-low oligopoly market structure. The conclusion shows existence of some market bulwark, such as scale economy, product differentia and absolute cost advantage. Li and Luo indicated that telecom manufactures compete by means of differentia of technology and service, scale advantage and network effect, and technical bulwark etc. [16].
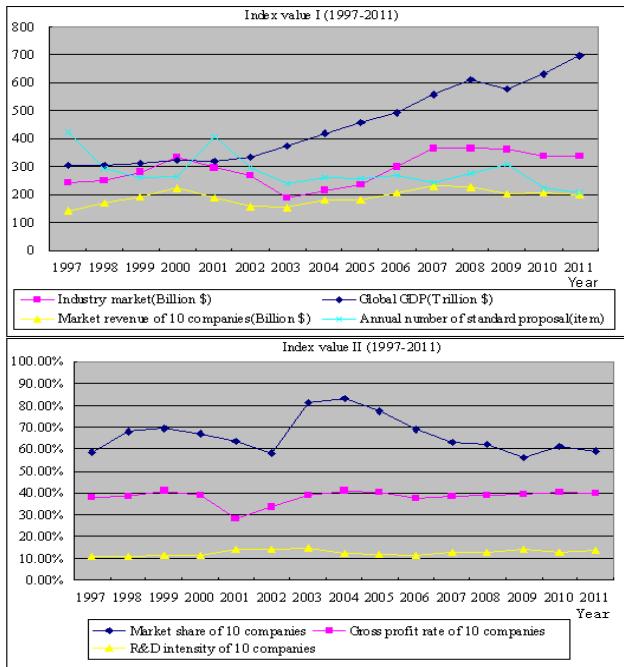
III. Factor Measurement

A. Index Selection

1) *Market Structure Index*: CR10, which reflects both market concentration and sample companies' market power.

2) *Market Performance Index: 1)* Gross profit rate: Average gross profit rate of sample companies, which embodies their main business performance and exclude influence brought by their different financial factor. 2) Total income of sample companies from telecom related product. 3) Industry market capacity: Total revenue of this industry.

3) *Enterprise Conduct*: R&D Intensity. In telecom manufacturing, technology innovation is a critical conduct for enterprises' survival and development. Ni Lei indicated that enterprises in telecom manufacturing must keep intensified input to innovation and R&D to acquire and keep core competition capability [17].

4) *Policy Regulation*: Annual number of recommended standard by ITU (the International Telecom Union). Since telecom manufacturing is an opened industry, telecom networks are interconnected and resources are uniformly assigned, ITU, a subordinate body of the United Nations, is in charge of global standard establishment and radio resource assignment. The proposals are the result of game and negotiation of governments and enterprises in ITU, and have general restriction reflecting intensity and frequency of regulation.

5) *Macro economy*: Global GDP, which influence expenditure of final users and operators.

B. *Value of each index*

The index values of past years are shown in Fig. 1.

Fig. 1   Index value (Year 1997-2011).

C. *Analysis of Index Stationary time series*

The analysis results of stationary character of Index time series by ADF test are listed in Table III.

TABLE III   Index time series stationary analysis result

Index	Stationary Prob.			Index	Stationary Prob.		
	99%	95%	90%		99%	95%	90%
GPR	No	No	Yes	RDR	No	Yes	Yes
Market10	No	No	No	DCR10	No	No	Yes
Market	No	No	No	DGDP	No	No	Yes
GDP	No	No	No	DMarket10	No	No	Yes
Policy	No	Yes	Yes	DMarket	No	No	Yes
CR10	No	No	No				

Note: Index with 'D' added in the first letter of its name means its difference time series

IV . Index relation analysis

Multiple linear regression mode and Granger causality test are adopted in analysis of relation of these indexes to evaluate degree and direction of influence of each pair of Indexes, and then different hypothesizes are verified. Since based on industrial organization theory, validity of tests is ensured. First, each pair of Indexes is selected to form a simplified VAR (vector auto-regression) mode to do VAR Granger Causality test. If an index time series is not stationary, its stationary difference time series will be used instead. The Result is shown in Table IV. Second, analysis is in order of performance, structure and conduct.

TABLE IV   Result of VAR Granger Causality Test for each pair of Indexes

Index	DGDP	Policy	DCR10	GPR	DMarket10	DMarket	RDR
DGDP			No	326.76,4, ***,4	No	13.83,4, ***,4	18.57,4, ***,4
Policy			417.72,4, ***,4	212.58,4, ***,4	No	15.83,4, ***,4	No
DCR10	No	No		172.37,4, ***,4	No	No	No
GPR	No	No	11.70,4, **,4				8.98,4 **,4
DMarket10	No	601.75,4, ***,4	No				13.02,4, ***,4
DMarket	No	No	No				25.06,4, ***,4
RDR	15.79,4, ***,4	No	No	83.46,4, ***,4	21.53,4 ***,4	No	

Note: Far left column represents Granger cause, and top row represents Granger result. Blank grid means no test done; "No" in grid means there is no Granger Causality; If Granger causality exists, Chi-sq, df, Significance level and Lag of VAR are listed in order; ***, **, * represent 99%, 95%, 90% significance level of Granger causality existence respectively.

A. *Market performance related analysis*

Argument of different hypotheses on market performance focuses on performance's determination by structure or by conduct. Performance indexes will be explained variables and others will be explanatory variables in following tests to verify above argument.

1) GPR: First, ordinary least square method and t-test are done with GDP, Policy, CR10 and RDR being explanatory variables, and GPR being explained one. The result is as (1). GDP, CR10 and RDR influence GPR significantly.

$$\hat{GPR_t} = 0.380 + 1.45 * 10^{-6} GDP_t - 4.53 * 10^{-5} Policy_t \quad (1)$$
$$+ 0.162 CR10_t - 1.264 RDR_t$$

(3.261)*** (2.558)** (-0.278) (1.893)* (-2.371)**

$R^2 = 0.568$ $\bar{R}^2 = 0.395$ F=3.283   D.W.=2.017

Note: ***, **, * represent 99%, 95%, 90% significance level of t-value respectively (the same below). ADF test of residual series refuse existence of unit root, which proves residual series to be stationary.

Second, according to above OLS result (1) and Granger causality test result in Table 4, further judgments and empirical analysis are given below.

i) GDP has notable positive influence on GPR in the same term. Economic fluctuation could influence demand and supply, and then alter GPR. Table 4 also shows single-direction Granger causality from DGDP to GPR.

ii) Policy only shows indistinctive negative influence on GPR in the same term. Standard proposal obedience may increase product cost. If lag time of Policy is changed from t to t-2, the regression coefficient becomes positive (Residual series is tested to be stationary by ADF test). Table 4 also shows single-direction Granger causality from Policy to GPR. Proposal obedience means possible rise of future GPR.

iii) CR10 shows notable positive influence on GPR in the same term. In practice, concentration will bring scale economy and scope economy, which reduce cost and raise gross profit rate. Table 4 also shows double-direction Granger causality between CR10 and GPR.

iv) RDR shows notable negative influence on GPR in the same term. In practice, high R&D expenditure will squeeze other input resource and bring benefit very late or even no obvious benefit. If lag time of RDR is changed from t to t-4, the regression coefficient becomes positive (Residual series is tested to be stationary by ADF test). Table 4 also shows double-direction Granger causality between RDR and GPR. These indicate high R&D intensity could raise gross profit rate in far future, vice versa.

2) Market10:   First, ordinary least square method and t-test are done with GDP, Policy, CR10 and RDR being explanatory variables, and Market10 being explained one. The result is as (2). GDP and Policy have significant influence on Market10.

$$\hat{Market}10_t = 759.773 + 0.016GDP_t + 3.075Policy_t \tag{2}$$
$$-94.177CR10_t - 2635.201RDR_t$$

(0.853)   (3.649)***   (2.469)**   (-0.144)   (-0.647)

$R^2 = 0.625$ $\bar{R}^2 = 0.476$ F=4.175   D.W.=1.286

Note: Residual series has no unit root by ADF test and is stationary.

Second, according to above OLS result (2) and Granger causality test result in Table 4, further judgments and empirical analysis are given below.

i) GDP has notable positive influence on Market10 in the same term. Economic fluctuation would affect income correspondingly.

ii) Policy shows notable positive influence on Market10 in the same term. This happens because issue of new standard proposal will open market for new product and technology.

For example, 3G mobile business network start to be deployed worldwide after ITU release 3G international standard. Table 4 shows single-direction Granger causality from DMarket10 to Policy, which points out that income variance of sample companies could affect establishment of technical standard.

iii) CR10 only has indistinctive negative influence on Market10 in the same term. Since CR10 is equal to Market10 divided by Market, variance of the samples' revenue is less than that of industry revenue. For example, during economic stagnation, samples' revenue decreases less than industry revenue does, which leads to higher concentration. But if lag time of CR10 is changed from t to t-2, the regression coefficient becomes positive.

iv) RDR only shows indistinctive negative influence on Market10 in the same term. R&D expenditure will squeeze investment in production and sale. If lag time of RDR is changed from t to t-1 and t-2, there will be significant negative influence, but indistinctive positive influence under lag time t-3 of RDR (Residual series is tested to be stationary by ADF test under all three conditions). Table 4 also indicates double-direction Granger causality between RDR and DMarket10. R&D expenditure goes against current market performance and brings benefit late, and market performance do so to R&D expenditure.

3) Market: Since sample enterprises lead technology evolvement and bring spillover effect of technology and knowledge in industry, R&D intensity could also explain total industry revenue. First, ordinary least square method and t-test are done with GDP, Policy, CR10 and RDR being explanatory variables, and Market being explained one. The result is as (3). GDP, Policy and CR10 have significant influence on Market.

$$\hat{Market}_t = 3194.089 + 0.026GDP_t + 4.546Policy_t \tag{3}$$
$$-3737.51CR10_t - 1447.284RDR_t$$

(2.449)** (4.069)*** (2.494)** (-3.902)***   (-0.243)

$R^2 = 0.821$ $\bar{R}^2 = 0.749$ F=11.429   D.W.=1.327

Note: Residual series has no unit root by ADF test and is stationary.

Second, according to above OLS result (3) and Granger causality test result in Table 4, further judgments and empirical analysis are given below.

i) GDP shows notable positive influence on Market in the same term, and analysis is similar to that of Market10. Table 4 indicates single-direction Granger causality from DGDP to DMarket. Above results show promotion function of GDP on Market.

ii) Policy has notable positive influence on Market in the same term, and analysis is similar to that of Marker10. Table 4 indicates single-direction Granger causality from Policy to DMarket. Above results show promotion function of Policy on Market.

iii) CR10 has significant negative influence on Market in the same term. If lag time of CR10 is changed from t to t-2, the regression coefficient becomes positive with unapparent

influence, which is similar with that between CR10 and Market10.

iv) RDR only shows indistinctive negative influence on Market in the same term. Influence and its notability under other lag time of RDR are similar with that between CR10 and Market10. Table 4 shows single-direction Granger causality from DMarket to RDR. The promotion function of market performance improvement on R&D intensity works late.

Known by above analysis, GDP, Policy, RDR and CR10 have significant influence on performance. GDP variance leads to same-direction variance of performance; Policy could also bring positive influence on performance other than on GPR in initial stage. CR10 could positively influence GPR but negatively influence revenue, especial industry revenue; RDR decreases performance, especially GPR, in anterior several stages, and then promote them. From angle of scale economy and scope economy, it could be explained that concentration raise samples' gross profit rate, but the drop of revenue could not be explained. Restraining revenue and facilitating gross profit rate shows character of oligopoly power. Sum up, R&D conduct and market structure all exert complex function on performance, in which efficiency factor and oligopoly power work together.

B. Market Structure Related Analysis

Argument of different hypotheses on market structure focuses on whether performance determinate structure. Structure index will be explained variable and others will be explanatory variables in following tests to verify above argument.

1) First, ordinary least square method and t-test are done with GDP, Policy, Market and RDR being explanatory variables, and CR10 being explained one. The result is as (4). GDP and Market have significant influence on CR10.

$$\hat{CR10}_t = 0.849 + 3.45 * 10^{-6} GDP_t + 0.001 Policy_t$$
$$- 0.0002 Market_t - 0.444 RDR_t \tag{4}$$

(3.986)*** (1.861) * (1.613) (-3.902) *** (-0.360)

$$R^2 = 0.642 \quad \bar{R}^2 = 0.499 \quad F=4.488 \quad D.W.=1.173$$

Note: Residual series has no unit root by ADF test and is stationary.

2) Second, according to above OLS result (4) and Granger causality test result in Table 4, further judgments and empirical analysis are given below.

i) GDP show notable positive influence on CR10 in the same term. Prosperity promotes concentration.

ii) Policy only has unapparent positive influence on CR10. But if lag time of Policy is changed from t to t-2, it become significant negative influence (Residual series is tested to be stationary by ADF test). After that lag time, the regression coefficient go back to be positive. Table 4 also shows single-direction Granger causality from Policy to DCR10. The results show complicated function of Policy on concentration, and the prior will promote the later in the long term.

iii) Market shows notable negative influence on CR10 in the same term, which proves industry performance will reduce concentration.

iv) RDR only has unapparent negative influence on CR10 in the same term.

If GPR or Market10 are used instead of Market in above multiple linear regression mode, the adjusted coefficient of determination become too little or no any significant t-value exists.

Known from above analysis and the prior GPR performance related analysis, GDP, Policy, Market and GPR have significant influence on CR10. GDP variance leads to same-direction variance of CR10. Policy has complex function on CR10, with positive to be main function. Industry revenue performance weakens CR10, but GPR could positively influence CR10. Sum up, performance has apparent influence on market structure, improvement of samples' gross profit rate will increase concentration, but improvement of industry revenue will reduce concentration; R&D conduct do not represent notable influence on market structure; In addition, standard regulation is partial to super companies, which promotes concentration.

C. Enterprise Conduct Related Analysis

Argument of different hypotheses on market conduct focuses on whether conduct is determined by performance and structure. Conduct index will be explained variable and others will be explanatory variables in following tests to verify above argument.

1) First, ordinary least square method and t-test are done with GDP, Policy, CR10 and GPR being explanatory variables, and RDR being explained one. The result is as (5). GPR has significant influence on RDR.

$$\hat{RDR}_t = 0.202 + 5.16 * 10^{-7} GDP_t - 5.43 * 10^{-5} Policy_t$$
$$+ 0.037 CR10_t - 0.285 GPR_t \tag{5}$$

(4.245)*** (1.687) (-0.718) (0.815) (-2.371) **

$$R^2 = 0.435 \quad \bar{R}^2 = 0.208 \quad F=1.921 \quad D.W.=1.344$$

Note: Residual series has no unit root by ADF test and is stationary.

2) Second, according to above OLS result (5) and Granger causality test result in Table 4, further judgments and empirical analysis are given below.

i) GDP only shows unapparent positive influence on RDR in the same term. Under prosperity, enterprises may view development prospect with optimism and increase R&D intensity for the long term development. Table 4 shows double-direction Granger causality between DGDP and RDR. The result not only shows promotion function of prosperity on R&D input conduct, but also indicates facilitation of economy by increasing R&D investment in telecom infrastructure.

ii) Policy only has indistinctive negative influence on RDR in the same term. But if lag time of Policy is changed from t to t-2, the coefficient becomes positive.

iii) CR10 only shows unapparent positive influence on RDR in the same term. Referring to structure related analysis.

iv) GPR has significant negative influence on RDR in the same terms. But if lag time of GPR is changed, it become positive influence in t-3, and significant positive influence in t-4 (Residual series is tested to be stationary by ADF test), which is similar to prior analysis between RDR and GPR. This result possibly indicates that continually improved gross profit rate could lead to enhancement of R&D intensity.
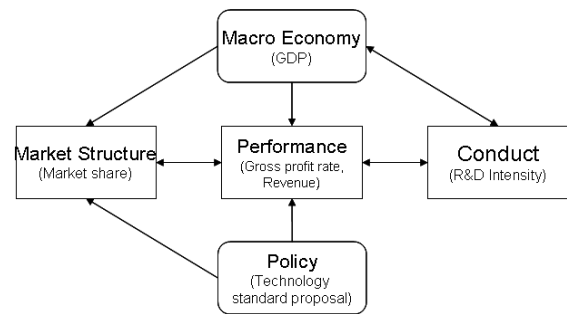
If Market10 or Market are used instead of GPR in above multiple linear regression mode, no any significant t-value exists.

Known from above analysis and the prior performance related analysis, GDP and GPR have significant influence on RDR; Market structure does not have significant effect on conduct of R&D input; Standard regulation has complex and unapparent effect on conduct of R&D input; Gross profit rate represents significant negative influence of R&D intensity in near periods, but positive function on it in the long term. The reason is that R&D invest may reduce performance in the near future, which may lead to that the improvement of performance could not promote R&D intensity in the near future. Sum up, performance has apparent influence on conduct, and structure has no significant influence on it.

V. Conclusion and Suggestion

In summary
(1) R&D conduct shows important influence on performance, which is negative in the prior stages and positive in the far future. Long cycle of R&D activity and great invest on it lead to this character. Ren Zhengfei in Huawei Technology indicated that output of R&D activity for an application-type fundamental patent need 2 to 3 year and more time is needed before it becomes effective [18].
(2) Gross profit rate performance of samples will promote concentration significantly, but revenue performance will reduce it apparently. Concentration will facilitate gross profit rate of samples but reduce revenue, which represents oligopoly power in a way.
(3) Macro economy boom will promote performance, R&D conduct and concentration, and it can also be impelled by R&D conduct.
(4) Standard policy has significant positive influence on revenue performance, but its positive function on gross profit rate happens late; Policy standard shows complicated function on concentration, mainly with positive function, which shows more benefit to super companies. Above relations are shown in Fig. 2.

Note: Real line represents notable influence shown in OLS and Granger Causality test; Arrowhead represents direction of the influence.[5]

Fig. 2   Relations among S-C-P and external variables.

According to above conclusion, suggestion for development of industry and enterprises are as below.
(1) Though with driving force on economy and far future performance, R&D conduct spends much and works late, and weakens performance in the near future. Enterprise should pay more attention to the long term and ensure R&D investment, and Governments should support R&D conduct and give preferential policies to it.
(2) In middle-low oligopoly market, performance and structure have influence on each other. Governments should not regulate concentration structure brought by improvement of performance and promote competition to reduce possible oligopoly conduct.
(3) Technology regulation has lagged influence on performance and structure. Reasonable technology regulation should be established to promote industry performance and improve industry concentration structure.
(4) On the whole, in middle-low oligopoly market, market structure and R&D conduct could all influence performance. Scale advantage from concentration should be exerted and disadvantage from it should be avoided. At the same time, R&D conduct should be promoted for the long term performance and the macro economy.

Acknowledgment

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[5] Above conclusions could not exclude following possibility: R&D conduct may be influenced by other external factors, e.g. high density of technology of this industry; other kinds of conduct and performance may lead to different types of relation among S-C-P and external variables.

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