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**Quality Theory and Strategy**

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# World-oriented Research on China's Quality Problems

## ----- Forward to the *Journal of Macro-Quality Research*

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China quality needs construction, especially the academic construction. The publication of the *Journal of Macro-Quality Research* is one foundation project implemented by Wuhan University Institute of Quality Development Strategy to promote the academic construction of China quality.

The *Journal of Macro-Quality Research* is approved by the State Administration of Radio, Film and Television, and is an academic journal publicly issued home and abroad. Today public publications have become scarce resources, and the reason why the *Journal of Macro-Quality Research* gets approved is its academic positioning. China is not short of journals in quality field, but has no truly academic journal. The academic research on quality, especially the public issue of academic papers is of significant meaning to China's quality construction. Although many journals have published some academic papers on quality research, faced with the complex situation of China quality, both the paper quantity and quality, especially the formation of common academic norms need further innovation and development.

The *Journal of Macro-Quality Research* aims to provide a standard, authoritative and high-level publication platform for Chinese scholars' research on quality; collect a series of original, pioneering and creative research achievements; stir up the emergence of new problems and solutions, new methods and tools, new ideas and theories in the field of quality research, and cultivate a team of internationally influential Chinese quality scholars and experts.

The objective of the *Journal of Macro-Quality Research* aims to become the door to academic studies on China's quality and the think tank platform of resolutions to China's quality, and finally become the first-class academic journal with the international influence.

Chinese studies, especially those on relevant problems in contemporary China, have attracted more and more scholars' attention and participation; but in Chinese studies, the issue of China quality is undoubtedly an important object of study. Great power quality, binary quality and transformation quality superpose with each other and constitute the unique phenomena of China quality which cannot be found in other countries. In terms of the "issue of China quality", our journal focuses on studying the internal law of this phenomenon, and endeavors to provide a scientific explanation for it, especially ways and policies of governing China quality. Therefore, our journal advocates studies facing realistic problems of China quality, form the academic form of China quality study, and construct the Chinese school of quality study. Chinese scholars should have such academic confidence, because we are confronted with the most interesting and unique quality problem in world. The science explains problems; if you find problems, you own the most valuable resources to stand in the academic frontier. Chinese scholars' most valuable treasure is the first-hand experience of realistic China quality problems. Our journal is devoted to publishing research paper on China quality problems, and we are firmly confident that new contributions of general theories will be made to the world academic circles.

The most prominent feature of China quality problems lies in “the macroscopic property”. The influence of macroscopic factors can be found behind each quality phenomena, including social and economic development strategies, national laws and policy systems, citizens’ behaviors and cultural under special national situations, the information dissemination and management in the era of big data. Only through studies on the influence of those macroscopic factors on quality problems, can the phenomena of China quality be explained and can effective quality measures be proposed. Our journal particularly encourages interdisciplinary studies on the problem of China quality, and has set up relatively fixed columns: quality theories and strategies, quality system and laws, quality and economic development, quality statistics and analysis, quality observation and cases, etc. our journal will stick to standardized academic research method, put forward conclusions of general meaning through the empirical observance and data statistics of problems, and conduct scientific verification of those conclusions.

“China quality observation” is chosen as the research topic of the first issue of the *Journal of Macro-Quality Research*, so as to perform the tenet of our journal, face up to realistic China quality problems, adopt the inter-disciplinary research method, and endeavor to propose creative theoretical viewpoints and practical measures on the basis of empirical data analysis. “China quality observation” is a huge research project targeted at China quality problems, in which all colleagues in Wuhan University Institute of Quality Development Strategy jointly participate and have worked for three years, and it is also the achievement of the Major Project of National Social Science Foundation of China “Study on China Quality Safety Evaluation and Network Prewarning Method”. This paper research covers various aspects of China quality problems, the analysis of economic perspectives, the research of legal perspectives, the discussion of public management, the data statistical analysis and case analysis. The common research topic of all papers is to explain the current situation of China quality by the inter-disciplinary research method.

From some perspectives, Chinese scholars are quite lucky, especially those studying problems of China quality because we are faced with unique realistic problems of China quality which cannot be found in other countries. Our high-quality research papers will not only provide the scientific support for the resolution of China quality problems, but also contributes Chinese scholars’ efforts to the innovation of the quality science in world. We sincerely invite overseas scholars to join hands with us, and wish that through our unremitting efforts the *Journal of Macro-Quality Research* will become the footstone for the academic progress of China quality, and innovative ideas of China quality will lead the progress of China quality practices.

President of Wuhan University Institute of Quality Development Strategy

Cheng Hong

Chief Editor of the *Journal of Macro-Quality Research*

June, 2013

## Research on Some Important Issues Concerning the Strategy of Prospering the Nation with Quality

Cheng Hong, Chen Xinzhou, Luo Lianfa

**Abstract:** The idea of prospering the nation with quality is commonly acknowledged by the whole society, but it has not ascended to a national strategy to be consciously practiced. At present, the theory and empirical study concerning prospering the nation with quality mainly focus on the quality itself rather than prospering the national through quality. Therefore, this paper raises the strategic framework of prospering the nation with quality and focuses on the research of major issues influencing the strategy implementation in 10 aspects of necessity: environment, objective, contents, market, society and government, etc, that influence the strategic framework, thus the fundamental theory, logical relationship, approaches and institutional system to realize its objective through quality are established.

**Key words:** Prospering the nation with quality; National Strategy; Major issues

The Eighteenth National Congress of the Communist Party of China put forward that a well-off society in an all-round way will be established when the Communist Party of China exists for 100 years, and a prosperous, democratic, civilized and harmonious socialist modernization state will be established when New China exists at that time. In order to achieve the two objectives, it shall maintain the sustainable development of economic society, especially improve the income level of the people based on large amount of economic aggregate. However, the development mode characterized by large-scale quantification of resources is difficult to sustain and support the above objectives completely. Therefore, the state put forward to change the economic development mode in top-level design. Such meetings as the Eighteenth National Congress of the Communist Party of China, the Third Plenary Session of the Eighteenth National Congress and the Central Economic Working Conference in 2013 constantly emphasized that transform the foothold driving development to improving quality and efficiency. However, the realization of China economic society development does not make economic development base on improving quality, namely the quality has not become the new drive of economic society development. Prospering the nation with quality is more exposed as an idea, and even in risk to descend to be a mere slogan. Prospering the nation with quality has not been established as a national development strategy practiced by the whole society. The reason is lacking scientific theory support and specific path design in transforming the idea to strategy, not lacking identification about the idea. The more prominent issue is that the current theoretic and policy research pay much more attention to quality, rather than discussing how to achieve the objective of prospering through quality, establishing the logical framework and specific policy through quality, and determining the correlation between quality and power. The paper researches the issues that: construct internal logic relationship between quality and power and discuss several major issues to achieve the logic, in order to fully prove the quality can prosper nation in theory and policy, and promote the transformation of turning “prospering the nation with quality” from an idea to a strategy. Above all, the establishment of any strategy is proving the necessity of the strategy in fundamental theory and scientifically assessing the strategic environment, in order to put forward objective and emphasis of strategy. On this basis, it shall also research the main contents, approaches, specific methods and institutional support of strategy implementation. According to the general requirements of above strategic theory, this paper shall demonstrate the necessity of “prospering the nation with

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quality” in fundamental theory, especially assess the environmental requirements to implement “Prospering the nation with quality”, in order to determine the objective and emphasis of “Prospering the nation with quality”; the paper shall also research the decisive effect of market on quality and how to make market become the fundamental path to achieve “Prospering the nation with quality”, such as how to make the market achieve high quality and high price for enterprises, how to make consumers become the leading force of quality development, how to make quality data decrease the dissymmetry of quality information in market transaction, etc.; as for the specific approaches, it shall take full advantages of social resources, such as how to make standard organization become a important force to drive enterprise quality innovation, how to build a perfect quality intermediary service system, etc.; finally, the realization of strategy also needs institutional support, including quality integrity as “soft system” and government quality governance system as “hard system”. The above contents constitute the basic strategic framework of “Prospering the nation with quality”, as shown in Figure 1.

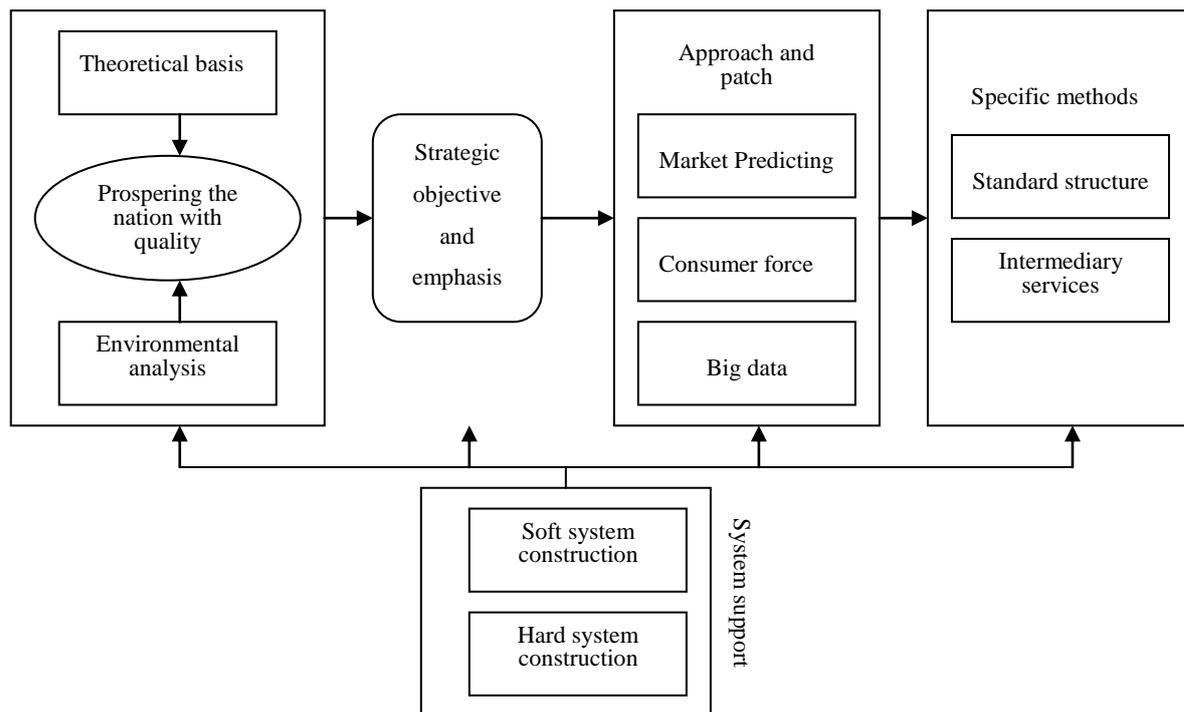


Figure 1 Strategic framework of “Prospering the nation with quality”

The main contents in the above strategic framework constitute 10 major issues influencing the realization of prospering the nation with quality, which are also an important party of power objective and a key point of internal logic relationship between quality and powerful country. The paper mainly researches the 10 major issues concerning Prospering the nation with quality as follows.

## I. Quality is an important drive to achieve power objective

Quality plays an irreplaceable role in all kinds of factors prospering the nation. The core of a powerful country is that the GDP, especially GDP per capita rank the forefront in the world. It shall input various development elements in order to improve the level of GDP and GDP per capita. The research of economics theory shows that the contribution rate of traditional elements such as land, capital, labor force, etc, to economic development is decreasing, but the innovation elements including technology, knowledge, management, etc, are contributing more and more to economic development (Solow, 1957). Amidst such innovation elements, technology & science, education and talents are significant to national economic development and especially the country strength. However, technology & science is not an innovation factor owned by every enterprise, and education and talents play a long-term role in enterprises. Whatever it is, technology & science, education or talent, the factors

are finally shown as improving specific products, service, environment and engineering quality. The quality factor is more general and realistic. As for generality, regardless of advanced technology, an enterprise still can produce general and mature products of higher quality level to obtain higher income. As for reality, the quality management and standard are mature in many fields. One normal staff may create high-efficiency and high-quality products with proficient quality skill regardless of advanced technology. As a result, amidst all economic development elements, quality is a most general element, which is also a comprehensive reflection of various input elements. Provided the fundamental factor which is quality is grasped, a backward country can become a powerful one and the national economic can be increased constantly.

The quality can greatly improve the input and output efficiency of China. The protruding reason why China is not a great powerful country and nation is that the input and output efficiency is too low. Total factor productivity is a common index reflecting input and output efficiency, mainly referring to the portion that the output still can be increased when the input factors (such as land, capital, labor force, etc.) are constant. According to relevant calculation, the relative value of total factor productivity of China at the end of 2011 was 0.37, while at the corresponding period, Japan was 0.71, Germany was 0.82 and Switzerland was 0.94. Data source: Penn World Table 8.0, <https://pwt.sas.upenn.edu/>. The values are relative ratio to that of America, and the total factor productivity of America of that year is regarded as 1. That is to say, China's input and output efficiency is only 40%~50% of developed countries. According to the data from World Bank, the national income produced from unit energy is USD 4, while Germany and Japan are USD 9 and Switzerland is USD 12. The average output of labor force in China at the end of 2012 was USD 10,445, which was 12.9% of Germany, 11.4% of Japan and 10.2% of America. Data source: the website of World Bank, <http://databank.worldbank.org/data>. The output value is calculated based on the purchasing power parity in 2005 (USD). The above data shows that regardless of measurement dimension, Chinese input and output efficiency is far behind that of the world power. Though there are many other factors, the most important reason is that, output fails to achieve higher price for low quality level. The improvement of economic efficiency refers to that more output can be achieved with lower input. When other conditions are constant, higher quality level can achieve more output out of the same input. Amidst the market where the supply of most products exceeds demand, the most important expression of product differentiation is quality level. Although the products are similar in function and technology, the price difference will also happen because of different consumer experience in quality. As a country with deficient resources, China has no ability to obtain growth with large input, where the development can be obtained depending on improving output efficiency of resources. The improvement in efficiency is based on higher quality in similar products. From the perspective of total resource factors, economic growth is impossible to present higher rate. But China can still maintain higher economic development speed when analyzing resource output efficiency from the perspective of quality. The difference is caused by the improvement in quality level. Only when China follows the path of quality innovation, can China become a true power.

Quality is a common factor for world powers to succeed. Regardless various factors, quality is a common factor for world powers to rise sharply. Only developing for several decades, after World War II Germany rapidly developed into a world power from a heap of rubble. Looking back to the development history, the most important secret is quality. Germany boasts 1,130 "hidden champions" in traditional fields, such as electron, automobile, machinery, chemistry, etc. According to the definition made by Hermann Simon, the originator of "hidden champions" research, "hidden champion" refers to the enterprise which meets the following three standards: market shares rank top 3 in the world or top 1 in the continent; annual sales is lower than USD 4 billion; the popularity is low in the public. (Venohr & Meyer, 2007) The enterprises occupy the global market based on the quality reputation for decades, making the enterprises maintain persistent competitive capacity and high price and become the new force supporting the export growth in Germany. The economic growth supported by powerful product quality in Germany makes Germany a "stabilizer" of European economy and successively defended against the impact of financial crisis and European debt crisis. Japan, also is the vanquished country in WWII, cultivates a multitude of enterprises (such as Toyota, Mitsubishi, Sony, etc.) with first-class quality through a series of material policies of "prospering the nation with quality" (such as Industrial Standardization Law, Enterprise rationalization Promotion Law, Deming Quality Award and comprehensive quality management, etc.). Therefore, the growth rate of GDP and GDP per capita exceeded 10% in most years during the 30 years after WWII. Data source: Japan Statistics Bureau, Ministry of Internal Affairs and Communications <http://www.stat.go.jp/index.htm>. Japan becomes a world economic power second to US. Economic stagflation appeared in US

in 1970s-1980s, making Americans realize that the decrease in productivity is largely caused by the deficiency in quality and the low efficiency. The government decision-makers represented by President Regan, together with enterprise senior managers and university experts specially convened “White House Productivity Conference” in 1983 through one-year preparations and studies, specifying the important role of improving quality in productivity and preliminarily generating the image of establishing National Quality Award. Data source: Report to the President of the United States on Productivity Growth: A Better Life for America, 1984. Afterwards, with the unremitting effort of some members of US congress and enterprises, President Regan signed the act of Malcolm Baldrige National Quality Award in 1987 and launched out the method of “excellent performance” as one of three quality evaluation systems in the world. Quality has been placed in national strategy level and become an important factor to promote increase in America economy. The implementation of quality strategy plays an important role in the promotion of American economic strength. American products backed to the front of international trade compete through quality in 1990s. The average annual growth rate of export volume in 1990s was 7.28%, 1.32% higher than that of 1980s. Data source: according to International Monetary Fund, the data is calculated from the database of *World Economy Outlook 2013* published by International Monetary Fund. The promotion of quality reversed the tendency of decreasing labor productivity in US. The average annual growth rate of total factor productivity was 1.4% in 1990s, 0.7% higher than that of 1980s. Data source: Penn World Table 8.0, <https://pwt.sas.upenn.edu/>. According to the estimation of US Department of Commerce, if the government invested 1 dollar to promote Malcolm Baldrige National Quality Award in 2001, it would obtain USD 207 as benefit. The proportion had increased to 1:820 in 2011. Data source: US Department of Commerce National Standard and Technology Institute, <http://www.nist.gov/baldrige/25th/upload/Milestones.pdf>. US cement the status of world power through implementing the strategy of prospering the nation with quality. The above facts fully prove that quality is not only an important sign of world power, but also a universal law leading to success.

## II. It is urgent to promote the strategy of prospering the nation with quality from the perspective of strategic environment in China

Quality is a new power of economic society development in the future. As a big country with 1.3 billion populations, China is still troubled by the problem of development, which is our fundamental problem. Without expansion of economic aggregate scale and increase in per-capita income, the country will not become powerful. Several factors supporting our economic growth are faced with great challenges. Demographic dividend and per-capita land resource are decreasing slowly. The input of natural resources will not meet the requirements of greater economic aggregate in the future. The carrying capacity of environment is approaching the limit. Thus, it shall find out new motive force of development in order to promote the further development of economic society. The reform in system innovation is a very important new force. Similarly, quality also is a new force of economic development in the future. The total input of resource factors is not low, while the difference is in low output efficiency. Therefore, though the total input is constant, the economic aggregate will also be enlarged through improvement in quality. According to relative estimation, if total factor productivity increases 1%, GDP will increase 1.75% accordingly. Data source: Bai Chongen’s speech in “Chang’an Forum” No. 232 with the title of “Income Distribution and Economic Growth”, [http://jjckb.xinhuanet.com/opinion/2013-05/27/content\\_447030.htm](http://jjckb.xinhuanet.com/opinion/2013-05/27/content_447030.htm). If our total factor productivity increased to the level of Japanese (increased by 92%) through quality innovation, the GDP will increase 1.6 times. If the total factor productivity increases Germany level (increased by 121%), the GDP will increase 2.1 times. Data source: total factor productivity level of each country is calculated based on Penn World Table 8.0, <https://pwt.sas.upenn.edu/>. The above analysis proves that if the total input of factors is stable, the total factor productivity will increase through quality innovation, and GDP will increase at least 1 time from the current level.

The promotion in international competition level must be achieved by the development of the quality. Power is a concept of international comparison. If a nation boasts greater economic aggregate and per-capita income level, it indicates that the power boasts powerful international competition. Amidst international competition, whatever it is political strength or military strength, the basis behind is economic strength. The fundamental of economic strength is from the international trade of a country, which may produce high-quality products. Although China has become the first export country in the world, whether

product competitiveness or additional value is still far behind that of world powers. As for processing trade export, the rate of national additional value is 20%; as for communication equipment and computer, the rate of national additional value is 16.6% and 8.2% respectively. Data source: Sina Finance and Economics, <http://finance.sina.com.cn/roll/20120830/000312992698.shtml>. Upon selling one iPhone, US occupy 60.8% of the profit and China, as an original manufacturer, obtains 1.8% profit. Data source: Kraemer, K.L., Linden, G., and Dedrick, J., 2011: Capturing Value in Global Networks: Apple's iPad and iPhone, [http://www.investmentoffice.com/io/Investment\\_Thoughts/Beyond\\_Finance/Capturing\\_Value\\_in\\_Global\\_Networks\\_Apple\\_s\\_iPad\\_and\\_iPhone.php](http://www.investmentoffice.com/io/Investment_Thoughts/Beyond_Finance/Capturing_Value_in_Global_Networks_Apple_s_iPad_and_iPhone.php). As a result, in order to improve international competitive ability of China, regardless of various approaches and paths, the most fundamental way is improving the quality level of Chinese products. It has been a fashion in the world that "Made in Germany" and "Made in Japan". In fact, it has become a brand and sign of both powers, which is supported by high quality. The promotion in quality level will not only promote the competitive ability of China, but also obviously perfect the international image of China. Quality is the best means to obtain competitive advantages in peaceful age, which is also the most visual method to prove the national power. If the international image of China will be matched with power, it shall make the world's people recognize that "Made in China" equals to high quality. The realization of "income doubling plan" shall depend on the improvement in quality. The most important point of Strategy of prospering the nation with quality is "enriching people" rather than simple "prospering the nation". Fundamentally, the final objective of Strategy of prospering the nation with quality is to enrich Chinese people. The Eighteenth National Congress of the Communist Party of China put forward that the specific objective of future development is that "the GDP and per-capita income of urban and rural residents will be doubled in 2020 than that in 2010" ("income doubling plan" for short). In order to realize the objective, the per-capita income shall keep an about 7% growth rate. Faced with the increasingly intense resource constraint, the quality shall be regarded as a new drive of economic development. In order to realize the objective of "income doubles", it shall set out from the following two aspects: one is enlarging the economic aggregate and establishing a solid foundation of national income; second is making the income fairer and enabling the whole society to share achievements of economic development. Quality development plays an important role in enlarging economic aggregate and achieving income fairness, which is a key element to realize the objective of "income doubling plan". On one hand, quality innovation can create new demands and promote effective needs. The increase in additional value of products will not only improve potential output under the premise of no increase in factor input, but also make the increase of national wealth sustainable. At the same time, the government may possess more financial resources for income distribution and adjustment during the process of economic growth, thus the income of middle and low income group will be improved. On the other hand, quality promotion will generate huge demand on professional technical personnel, promote the economic and social status of labors, increase the proportion of remuneration for workers in national income and accelerate the realization of equitable distribution objective. The leading countries in quality are also high in remuneration for workers. According to the statistics provided by University of Pennsylvania International Comparison Center Database (PWT), as for the proportion of remuneration for workers versus GDP at the end of 2011, America was 62.2%, Germany was 60.9%, Japan was 52.4% and China was 41.9%. Data source: Penn World Tables (PWT) of University of Pennsylvania, <https://pwt.sas.upenn.edu/>. The correlation between quality level and proportion of remuneration for workers versus GDP is completely positive. That is to say, if one country obtains more competitiveness on quality, the country will increasingly depend on labors, thus the income of labors will be greater. Theory and practice prove that: quality development plays a positive role in the increase in national wealth and especially the improvement in remuneration for workers. In order to realize "income doubling plan", China also need to depend on quality development.

### III. National income and enterprise quality ability are the core objectives and key content of strategy of prospering the nation with quality

The increase in national income is the core objective of strategy of prospering the nation with quality. As for the strategy of prospering the nation with quality, quality is only the means. The fundamental objective is to enrich the nation rather than

promoting quality. Prospering the national contains multiple objectives, such as economic prosperity, social stability and people happiness. The most fundamental and core objective is the great increase in national wealth, namely the continuous improvement in per-capita income. Without increase in national income ranking top in the world, the national strength will lose internal value. The essence of national strength is to make people happy based on higher per-capita income. From the perspective of practice, any indicator system evaluating the comprehensive strength of a country will place the per-capita income in a vitally important position. HDI issued by the United Nations contains three indexes: income, education degree and life expectancy. And also, it is found that the relative coefficient between per-capital income level and its HDI reaches 0.70. Data source: calculated based on *Human Development Report 2012 published by United Nations Human Development Program*. It presents highly positive correlation. The high human development index is hardly to build based on a lower per-capita income. High-quality living index established by OECD emphasizes non-income indexes (such as employment, leisure, etc.), while it also pays more attention to the evaluation of national income and incorporates it into assessment index. Per-capita GDP index of the world powers, such as US, Germany, Japan, etc, rank top in the world. The GDP of China in 2012 was USD 8,227 billion, while the per-capita GDP was only USD 6,075.92, ranking 87th among 188 countries. Data source: *World Economy Outlook 2013* database published by International Monetary Fund. Amidst United Nations Human Development Index issued latest, our per-capita national income ranked 90th among 187 countries. Therefore, in order to build a powerful country, the primary objective is focusing economic growth on the increase in per-capita national income. All strategies shall closely center on the objective. The improvement in quality can improve resource output efficiency fundamentally, make each enterprise share market benefits brought by innovation, lay a solid foundation for the increase in national wealth and embody the professional technology input of labors in economic development, thus the remuneration for workers will increase and the achievements of economic development will benefit most labors. Therefore, the strategy of prospering the nation with quality is especially important because quality is a fundamental factor to increase national income and also an important sign of a happy life.

The improvement in enterprise quality ability is also an important content of prospering the nation with quality. In order to achieve the fundamental objective of constant increase in national income, the premise is that the enterprise as quality provider shall be competitive in quality. Whatever it is, the objective and approaches involved in the strategy of prospering the nation with quality, or specific means and system support, it will be based on the powerful quality ability of enterprise. Enterprise quality ability refers to that the enterprise shall boast core competitiveness focusing on quality and leading quality level in the same industry. The objective of prospering the nation with quality will be achieved only when the quality level of microcosmic enterprises is promoted and higher national output is created. The quality ability of an enterprise is the basis determining other factors in quality strategic framework. The main contents of establishing market mechanism in high quality and high price is to establish the dominant role of quality, namely the enterprise is required to establish a mechanism compatible between incentive and constraint (Li Han, 2013); the starting point and foothold of product comparison experiment is to make consumers monitor product and service quality by realistic means, thus the enterprise will be driven to improve quality; the implementation of group standard is to make enterprise guide industry innovation utilizing standards, in order to improve the innovation level of the whole industry; the purpose of quality soft culture construction centering on sincerity and modern quality governance system and governance ability construction is to create a better quality development environment for enterprise. Therefore, the most important content of prospering the nation with quality is promoting the quality competitiveness of enterprise. From reality perspective, an important symbol of national power is that, the enterprises in the country boast powerful quality competitiveness. Whether America, Germany or Japan, their strong national power are based on massive high-quality enterprises. Taking US Apple Inc. as the example, the company created a miracle of enterprise development regardless of a traditional and surplus industry. iPhone 1 was issued in 2007. The business income was USD 156.5 billion in 2015, while the net profit was USD 41.7 billion that year. Data source: Tencent [http://tech.qq.com/a/20130724/012249\\_1.htm](http://tech.qq.com/a/20130724/012249_1.htm). The success of Apple Inc does not depend on breathtaking technology innovation. The company idea is creating a company handing down to next generations. The company also insists on the quality idea of creating great products (Walter Isaacson, 2011). Therefore, all contents in the strategy of prospering the nation with quality are centering on the improvement of enterprise quality

competitiveness. Only when Chinese enterprises boast leading quality core competitiveness in main industry fields of the world, can the strategy of prospering the nation with quality be achieved indeed.

#### IV. High-quality and high-price market mechanism is the system foundation of national power

High quality and high price is an important sign of mature market economy. What China implements is socialist market economy. The practice after the reform and opening-up policy fully proves that market economy is the most important selection of China economic development. However, market mechanism does not play a decisive role indeed, showing that China economy has not achieved high quality and high price actually. In addition to adjusting resource allocation and achieving balance between supply and demand, the other important function of market is to discover high-quality products. That is to say, the suppliers providing high-quality products as the market requires will obtain the best evaluation based on price. Only in such way, will the market entity be simulated to produce high-quality products and the efficiency of resource allocation will be optimized. In case of information asymmetry, the inferior goods will squeeze quality goods out of market because the price of two kinds of goods can not be distinguished effectively (Akerlof, 1970). Therefore, the failure of both high quality and high price is the main reason for market dropping and even disappearing. The fundamental reason influencing the true implementation of high quality and high price is too much government intervention, especially the protectionism of some local governments. In order to maintain the narrow local benefits, the governments take administrative means at any cost and hinder the presentation of high-quality products artificially to protect behindhand product quality, thus the high-quality products will not be developed indeed. On the other hand, government implements single standard identification policy, making the enterprise fail to transmit high-standard quality to market and even take the basic standard established by the state as an optimum choice. The decisive role of market in resource allocation is that the high-quality providers can obtain more resources in essence. Thus, the use ratio of resources will be increased and the national power will be strengthened.

The key point of market mechanism is to achieve the principle of “survival of the fittest”. The national strength is positively correlated with market competition generally. If the market competition is more intense, the national wealth will be richer. Because market competition can screen out providers of high-quality and inferior-quality products, thus the providers of high-quality products will obtain higher price evaluation and the providers of inferior products will be eliminated. Only when the market competition mechanism of “survival of the fittest” is formed, will the dominate status of quality be established. Under market economy with free competition, only high-quality products can obtain higher market profits, while the low-quality products can only exit market. If every enterprise is stimulated, the whole social production productivity will be increased greatly. Market competition is the best means to optimize resource allocation. Under the competitive mechanism of “survival of the fittest”, the market will weed out product producers failing to meet market requirements, making capita, labor force and other factors flow to the producers of high-quality products, thus the resource waste will be reduced and the output efficiency will be increased. Market competition mechanism of “survival of the fittest” is also an important source of motivating national vitality and competitiveness. The world powers own batch of energetic and competitive enterprises. Under intense market competition environment, the enterprises have powerful crisis awareness, driving them for quality innovation. Only when the products and service meet consumer requirements, can the enterprises survive on market. The world famous enterprises, such as Apple, Samsung, etc, are active in quality innovation. The competition between enterprises centering on product quality is the foundation that driving national innovation. National strength needs solid micro-foundation, which shows that the market mechanism can select the production entity and enlarge the country macroscopically based on micro entities providing high-quality products.

Implement different standard and label system as for enterprise product identification. In order to possess enterprises producing high-quality products, the powerful countries are necessary to manifest the quality level of enterprise products. Thus, it will not motivate the enterprises to produce high-quality products and provide better basis for consumers to select products. In order to achieve the objective, it shall clearly reveal the quality standard of different products in product label, making the label of quality standard in different levels become the visual basis of consumers to select products. It shall reform the system that label government standard on product identification, and the government standard can be the only reference for enterprises to produce products. High-level standards higher than government standards used by the enterprise can be identified to reveal the

difference in quality. It shall note that the high-level standards higher than government standards are approved by the market, industry and society. Only the standards approved by the society can be identified in product identification. The product labeling system meeting national basic standards and reflecting difference can effectively select fittest market mechanism and encourage enterprises to adopt more high-level standards, thus the national strength will be enhanced persistently.

## V. Product comparison test is an important means to establish a powerful country

A powerful nation must have massive consumers. National strength and especially national economy strength are not abstract ideas, which mainly depend on the active consumers on market. Only active consumers can guide enterprises to produce high-quality products and eliminate producers producing inferior products. The consumers not only select products with different quality with “intangible hands”, but also monitor the behavior of producers with “tangible eyes”. Regardless of the different characteristics of consumers in world powers, one common feature is that they have powerful action capability. The product quality will be promoted and the industrial and economic development will be improved just by the rigor and picky consumers in world powers (Michael Porter, 1990). Germany consumers are famous as nitpicking. The common family in Germany will compare price as for equal quality and compare quality as for the same price, making the products are rigorous and particular in quality. Japanese consumers are characterized by variable demands, making Japanese products lay emphasis on quality improvement and innovation. American consumers have strong right awareness. In the case of quality problems, they are used to adopt law to protect themselves, making each producer respect the consumers as the god. That is to say, the excellent quality in Germany, Japan and US is created under the pressure of consumers. The powerful consumers are the backroom drive of world powers.

Product comparison test is an important method to strengthen consumers. In order to strengthen consumers, it shall take relative measures, including legislation based on sovereignty rights of consumers, compensation system for product harm, system of encouraging collective action of consumers, etc. However, most methods are based on negative protection. The post-event protection can not reflect the leading role of consumers in product quality. The product comparison test method used in US, Europe, Japan and other developed countries and regions can reflect the motivation and restriction role in product quality and manifest the strength of consumers. Comparison test refers to a kind of action testing the product or service in the same type and different brands with the same standard and regulation, in order to compare products or service. The oversea investigation shows that the quality information issued by comparison test organization plays a decisive role in consumption option and directly influences the marketing results of manufacturers (Silberer, 1985). The reason is that the consumer is core of comparison test, the main income source engaged in comparison test organization, the main formulator of test standards and reference system simulated in test method. The interest relationship guarantees that the comparison test organization can take actions representing consumers. Comparison test provides the consumers with quality information disclosed fully. There are hundreds of organizations engaged in comparison test in these powers. They operate independently and competitively. Each organization will choose some product subdivision fields based on the comparative advantages, presenting a competitive and complementary situation between each other. The quality information of consumer goods can be fully disclosed from different sides. Comparison test takes the requirements benefiting consumers and higher than national standards as the test reference, in order to evaluate whether the product or service quality can meet consumer requirements. When most consumers approve and accept the standard, in order to achieve economic benefits, the enterprises will also be urged to accept the marketization standard higher than above standard, thus the quality level is promoted. The practice of world powers such as US, Germany proves that product comparison test truly reflects consumer rights, which can not only promote enterprise quality based on consumers, but also promote the enterprises to strive for excellent quality based on higher requirements of consumers.

Construct social mechanism driving comparison test. Comparison test is not only the quality measurement method based on consumers, but also an important social mechanism of prospering the nation with quality, which will drive the development of social organizations and promote the non-aggressive competition between social public welfare organizations. Comparison test organization is neutral independent of producers and consumers. The comparison test is able to propagandize product quality, thus the non-profit social organizations will become the suitable organizations of comparison test. Therefore, the government shall promote consumer organizations to engage in comparison test, in order to test the products and services with higher

coverage nationwide. At the same time, encourage social organizations, non-profit organizations and companies to engage in comparison test, in order to achieve non-aggressive competition. It shall assist the organizations in development through tax reduction and exemption, fiscal subsidies and other policies. The government shall also try to perfect the legal and standard systems that comparison test organization represents consumer benefits, in order to guarantee the legal status and intellectual property of entities engaged in comparison test. In case of conflict and legal disputes between results of comparison test and enterprise benefits, judicial department shall support the comparison test organizations to set out based on consumer benefits under the premise of scientific basis, in order to establish their test standards, methods and results. The broad development of comparative test organization will make the quality powers possess extensive social foundation and constitute an important unit promoting modernization of national governance capacity.

## VI. Big data of quality is an important strategic resource for the state

The strategy of prospering the nation with quality requires the strategic resources of big data of quality. The big data in internet era have become an important strategic resource in one country. US, Europe and other world powers will regard big data as important as oil in the future. At present, big data have generated significant revolutionary influences in various aspects, such as commerce, medical treatment, government, education, health, humanity and society. (Sch önberger, 2012). Amidst various types of big data, the big data in quality is one of the most important data types. Big data in quality is the core of economic data. What economic data reflects is transaction condition of products. As for product transaction, all things of price formation, amount of product transaction and change in product transaction structure reflect product quality in effect. Big data in quality is also the basis of social data. The changes in social income and requirement as well as benefit preference of different levels and groups reflect their position and behavior in quality field to a large extent. Even there are various data in political level and military level, what they reflect is the data based on quality. The strategy is based on resources. No resources, no strategy. During the process implementing the strategy of Prospering the Nation with Quality, the big data in quality shall be regarded as important strategy resources, which are used to drive the macroscopic quality management and serve the microcosmic competition of enterprises.

Big data in quality can promote international trade competitiveness. In international trade, Chinese industries still remain the low end of value chain. There are many causes for the problem, while the most important one is lacking command and evaluation on big data in quality. Foreign organizations basically control the evaluation rights of product transaction quality data in international trade, and obtain higher benefits based on the evaluation rights on data. In order to promote international trade competitiveness and obtain the same speaking right on product quality as world powers, the most fundamental step is to obtain massive big data in quality and excavate big data to obtain speaking rights. International trade competition is mainly a competition about quality, while the core resource of quality competition is the competition in big data. Only with data of product and service quality, will the dominant rights of trade competition be grasped. With more quality data, one country can dominant the standard promulgation, thus the standard will be used to formulate more flexible international trade policies and protect the industrial development. In addition, with data in quality, one country will have more speaking rights in international trade. The international trade pricing of products shall be based on their quality inspection and certification. Only when more quality data is grasped, more pricing power will be owned, or the country will be passive in international trade. Therefore, during the global competition, if China wants to be a true world trade power, it shall seize the most important strategic resource – big data in quality. If big data in quality are owned, it will not only promote the quality competitiveness of Chinese products, but also promote the additional value of product quality. Based on the big data in quality, China will gradually create speaking rights in global product quality evaluation, thus it will enter into the high end of value chain concerning product competition.

Big data in quality shall take consumer information as the main source. If big data in quality applied as strategic resource, it shall obtain the most valuable quality information. Consumer is the final evaluator of product quality, therefore, the country shall build big data system in quality based on consumer evaluation. The fundamental objective of quality is to meet consumers' requirement. Consumer is the purchaser and the direct percipient of quality. What's more, consumer generally possesses the intrinsic motivation to provide true quality information, because quality information is closely related to their own benefits. Therefore, the quality data based on consumers can truly reflect quality conditions. US, Germany and other world

powers pay much attention to the big data in quality of consumers. Consumer Product Safety Commission established statistical information system about consumer injury, which is regarded as the reference of national quality safety precaution. The formulation of Germany standards and quality regulations refers most data of comparison test. The range of quality data based on consumers is very broad, which is mainly from two aspects: one is the real physical world from non-internet; the other is the virtualized internet world. Big data in quality shall obtain quality information from offline real world and online virtual world at the same time. It shall build a substantiated platform to manage and analyze the big data in quality. On one hand, it shall build quality observation and investigation network based on consumers nationwide, in order to regularly collect the data reflecting overall quality conditions. Through scientific sampling method, it selects regional and national representative survey samples. The survey contents shall include quality safety and quality satisfaction in the aspects of products, service, engineering and environment, as well as the institutional environment of quality public service and public quality; the offline big data in quality are collected from various dimensions. On the other hand, it shall build quality observation and precaution platform based on internet information. The most important part of big data is the data from internet. And big data in quality is also obtained from internet. As for the big data in quality based on internet, it mainly takes advantages of modern semantic analysis technology to timely collect and analyze the quality information published in microblog, blogs, forum and other network medias. After analyzing the correcting, it could provide risk precaution to regional, industrial and enterprise quality safety. It is entirely possible that China acquires second-mover advantages in quality field. The advantage originates that world powers and China stand in the same starting line in face of big data in quality. If big data system in quality taking consumer as main data source can be established, it may form the important strategic resources supporting national power.

## VII. Group standard motivates innovation energy of national power.

Developing group standard is the common practice of world powers. National power depends on the motivation of innovation energy. What is called taking first-class enterprise as standard, it refers to motivating innovation energy through standard guidance. US, Europe, Japan and other developed countries and regions take advantages of standardization method to control high end of value chain, namely the national power is supported through controlling high end of innovation. The standards are formulated mainly on industry alliance, professional organizations and social organizations. The standard documents voluntarily formulated and implemented by market and social entities are called as group standards. Take America as an example, American standard system mainly consists of group standards formulated by standard formulation organizations built voluntarily. At present, over 600 non-governmental standard organizations formulated about fifty thousand voluntary standards, in which 20 standard organizations formulate 90% standards throughout the United States (Breitenberg, 2009). In addition to government's technical regulations and instructions, most standards are voluntary standards formulated by social organizations. Even though the government's technical regulations lack of detailed requirements, these blanks are supplemented by voluntary standards formulated by social organization (European Commission, 1999). In addition to formulating group standards used in the industry, Japanese professional groups and industrial associations also draw up proportional national standards. Developed countries and regions pay much attention to group standards, because the standards are born according to the requirements of market entities. Besides, the standards can rapidly transform the advanced technology to standard control force, and control the whole industry chain through control standards and achieve rapid industry innovation and quality innovation.

Group standards can motivate innovation energy of the country. Group standards are formulated by users separately through alliances and other organizations. Every single step in innovation during production and operation practice compact and reflect the requirements of users in a standard way. What standard formation process emphasizes is a kind of voluntary and consensus, namely the interested parties may express their interest appeal and form a kind of institutional arrangement or regulation based on consensus through multi-layer game (Liao Li, 2013). Due to the consistent benefits between formulators and users, the group standard can be updated rapidly, in order to reflect new achievements achieved by themselves. Therefore, the full development of group standards is that give full play to innovation energy of each market entity, especially the innovation entity may enjoy the benefits from innovation achievements transforming into standard. Group standard may make the innovative enterprises maintain leading advantages in the industry. The key point of improve quality is the standards. Only when the standard brings the market benefits, will the enterprise be motivated to improve standard. Group standard reflects the newest innovation

achievements of the industry. Through using the group standard in the industry, it will obtain leading position in the industry and monopoly benefits similar to patent as the rationality compensation of innovation. Under the mechanism, all enterprises are motivated to pursue higher standards, in order to promote the quality improvement of the whole society. Group standard can timely solidify the innovation of single enterprise as industrial innovation achievements. The enterprise itself is the innovation entity grasping innovation capacity and willing to apply innovation achievements. If the innovation achievements are reflected through group standard, not only that the member enterprise can enter into new industry fast and occupy commanding height of industry innovation, but also that other enterprises can use the group standard through certification, in order to obtain more benefits. Under the motivation of economic benefits, the formulation entity of group standards can constantly tackle hard-nut problems in science and technology, and promote technical innovation and industry updating. The group standard itself can also be regarded as a kind of operation behavior. Those organizations that provide group standards will have more endogenous power to develop updated group standards. Only in such way, the group standard organization could constantly obtain benefits from innovation. Innovation is an inexhaustible motive force driving China to be stronger: group standard can make market entity transform the innovation to standard and obtain economic benefits through standards; the group standards will be innovated constantly under the motivation of benefits; the group standards will be updated and the enterprise will be promoted to pursue higher quality, making the enterprises willing to identify high-level group standards in product identification.

Group standard needs new system mechanism. In order to develop group standard, it shall reform the existing standard system that meet the development of group standards. In fact, the group standard itself is also the important content of the strategy of prospering the nation with quality. The objective of government standard is to meet the public benefits in the aspects of health, safety, environmental protection and other common fields, so it is difficult to promote quality innovation development with quality. In order to motivate national innovation energy, it shall reform the current standard system dominated by government and build the national standard system consisting of group standard and government standard. Government standards are applied in common field. The government will not formulate other recommended standard. The new fields reflecting industry technology innovation will be under the charge of group standard. The group standard will gradually replace the existing industry standards. The formulators of group standard are allowed to obtain legal benefits through standards. After obtaining more market entities, the government can hitch a ride of market. Under the premise of without involving the intellectual property and benefits of standard formulator, the standard with innovative functions will be invoked and the formulator of group standard will be paid. The development of government standard is driven through innovation of group standard. If one country establishes system and mechanism supporting group standard, it will not only make the country obtain continuous new force, but also establish important innovation system and improve the capacity.

## VIII. Quality service industry is a strategic industry to promote international competitiveness of Chinese manufacturing industry.

All the world powers own first-class quality service industries. Manufacturing industry is the foundation industry of world powers. No matter how the industrial structure changes, world power will take the manufacturing industry as the economic foundation. The important means that the world powers can occupy high end of the value chain of manufacturing industry is develop quality service industry rapidly. Along with the specialization division of labor and industrial transfer of global manufacturing industry, as well as the unprecedented complication of upstream and downstream supply chain, manufacturing enterprises will increasingly depend on the trade across enterprises and national boundaries, in order to complete production and exchange of final products. Quality service industry is a production service industry evaluating and guaranteeing the quality level of sellers through providing inspection, detection, certification, standard, metering, consultation and other third party quality services. Every world power has a powerful quality service industry behind it, such as Germany TUV, US UL, France BV, England Intertek, Switzerland SGS, etc. The foreign-capital quality service organizations in China have rapidly occupied over 30% market shares in national quality service market from 2001 to 2013. Quality service organization is not only the core subject identifying whether the products meet technical regulation and voluntary standard, but also a third organization implementing conformity assessment procedure. And also, the quality service organization also can formulate industry

standards. If it passes the government acceptance, the industry standards will be adopted as the legal requirements on products. Although world powers gradually transfer the processing link of manufacturing industry to other countries, while the quality service industry is controlled in their own hands. Through the controlling force, the core value of manufacturing industry will be grasped.

Good quality service industry will significantly promote additional value of manufacturer. Quality is intrinsic characteristic of products. The characteristic shall be embodied by quality service organization through standard, inspection and certification. Quality service is a process constantly evaluating and proving the intrinsic characteristic value of products. In order to enter into high end of value chain, China shall prove the intrinsic characteristic value of products through quality service industry. Firstly, the product inspection service may promote the quality level of products, and the quality can also promote the additional value of products. Product inspection and detection will estimate the product performance and various indicators clearly, making the enterprise know and improve its quality level. Authoritative quality detection service may promote consumer's credibility on products and produce brand premium. Secondly, certification will greatly promote the product value. Certification is to certify whether the products meet standards. The third party certification can make the intrinsic quality property externalized and explicit. Enterprises can promote proper quality through standard innovation. Authoritative certification is required to make the purchasers identify product quality and achieve market benefits. Thirdly, quality service industry plays an important role in driving technical progress of enterprises. As for the organizations providing detection, certification and other quality service, the service object is massive enterprises. Compared to individual enterprise, quality service industry masters more quality information and technical forefront. Through detection, certification, consultation and other services, the enterprise can understand the difference in technical level, put forward improved scheme and promote technical level. Quality service industry can improve product value, in fact, it is proving the higher value of products as a third party. Quality service industry is an indispensable intermediary service on market, and also an important provider of social quality credit. China is a great power in manufacturing industry. The acceleration in quality service industry can promote China to become a powerful nation in manufacturing industry.

It shall form an internationally first-class quality service industry system as soon as possible. As a country has the largest manufacturing industry, China shall have a quality service industry matched with its status, and implement "going out" strategy serving manufacturing industry. It shall create a batch of quality service groups with international competitiveness. Quality service industry, in essence, is an industry providing credit. The credit building needs not only long-term calculation, but also should develop into certain scale. Chinese enterprises which provide quality service are massive in quantity, but small in scale. Therefore, such enterprises have no speaking rights matched with the international trade status. In order to form rational industrial organizations in quality service industry, it shall have national large-scale groups, different professional quality service enterprises and local quality service organizations serving for local quality development. In national level, it shall take two or three largest national quality service organizations as carrier to furthest inspect and detect national assets in similar or relevant industries and fields, making the enterprises boast capital strength to participate in international competition. According to the characteristics of different industries and regions, the remaining national quality service organizations can be integrated to 8-10 professional quality service groups with leading strength in the industry, and 20-30 regional quality service groups, to construct multi-level quality service industry structures with international competitiveness and national vigor. In order to promote the comprehensive service ability of quality service enterprises, it shall integrate the standards, certification, consultation and other businesses, prolong the value chain of service and create quality service industry with comprehensive competitiveness. The only road to promote value of manufacturing industry and the important support participating in international competition is to construct powerful quality service industry system and create quality service groups that can compete with world powers. Only when powerful quality service industry system is developed, will the social foundation supporting the strategy of prospering the nation with quality be constructed.

## IX. Quality credit system is the soft power foundation of national power

The core of national soft power is the construction of quality credit value. The symbol of powerful nation contains the hard power taking economy as main content, and the soft power taking value as main content. Regardless of various aspects in value,

the most fundamental and general value that should be generally followed is quality credit, because quality credit is the foundation of value and the premise of other values. The credit is the expectation of members in social group on normal, honest and cooperative behavior between each other (Fukuyama, 1998). The credit based on quality is the expectation on normal, honest and cooperative behavior provided by quality information. Popularly, it refers to providing better products or service. Chinese value has a huge system, while the main contents are based on quality credit. Dedication is the reflection of quality credit in work. Personal dedication is consciously avoiding system loophole caused by imperfect monitoring in principal-agent relation and taking the improvement in work quality as conscious activity. Therefore, the dedication in work is the reflection of quality credit in practice. The value of equality is treating everyone equally in the course of associating with others regardless of the identity. The products provided by the seller are the same to everyone. We are equally honest with aged and child customers. What the saying tells is the principle, and it is also the earliest quality credit in market economy. The value of treating people friendly is the reflection of quality credit to a larger extent. You can obtain others' respect only when you treat others with courtesy. "Honesty" often is related with "sincerity". As for the value of quality credit, only when the products in market trade are in high quality, will the market benefits be achieved constantly; a person lacking quality credit will not only treat others friendly, but also obtain others respect through providing high-quality products. Although the task of soft ability construction in Chinese value is very onerous, so long as grasping the fundamental value of quality credit, it can drive other constructions, such as dedication, equality, justice and friendliness, and construct the fundamental and important soft ability in international competition as a world power.

Good quality credit can obviously reduce economic and social trading cost. If the social trading cost is higher, the economy will more backward. Especially, the range influencing market trade is getting large (Coase, 1937). In order to reduce social trading cost, it is necessary to build soft system of quality credit in addition to legal system. If the quality credit level is higher, it can reduce the cost in negotiation, implementation, trial and error, thus the range of market trading will be enlarged. The area with higher credit degree will be developed in division of labor and trading, thus the regional advantages will be exerted and the economic growth rate can up to higher level (Zhang Weiyang, 2002). Powerful nations boast excellent quality credit, or to say that quality credit promotes the formation of powerful nations. Quality credit can reduce cost to obtain information, and reduce the information asymmetry between both parties. A completed trade needs information search, while the searching process needs the cost. The quality credit formed through multiple repeated games is the best quality signal to trading entity. According to the existing quality credit level, the deal can be completed and the information cost can be reduced rapidly. Quality credit can also reduce the cost of intermediary cost on market. Although the intermediary agency of market promotes the transaction, it will increase the trading cost accordingly. The improvement of quality credit can promote the credibility of products or service, and significantly reduce the additional cost of market intermediary because of uncertainty. Quality credit also can greatly enlarge the market dealing range. Modern market economy is a kind of typical stranger economy. Especially in information age, both dealing parties are impossible to monitor each other directly due to dealing virtualization. As long as the quality credit system is established, the market dealing range will be enlarged constantly, thus the Chinese economy will further develop in information age. Therefore, excellent quality credit will not only reduce economic and social dealing cost, but also powerfully promote the development of economic society.

It shall accelerate the construction of market-oriented quality credit system. Quality credit is a principle followed in market dealing. Every world power has a developed intermediary service system of quality credit. As long as the market-oriented quality credit system is built, the quality credit of value can be solidified in market and society, thus the market economy taking quality credit as the main dealing guarantee can develop healthily. There are various channels for getting quality credit, while the most fundamental one is the trust relationship in economic activities. Because the dealing subject will trust the other party through repeated games, especially when acquaintance economy in market economy is developed to stranger economy, the interpersonal trust can not be maintained depending on blood relationship and geographical relationship, which is verified through repeated market dealing. Quality trust is a resource promoting transaction fundamentally. Therefore, the quality integrity has market property naturally. Quality credit is a kind of quality signal, which can be perfected constantly during the marketization process. Along with the expansion of dealing range and improvement of complexity in dealing information, the personal or organizational quality credit level is impossible to prove, and directly obtain by dealing subject. It shall be provided

by professional quality credit evaluation organizations. The quality credit evaluation service is full of competition. The market-oriented quality credit evaluation system may make the evaluation organization possess the intrinsic motivation providing quality credit information. The organizations providing false quality credit information will be eliminated by market and faced with legal sanction. Quality credit is evaluated through market-oriented company, which is proved to be effective in practice. The completely market-oriented standard and poor corporation will not only evaluate the credit of financial organization and other enterprises, but also evaluate the credit of national sovereign debt. In US, the government encourages social capitals to go into quality credit intermediary service industry, making massive intermediary agencies provide quality credit service, therefore, three authoritative companies (Experian, Equifax and TransUnion) are established, providing reliable quality credit data to the whole society. As for a powerful nation, quality credit is the basic system device of a society and market rather than simple moralization, which can achieve systematism, sequencing and marketization.

## X. A powerful nation shall owns powerful quality governance ability

Quality governance ability is an important sign of national strength. National governance involves various fields. In multiple fields, the key part is quality governance ability. Whatever it is political governance, social governance and economic governance, each kind involves quality governance. In a way, the quality governance is the important foundation and link to improve systematicness, integrality and cooperativity of governance reform in various fields. Good quality governance is the foundation of political governance. Under the background of economic globalization, quality has become one important factors influencing political governance level. The governance level of various consumer goods and service quality not only concerns the national safety and health rights, but also crosses national boundaries, becoming a important factor when implementing economy, trade and foreign activities. Therefore, modern countries shall adjust national quality governance system and promote quality governance ability according to the development situation and changes of national and foreign economy, politics, society, culture and ecological environment, thus the lasting political stability and stable development will be achieved through modern quality governance. Good quality governance is the fundamental objective of social governance. Social governance is the process that the government, social organizations, enterprises and public institutions, communities and individuals standardize and manage social affairs, social organizations and social life through equal cooperative partnership, in order to maximize public benefits (Chen Jiagang, 2012). An important content of social governance is positively promoting the welfare of vast citizens. Along with society development, people require high in better life, which is intensively reflected in the improvement in basic necessities of life. Quality governance can guarantee vast citizens to enjoy better life, which is also an important content of fundamental objective to achieve social governance. Quality governance is the core content of economic governance. Quality is an indivisible part of management, science and technology and other factors are also fundamental factor and important drive to promote economic development. To strengthen modern countries shall not depend on quantitative development pattern for a long time, it shall make the government, market and society construct national quality governance system through a series of scientific and effective national quality systems on the basis of effective quality system ability and quality order governance ability, thus the development foothold will be transferred to quality and benefit, in order to promote quality development in economic society and form powerful internal motivation. All political governance, social governance and economic governance involve quality governance. Only good quality governance, the political governance will have stable foundation. One key field of social governance is to make the people enjoy high-quality life. Quality governance is the core content of economic governance.

The wide participation in government, society and market is the key point of quality government modernization. National quality governance system is not only the responsibility of government, which requires common participation of market and society, in order to govern quality effectively under common participation. For a long time, under the background of social and economical transformation, in order to achieve great-leap-forward development, China has been adopting pursuant development pattern dominated by government, and laying particular stress on the single governance of government in quality field. During the modernization process of restarting the reform and opening-up policy, the governance pattern fails to deal with various challenges in quality governance, which also restrains the utility of the strategy of prospering the nation with quality. The modernization of quality governance is to change the previous quality management model that lay particular stress on

government, construct modern quality governance system based on government, market and social interaction, and achieve structural change from unitary and unidirectional governance to multiple interactive governances. (Jiang Bixin, 2013) The government, market and society will play their own governance advantages through diversification of governance subjects, diversity of governance means, efficiency of governance mechanism, and equalization of governance responsibilities and cooperation of governance factors, in order to form resultant force of quality governance and promote the strategy implementation. The government, market and society can compensate and compete with each other, in order to incorporating the governance function of market and society into the quality governance process dominated by government, promote the continuous improvement and promotion of modern quality governance ability, create scientific quality governance system and promote national strength and development. To implement the strategy of prospering the nation with quality effectively, the most important institutional foundations are the construction of government, market and society governance system, and the common participation of three parties.

Establish a powerful quality public service system. Government quality governance involves quality safety regulation and quality public service; to promote regulation efficiency, it shall take powerful quality public service as the foundation. Quality regulation is mainly the management on such problems caused by quality safety risk and deficiency in quality ability. Under market economy conditions, the enterprises are the responsible subjects of quality. Only under minority conditions, quality safety problems are deliberately made. In most cases, it is because the quality ability of enterprise fails to meet the relevant quality standards. The enterprises lacking quality ability are mainly SMEs. Under the specific development background, SMEs are faced with a lot of difficulties in the development of quality ability, for example, standard ability, quality system application ability and quality method can not be used basically. Therefore, the improvement of government quality public service to SMEs in these aspects can effectively reduce the uncertainty of enterprises in quality, reduce quality safety risk of enterprises and achieve the objective of government quality safety regulation. The core of government quality public service is to establish quality-oriented evaluation mechanism, incorporate quality into assessment system of local economic development, and change the development incentive mechanism pursuing quantity growth. If the assessment on local government adds total factor productivity, proportion of added value of products and other microcosmic quality indexes, it will reflect the changes in microcosmic product quality and macro economy development quality as well. If the conducting baton of quality is built, it will create an excellent strategic environment for the growth of market and social quality governance. Establish quality relief system in favor of implementing consumer rights (Luo Ying, 2012), promote the implementation of consumer claim system in quality field, perfect punitive compensation system, promote the formulation of Whistleblower Protection Act, and accelerate diversified quality relief mechanism consisting of compensation for damage, liability insurance, compensation fund and social relief. The foothold of government quality public service shall be serving SMEs and implementing service engineering of SMEs quality ability improvement. The SMEs in China account over 99% of total enterprises, which creates 60% GDP and 50% financial tax. The SMEs also provide nearly 80% urban employment posts. Data source: *Guidance of Social Responsibilities of SMEs*. <http://smec.org.cn/?info-2467-1.html>. It plays a distinctly important role in Chinese economy. Especially, SMEs are the suppliers of large enterprises, so the quality level of SMEs finally decides the quality level of large enterprises. The foundation of service engineering of SMEs quality ability improvement is to set up quality input project facing SMEs, encouraging SMEs to apply for the quality project set by various governments, and promoting quality ability of SMEs through subsidy of national finance. As for service engineering, it shall transform the setting mode of various government standard organizations, transforming its function to provide standards literature to SMEs. The government shall also provide SMEs with service of import in quality management system and training quality talent through purchasing mode. As for national quality public service, it shall change the structure of higher education from strategy, in order to improve the education system of occupational technology talents. Adjust expenditure structure of higher education, take occupational technology education as the key point of national finance input, encourage various regions to develop occupational technology education suitable to local industrial features, formulate special employment and social guarantee for occupational technology talents, make occupational technology recognized by the whole society and become the main body of Chinese talent team. The perfection in quality public service may not only guide the whole society to improve quality, but also provide most important

public service to quality development of enterprises. At the same time, along with the implementation of the strategy of prospering the nation with quality, the economic and social status of labor forces can be increased remarkably. Based on the analysis of the 10 major issues, we can obtain the implementation model of the strategy of prospering the nation with quality, as shown in Figure 2.

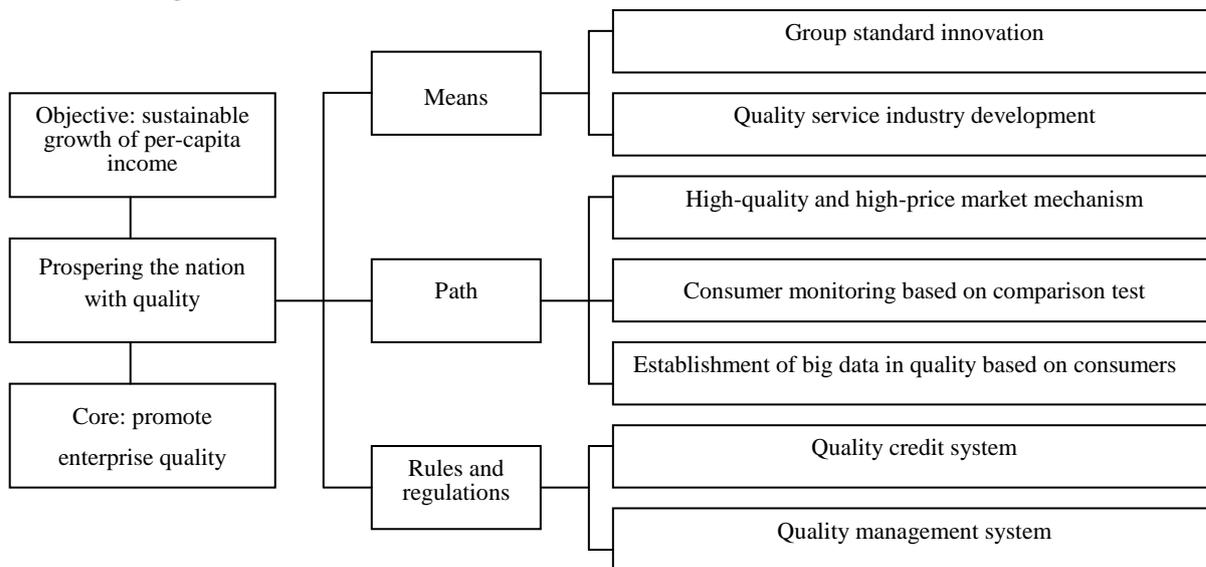


Figure 2 Implementation model of the strategy of Prospering the Nation with Quality

The implementation model of the strategy of prospering the nation with quality builds the logic relationship between quality and power, that is to say, it specifies that quality is the objective to achieve sustainable growth in per-capita income, and the improvement in enterprise quality ability is the core to support the objective. The fundamental path to achieve the objective and core of prospering the nation with quality is to build high-quality and high-price market mechanism, in order to motivate enterprises become the quality subjects providing high-quality products, make consumers guide enterprise to promote quality ability in demand side through comparison test. Finally, the big data in quality will be established through reducing quality information asymmetry between enterprises and consumers. The model puts forward two means to achieve the strategy of prospering the nation with quality: motivate quality innovation energy with social group standards; transform and upgrade manufacturing industries depending on quality service industry. The model designs the institutional arrangement of supporting path and means, not only involving soft system of quality credit system, but also including hard system of quality governance system. The model is a structuring abstract of strategy of prospering the nation with quality, and also an expression that how quality supports powerful nations, making the quality and power nation become a complete system with internal logic relationship. In order to transfer the model from theoretical design into effective practice, the fundamental step is solving 10 major issues in the paper. The implementation of strategy is a breakthrough of issues. The research on 10 major issues is the key point to implement strategy of prospering the nation with quality.

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# Research on Some Important Issues Concerning the Strategy of Prospering the Nation with Quality

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**Abstract:** The concept of prospering the nation with quality has been recognized by the whole society, however, it has not been adopted as a practical strategy for the national development. Currently the theoretical and empirical researches on prospering the nation with quality generally emphasize on improving quality itself rather than strengthening the national competition through quality development. Therefore, this paper proposes a strategic framework of prospering the nation with quality. Based on this strategic framework, this paper focuses on 10 important issues that affect the implement of this strategy, which includes the necessity, the strategic environment, the objectives, the content, the market, the social intermediaries and the government, et cetera. Thereby, this paper establishes basic theory, logic, methods and institutional system of how the quality could realize the goal of prospering the nation.

**Key Words:** Prospering the Nation with Quality; National Strategy; Important Issues

■ Editor Wang Xiaoqing

## The Research Progress in China's Macroeconomic Growth Quality

### ——Literature Review and Policy Implications

Yin Desheng and Fan Jianyong

**Abstract:** strategic restructuring of economic structure is the main direction of China's economic transformation, deciding China's macroeconomic growth quality. In this paper, author tries to comprehensively review the research literatures of China's macroeconomic growth quality. On one hand, the literature review clears up the driving force of China's macroeconomic growth quality, direction of strategic restructuring of economic structure and influence of spatial economic structure adjustment on macroeconomic growth quality; on the other hand, centering on core issues of key points, difficulties and promotion path to promote China's macroeconomic growth quality, the literature review summarizes a series of policy implications; discusses how to transform government-oriented growth pattern, what new growth mechanisms are needed transforming to "growth in structural coordination" from "growth in structural imbalance" and what the new path is to promote strategic restructuring of economic structure; proposes that the economic organic growth is transformed to efficiency orientation from factor input orientation, depending on factor marketization, resource allocation globalization and spatial efficiency promotion, and choosing a road of efficient industrialization and efficient urbanization.

**Key Words:** macroeconomic quality; economic transition; government-oriented growth pattern; efficiency-oriented

### I. Driving force of China's macroeconomic growth quality

The academia consists that factor input is the force of economic sustainable and high-rate growth in past 35 years after the reform and opening up. The capital growth rate was 13% during 1999-2007, while the average annual growth rate was about 10% during 1979-1998 (Wang Xiaolu, etc., 2009). The growth rate of total factor productivity was reduced to 0.010~0.028 during 1995-2005 from 0.028~0.038 in 1978-1995 (Zheng Jinghai, etc., 2008). This kind of high investment and high growth without obvious technical progress is at the cost of non-performing assets, heavy pollution and high energy consumption. The government will assume the macroscopic cost of economic growth (research group of China economic growth and macroscopic stability, 2005, 2008). The Eighteenth National Congress of the Communist Party of China put forward that the main attach direction of accelerating change of economic development mode is to promote strategic restructuring of economic structure, intending to promote China's macroeconomic growth quality depending on strategic restructuring of economic structure and economic autonomous coordination. Fang Fuqian (2007), Qian Shuping (2008), Zhou Shulian (2008), Wei Jie (2009, 2011), Lang Lihua, Zhou Mingsheng (2012), etc, summarized the feature of China's economic structure in past 30 years as extensive growth characterized by "high investment, high energy consumption, high material consumption, heavy pollution and low efficiency". China is increasingly limited in resource demand, seriously damaging economic balance and giving rise to tense conflicts between human and natural environment. The reasons for imbalance in economic structure are summarized as three structural factors: unreasonable demand structure, unreasonable industrial structure and unreasonable factor input structure. The previous economic growth excessively relies on investment and export (Shen Guangsi, 2009; Zhang Xu, 2010; Wei Jie, 2011; Luan Dapeng, etc. 2012), laying particular stress on secondary industry, thus the development of tertiary industry lags behind (Li Shantong, 2008; Zhu Guanghua, 2009); the output efficiency will not be high excessively depending on input (Wang Yiming, 2008, 2011; Ge Yang, 2010).

The purpose of economic structural adjustment is to change economic development mode, increase economic growth quality and make economic growth mainly depend on scientific and technical progress, labor quality increase and production efficiency

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promotion rather than material resources consumption. Total factor productivity (TFP) is a core index to measure economic development quality and source. Foreign empirical study concerning economic growth quality and sustainability mainly focuses on new growth theory. Helpman (2004) comprehensively reviews the literatures in this aspect and concludes that: the economic growth depending on factor input, especially capital accumulation, is unsustainable for long-term practice; the economic growth depending on technical progress and innovation through improving technical efficiency and resource allocation efficiency is sustainable.

The domestic perspective and results about TFP empirical study are concluded into the following four aspects: (1) the conclusion supporting Krugman (1999) holds that China's growth mode is typical input growth (Guo Qingwang, etc, 2005; Development Research Center of State Council, 2010; research group of China economic growth front, 2012); (2) inspect the dynamic changes of China TFP before and after reform: TFP before reform is regressed and TFP after reform is increased obviously (Wang Xiaolu, 2000; Zhang Jun, et al., 2003); (3) emphasize the high growth of technical progress and efficiency after reform (Yi Gang, etc., 2003), at the same time, China TFP after middle period of 1990s presents a decreasing tendency (Wang Zhigang, etc., 2006; Zheng Jinggai, 2008); (4) investigate technical progress and changes in provincial level TFP study (Yan Pengfei, et al., 2004; Wang Zhigang, etc., 2006; Fu Xiaoxia, etc., 2009; Liu Ruixiang, etc., 2012; Kuang Yuanfeng, etc., 2012) rather than investigating technical progress in China industrial level (Tu Zhengge, etc., 2005; Chen Yong, etc., 2007). The fundamental conclusion of these researches is that: the main source of China TFP growth is the low contribution from technical progress and technical efficiency. The study is extended to prefecture cities and sub-classification industries from provincial level and two-figure or three-figure industrial data, not only measuring and decomposing TFP, but also inspecting the decisive factors and change tendency of constituent of TFP. The method measuring and decomposing TFP contains parametric method and nonparametric method. Parametric method is divided into production function method and stochastic frontier production function method; the nonparametric method mainly refers to index method, such as Malmquist index method. Both methods can decompose the technical progress and efficiency in TFP changes. While the former needs setting specific production function; and the latter requires no specific function and complete price information.

## II. Strategic restructuring direction of economic structure and China's macroeconomic growth quality

The improvement in China's macroeconomic growth quality mainly depends on the selection of strategic restructuring direction for economic structure Chi Fulin (2010, 2011) ascends the strategic restructuring of economic structure to the main battlefield of second reform, and puts forward that it contains three implications: firstly, emphasize transition of economic growth style, play the fundamental role of market in resource allocation and play the important role of expanding domestic demands in economic growth; secondly, emphasize the transition toward social public demands, and construct the development-oriented society system and policy system meeting China's characteristics; thirdly, emphasize government transition, especially emphasize the transition from production-oriented government to a public service government. That is to say, the three implications have strong enlightening and generality, which are anastomotic with the real instinct on economic structure adjustment (Poncet, 2005; Yang Jianlong, 2010). However, it is impossible to act appropriately to the situation if the internal systematic mechanism and core issues of economic structure imbalance and adjustment are not discovered.

Wu Jinglian (2011a; 2011b) holds that: an important reason for unfavorable economic structure adjustment is that the systematic obstacles are remained, for example, government still remains allocation power in some important resources; most important production factors are priced by the government, causing serious distorting in price. Such reasons urge local governments to pursue high growth in GDP, such as taking GDP growth as main assessment criteria for performance, income structure giving priority to production value added tax, excessive transition of important expenditure liability, etc. Under the above system, economic growth mainly depends on additional land input and capital input. The capital or credit capital is mainly grasped by local government, state-owned commercial bank and state-owned enterprises (Development Research Center of the State Council, 2010). Because the land property right is not assigned to families, the additional income when agricultural land is transformed to urban commercial land is acquired by governments at all levels and relevant enterprises. Thus, the ratio of income of governments and state-owned enterprises versus national income is becoming higher and higher, but the

proportion of remuneration for workers, especially the income of farmers goes downhill. The perspective of Wei Jie (2009, 2011) is basically same as the point.

China development report (2010) puts forward that the new-type urbanization strategy shall be regarded as fundamental policy measures for China's economic structure adjustment, and raises specific channels: firstly, take urban agglomeration as the main form to promote urbanization and construct urban strategic pattern of "two-horizontal & three-longitudinal"; secondly, perfect urban public service system, increasing equalization level: central government is responsible for the fundamental public service in undifferentiated and non—marketization proportion of whole social members; provincial and below local governments assume public service products which are weak in publicity (Development Research Center of the State Council, 2010). The 12th Five-year Plan puts forward that implement main functional area strategy and perfect urbanization pattern and form; according to the requirements of national economic pattern, form a efficient, coordinated and sustainable land space development pattern. Perfect urbanization pattern and form, promote the harmonious development of large, medium and small cities and small towns, and scientifically plan the city function location and industrial pattern within urban agglomeration. Just because the reform of land factor market lags behind, the economic development mode transition and economic structure adjustment show no sign of a rise. The market of land and other factors has not created market-oriented price decision mechanism. The price signal of factor input is in chaos, making the efficiency of economic growth (technical progress or total factor productivity) decrease, and the weak groups owning land rights miss the opportunity of sharing additional results during economic development process.

As for the direction of strategic restructuring of economic structure, the Eighteenth National Congress of the Communist Party of China put forwards that "the key points are to perfect demand structure, optimize industrial structure, promote regional coordination development and boost urbanization". Compared to the economic system reform in 1980s, the existing strategic restructuring of economic structure is faced with complex constraint conditions and environment inside and outside. It is necessary to discover the new growth mechanism to transform Chinese economy to "the growth in structure coordination" from "growth in structure imbalance", and realize that the economic growth and structure adjustment is driven by efficiency rather than factor input. Economic growth mainly depends on scientific and technical progress and improvement in labor quality and production efficiency rather than material resource consumption. The fundamental path to achieve this mainly depends on factor marketization and efficient industrialization driven by technical progress. Moreover, the research on economic structure adjustment increasingly focuses on the system dividend brought by space efficiency and urban system structure. Spatial agglomeration can promote knowledge overflow and scale effect in economic growth. The system dividend produced from urban system reform can promote the configuration efficiency and scale effect of total factor productivity. These can greatly expand the space of economic structure adjustment and sustainability of growth.

### III. Spatial economic structure adjustment and China's macroeconomic growth quality

Geographical agglomeration can promote spatial efficiency, which is reflected in technical efficiency improvement and scale effect in composition of total factor productivity. The efficiency promotion generated from deepening reform of urban system structure adjustment indicated that the allocative efficiency in total factor productivity is promoted (structure dividend or system dividend), and social equality and environment pollution will reduce the welfare.

#### (I) Spatial efficiency of urban system and geographical distribution of economic activities

According to the size of regional area, the spatial efficiency generated by geographical agglomeration can be divided into spatial efficiency in large geographical range and small geographical range (Fujita, Krugman & Venables, 1999; Fujita & Thisse, 2002). The former refers to the efficiency brought by spatial agglomeration in new economic geography. It comes from the accumulative cycle effect of market scale in near space, namely pecuniary externalities; the latter refers to the efficiency of single urban scale in urban economics, namely technological externalities. New economic geography literature depicts the intrinsic mechanism and theoretical foundation generated from pecuniary externalities, and illuminates the reason of different spatial efficiency under the structure of increasing returns to scale, transportation cost, differentiated products and monopolistic competition market. The spatial efficiency in large geographical range is suitable for metropolitan area system. The spatial efficiency contributed by closeness of cities will promote the promotion of total factor productivity and boost economic transition. The spatial efficiency in small geographical range depends on the industrial structure in single city. If the industrial structure in the city is professional obviously or dominant by certain leading industry, the urban efficiency mainly depends on

the scale of leading industry. The spatial efficiency is called as "localization economy"(Marshall, 1920). The spatial efficiency of small geographical range depends on not only the scale of single city, but also the diversity of urban industry. If the industry variety is larger, the urban spatial efficiency is higher. This type of spatial efficiency is called as "urbanization economy" (Jacob, 1969).

Existing literatures have not inspect the sustainability of economic growth from spatial efficiency respect, or to say that the relation between these two factors is basically separated, but the discussion on geographical distribution of economic activities increasingly enriches the literatures concerning economic growth and structure influence. The research in this field mainly focuses on three levels: first is the distribution and decisive factors of spatial agglomeration of manufacturing industry (Fan Jianyong, 2004; Lu Jiangyong, etc., 2006); second is influence of market scale and industrial agglomeration on regional economic growth (Wang Zhigang, etc., 2006; Huang Jiuli, etc., 2008; Yin Desheng, 2010; Sun Xiaohua, 2013); third is the influence mechanism and results of industrial agglomeration on labor mobility and regional income gap (Fan Jianyong, 2008; Fan Jianyong, etc., 2010; Liang Qi, 2009). The general conclusion is that: the spatial efficiency in large geographical range is remarkable and the industrial agglomeration is positive on economic growth, but it may widen the regional income gap.

The research on spatial efficiency of urban system and geographical distribution of economic activities is expanded on three paths: firstly, along with the material adjustment in regional economic pattern in past years, the location distribution of manufacturing industry, space efficiency difference and total factor productivity structure have changed profoundly (Zhang Jun, et al., 2009). Secondly, the research with particular emphasis on urban system of macroscopic perspective and regional economic adjustment policy may ignore the spatial efficiency in small geographical range. Thirdly, the existing literatures are inclined to efficiency objective dimension, failing to integrate the objectives of economically sustainable growth, resource saving and environmental protection.

## (II) Dispute on urban system and road of urbanization

It will involve the dispute on China's road of urbanization when researching the spatial efficiency of urban system and geographical distribution of economic activities from the perspective of actual urban structure system, the layering feature that "big cities are lacking, medium and small cities are flourishing" is quite obvious (Yang Kaizhong, etc., 2008; Fan Jianyong and Shao Ting, 2011). From the perspective of tendency of policy selection, the dispute in urbanization direction has never stopped, forming two schools of "small town theory" and "large city theory". The scholars supporting "small town theory" represented by Fei Xiaotong (1984) hold that: small towns can connect two markets in city and town, in order to receive surplus rural labor force and alleviate the conflict of a large population with relatively little land in rural areas. The proposition was the main opinion of China's urbanization road before middle period of 1990s. The scholars supporting "large city theory" emphasize that the large cities boast scale benefits, and hold that "the advanced objective law of development in large cities" exists, and China shall choose the road of developing large cities (Wang Xiaolu, etc., 1999). Zhou Yixing (1992) compromises both opinions, holding that the optimal city scale generally accepted by the people is absent. Urban system consists of large, medium and small cities forever. He also raised a "pluralism" urbanization policy.

After the middle ages of 1990s, the dispute on the selection of urbanization road entered into institutional level, and it was closely related to other macroeconomic issues. For example, the reason for adopting urbanization development strategy is that the perspective of scale benefits or other economic rationality is suspected. The supporting of "small town theory" began to abandon "local transfer theory", emphasizing that the development of small towns shall be intensive and insisting on develop counties or central towns (Gu Shengzu, etc., 2000). At the same time, more and more scholars insist on diversified urbanization road (Ye Yumin, 1999).

In the 21st century, two new perspectives centering on urbanization road dispute appear: one is new urbanization road (Chen Yongjun, et al., 2009), emphasizing the unity of economic intension, function optimization, social harmony, overall urban-rural development and environmental protection. Although the theoretical foundation is to be deepened, it may represent the development direction of urbanization. Second is study, formulation and implementation of main functional area (Xiao Jincheng, 2008). Divide China land into optimizing development zones, key development zones, restricted development zones and prohibited development zones, And raise the theory that the area suitable for economic development is located in southeast of Hu's line.

Based on the economic fact of economic structure imbalance and, resource and environment restriction, the distributed urban system could not work in China, because scale economy fails to play advantages in economic growth and efficiency, land

resource saving, environment pollution governance, and public facility cost apportionments. Develop megalopolises and especially guide several medium and small cities to gather into urban agglomeration centering on core cities. The intensive urban system is not only conducive to promoting spatial efficiency and total factor productivity, but also plays prominent scale economy advantages in the aspects of non-agricultural land, resource supply, unit energy consumption and pollution governance.

#### IV. Key points of promote China's macroeconomic growth quality

What does the economic structure adjustment refer to? As for the connotation of economic structure, imbalance expression and adjustment path, there are different understandings in economics circle. Some is based on the structure of ownership; some expands the economic structure into various aspects in social and economic life. The economic structure as macroeconomic issue can not be separated from the source structure of GDP. From the measurement perspective of GDP expenditure approach, the economic structure is shown as the structure in consumption, private investment, government investment and net export. From the measurement perspective of GDP income approach, economic structure is shown as the income structure of economic entities, namely the structure amount resident income, government income and enterprise income. From the measurement perspective of GDP production approach, economic structure is shown as the industrial structure and regional structure. Industrial structure refers to the contribution of each production entity to GDP. Regional structure refers to the construction of each region to GDP. The economic regional structure is shown as the constant propulsion of urbanization. Urbanization level and urban population represent the vigor and scale of regional economy. At present, the academia comprehends the disharmony of China's economic structure from GDP source (Wei Jie, 2011), including four aspects: first is the imbalance among consumption, investment and export; second is the imbalance among resident income, government income and enterprise profits; third is the imbalance among primary industry, secondary industry and tertiary industry; fourth is the imbalance between regions, especially the inconsonant pattern in large, medium and small cities as well as intensifying city-countryside dualization. The selection of urbanization road represents the spatial agglomeration direction of production factors and declares the adjustment direction of regional economic structure.

At present, the most prominent imbalance in China's economic expenditure structure is the imbalance among consumption, investment and export structure. As the "three-in-hand" of economic growth, the contribution of consumption, investment and export to economic growth shall maintain a proper proportion and effective coordination. The economic growth is difficult to sustain when it excessively depends on one kind of power. Since China's entry into WTO, economic growth significantly depends on export. In 2001-2007, the average growth rate of GDP was increased by 3.6%, while export contributed 63.9% (Wei Jie, 2011). China's economic growth is typically driven by overseas market demand. The pattern is faced with severe challenge and it is difficult to sustain under the influence of international financial crisis and Europe and America debt crisis. The world economy situation in post-crisis era has changed profoundly. The economic growth rate in developed countries went down obviously; the economic strength of developing countries and emerging economy entities went up; the global trade protectionism has enlarged. The foreign market shares of Chinese products and service not only tend to decline due to slowing economic growth in developed countries and the intensive competition of other emerging industrial countries. In addition to the export-oriented economy growth, one serious issue in expenditure structure is excessively depending on government investment. China mainly depends on adding government investment to drive economic growth both after Southeast Asia Financial Crisis in 1997 and US Financial Crisis in 2008. This action can only be regarded as anti-crisis measures in short term, rather than a normal strategy accelerating economic growth. The means excessively depending on government investment intensify the imbalance in industrial structure and low efficiency of resource allocation. It shall note that it is alternative between excessively depending on export and excessively depending on government investment. When the export goes down, the government investment will increase massively. Government investment became the main force driving the economic growth. During 2000-2007, the total saving rate was increased to 51.8% from 35.1%, which was increased by 16.7%. During 1978-2000, the total saving rate basically was maintained at 35%~40%. The total saving rate is 15.3% higher than that in middle income countries (Development Research Center of the State Council, 2010).

China takes the expansion in consumer demands as the strategic emphasis to expand domestic demand. The core factors hindering consumer demands are low level in resident income and slow growth rate. It involves the income structure of economy. At present, the imbalance of national income distribution mainly is intensively expressed in "two desynchrony":

firstly, the growth of national income is non-synchronous with GDP; secondly, the growth of national income is non-synchronous with income growth of government. Before 1990s, the proportion of labor income versus GDP was above 50%, which began to reduce since 2001. The value was reduced to 39.7% in 2007. The proportion of net production tax representing government income versus GDP and the proportion of fixed asset depreciation and operating surplus representing business income was increased to 14.2% and 46.1% in 2007 from 11.7% and 34.9% in 1990 (Wei Jie, 2011). In developed countries, the proportion of wage income versus operating cost is about 50%, while China is less than 10%. The proportion of labor remuneration versus national income in developed countries is about 55%, while China is less than 42%, presenting a declining tendency (Wei Jie, 2011). The proportion of resident's financial income versus government's financial income is much less. According to the statistics of some scholars, 76% financial income is controlled by the state, while only 1/4 financial income is grasped by the people (Wei Jie, 2009).

China's industrial structure is increasingly imbalance, which is expressed that: the proportion of traditional manufacturing industry is higher, while the proportion of high-end manufacturing industry is smaller; the industrial structure is out of tune and the tertiary industry lags behind. The proportion of tertiary industry versus GDP is around 40%-43%, and the economic growth is still relying on the secondary industry; the proportion of service industry and production-oriented service industry is low; the industrial structure adjustment seriously lacks technical innovation; agriculture and other basic industries are low in resistance to risk. The industrial input structure is not rational, the material resource consumption is massive and the contribution rate of technical and scientific progress is low. For example, China GDP accounted for 8% of global amount in 2009, while the consuming rate is 18% in world resources, 44% in irons and 53% in cement. The economic growth is at high cost of resource and environment, so the relationship between human and nature tends to be tense. The economic structure is inconformity with fundamental requirements of scientific development, and it is difficult to sustain facing with severe challenges in post-crisis era. The strategic adjustment of China's industrial structure not only is faced with the issues of irrational industrial structure and imbalance in primary, secondary and tertiary industry. It also requires high in independent innovation, energy saving and environmental protection.

The regional structure of economy is a main expression of GDP production approach measurement. The 12th Five-year Plan puts forward that it shall promote the coordinated development of all regions, proactively and stably boost urbanization and accelerate the coordinated development among big, medium and small cities as well as small towns. At present, the regional economic development pattern enters into a new adjustment stage. Under the constraint of optimizing spatial efficiency, social equality, resource saving and environmental protection, the important issue that receiving more attention is how to choose the direction and path of regional economic structure adjustment in new period. Economic regional structure is expressed in constant propulsion of urbanization. Urbanization level and urban population represent the vigor and scale of regional economy. The selection of urbanization road declares the adjustment direction of regional economic structure. From the perspective of actual urban structure system, the delaying feature that "big cities are lacking, medium and small cities are flourishing" is quite obvious (Fan Jianyong and Shao Ting, 2011; Chen Liangwen, etc, 2007). The emerging medium and small cities are mainly distributed in coastal region (Xu Zheng, 2010), giving propriety to manufacturing industry. The typical results caused by the above reason are excess capacity of finished products, high cost in environmental pollution, extensive economic growth and other disadvantages. Moreover, the urban and rural income gap or regional income gap reflects the income gap between peasant-workers (including the mobile ones across regions and within regions) and urban workers to a large extent (Wan Guanghua, et al., 2005). It implies that only when the segmentation in urban labor market is eliminated completely or proportionally, will the intervallic income gap between regions or rural and urban area will be relieved.

Regardless of multiple reasons in the imbalance of four levels in economic structure, one common system factor is government-oriented growth pattern. The pattern is that the government controls more economic resources and national income, and excessively intervenes in the inner mechanism of economic activities, damaging the fundamental role of market economy (Development Research Center of the State Council, 2010; Wei Jie, 2011). Objectively, government-oriented growth pattern produces remarkable results in catching up the developed countries for undeveloped countries. When the economy reaches certain stage, it shall timely change the pattern and play the decisive role of market in resource allocation, in order to achieve Pareto optimality of resource allocation efficiency in economic growth.

The alternative phenomenon between export-oriented growth and government investment-driven growth is closely related to the excessive use of administrative resources. Such as, in order to stimulate export, the government implements export tax

refund policy, involving more than 3000 kinds of industrial products. The tax refund rate of many products reaches 13%. In order to coordinate the implementation of export-oriented growth pattern, three kinds of price of Renminbi – price, interest rate and exchange rate fail to realize linkage. Price distortion causes the imbalance among investment, consumption and export.

Government-oriented growth pattern is one important reason for imbalance in national income distribution. The most prominent expression is the excessive expansion of national economy. Since 1990s, the number of state-owned enterprises was reduced by 1/2, but the capital scale was doubled. The capital expansion and paper profit are mainly from the potential subsidy, such as tax, credit, resource rent, etc. During 2001-2008, the three subsidies reached 6000 billion Yuan. At the same time, the profit of state-owned enterprises was 4900 billion Yuan and the actual loss was 1100 billion Yuan (Wei Jie, 2011). Government-oriented growth pattern hinders the synchronism in national income, GDP, resident income and financial income. Since 1990s, the labor shares in GDP were increasingly reduced, the saving rate was increased, the investment rate was enhanced and the excess production capacity was increasingly serious. China's economy fact is not consistent with one Kaldó economy fact in developed countries – labor quotas are constant. The latest empirical research points out that: the changes in China's labor share are closely related to technical changes, industrial structure changes, factor market distortion and other factors (Young, 2006; Bai Chong'en, 2008, 2009; Li David, et al., 2009; Luo Changyuan, 2008).

The first reason for imbalance in industrial structure may monopoly and especially is administrative monopoly. The factors are difficult to flow smoothly in industry, influencing the market adjustment mechanism between various industries. Although the monopolized industry is open in equity investment, the state-owned economy is still in dominant holding position. The soft budget constraint and investment shortage in state-owned industry investment worsen market adjustment mechanism in industrial structure.

The imbalance in economic regional structure and especially the delaying urban system are related to government-oriented growth pattern. Since the end of 1990s, the high-rate growth of China economy is mainly expressed in rapid industrialization and urbanization. The industrialization and urbanization depend on the land requisition seriously, mainly manifesting that local governments monopolize the first-level market of urban land supply. Financial decentralization determines the intense GDP competition between local governments, weakening environment, distorting land, resource and other factors, and motivating the extensive growth of economy.

The key point of adjust four-level economic structure is to change the existing government-oriented economic growth mode, strengthen the decisive effect of market in resource allocation and achieve independent coordination of economy depending on market mechanism. Actually, the report of the 14th Plenary Meeting has provided top-level design for China's economic development pattern, namely the socialistic market economy system. As for the imbalance in four-level economic structure, it shall adjust the structure among financial income, enterprise profit and resident income firstly. The consumption is not the main driving force of economic growth because of lower resident income level and growth rate. Thus, the economic growth only depends on export and government investment, causing the structure imbalance between export, investment and consumption. Export and government investment become the main force of economic growth, causing the imbalance in industrial structure, especially the administrative monopoly in industry and overexpansion in state-owned economy. The regional distribution of industrial structure and financial decentralization system create delaying urban system.

## V. Difficulties of promote China's macroeconomic growth quality

The growth with imbalanced structure is the inevitable result of economic growth. Modern economic growth theory provides rational economic interpretations. Zhang Ping et al. (2011) also provide sufficient evidences: during the development process of latecomers, the systematic high-income and high-growth departments exist. It will produce remarkable increasing returns to scale if mobilizing massive resource allocation to such departments. The structural allocation adjustment will bring obvious catching-up growth (Jones & Romer, 2009; Barro & Sala-I-Martin, 1995; Qian Nali, etc., 1986). It is shown in three paths in China: one is government-oriented industrialization. Government mobilizes resources and configures high-growth industrial department. China will become "world factory" in shortest time. Second, economic opening achieves prominent increasing returns in large scale. China became the second export country within 10 years after entering into WTO. Third, the spatial agglomeration of urbanization brings huge increasing returns in large scale. At present, China's urbanization rate exceeds 50%. The increasing returns in large scale caused by unbalanced allocation increase the economic growth rate in the early stage and middle stage. But the rapid expansion of unbalanced catching-up pattern and economic scale in high-growth department gives

rise to the imbalance in economic structure. The structure imbalance caused by catching-up gives rise to the dependence on the path of growth and profit distribution, and distorts the sharing mechanism of economic growth achievements.

Government intervention is normal during the process of economic catching-up. Whatever it is “China miracle” or “East Asia miracle”, the latecomers achieve the objectives of high-rate growth in GDP through centralizing resources and distorting policies; but the negative influence is huge (Cornay, 1992; Masahiko Aoki, etc., 1998; Zhang Ping and Wang Hongmiao, 2011). For example, it limits the fundamental role of market mechanism in resource allocation. Where is the boundary between government and market? How to coordinate the relationship between government and market? Although the newly industrialized countries are faced with such problems when spanning “middle-income trap”, China has its particularity at present. The economic scale of Four Asian Tigers is relatively smaller. The main European and American developed countries are growing while transforming. The structural transformation of China economy is carried out when the scale ranks second in the world. There is no precedent that how to successively change government-oriented growth pattern in the economic entity with huge economic scale.

The growth of structural coordination shall solve not only the problem of new growth mechanism, but also the issue of interest allocation mechanism. The conflicts caused by structural imbalance are increasingly difficult to solve upon decreasing returns to scale after economic scale entering to middle-income level, making the economic structure adjustment depend on growth mechanism and benefit distribution, namely the growth of structural coordination can not be separated from the path of original mechanism (Zhang Ping and Wang Hongmiao, 2011; Zhang Ping, etc. 2011, but it shall also endow new connotation. Therefore, the difficulty of economic structure adjustment is to find out a growth mechanism out of “structurally imbalanced growth” and make the “growth of structural coordination” possible. The criterion is efficiency orientation. The transition from growth driven by input to growth driven by efficiency shall eliminate the system barrier obstructing the operation of market mechanism and innovation mechanism.

How to drive the new growth mechanism or a new round of increasing returns to scale? Overall, it is still industrialization and urbanization ((Zhang Ping, Wang Hongmiao, 2011). The drive factor of industrialization and urbanization is transformed to efficiency from input. The rapid industrialization and urbanization drives the rapid growth of China economy, while the industrialization and urbanization mainly depend on land acquisition. Local government monopolizes the supply market of urban land. Financial decentralization and performance assessment promote the intense GDP competition between local governments (Shen Kunrong, Fu Wenlin, 2006; Xu Xianxiang, et al., 2007). It not only distorts the price of land and other resources, but also gives rise to the delayering urban system that “medium and small cities are flourishing” and the manufacturing industry is dominant. The pattern not only intensifies resource waste and excess production capacity, but also is conducive to promoting spatial efficiency and regionally coordinated development. Overall, the new distribution mechanism also depends on the perfection of factor market, while the perfection of factor market requires government transition. What is the breach of government transition? Generally speaking, when the urbanization rate is about 50%, government objective and constraint conditions will be changed obviously. The public welfare objective will become the government-oriented market (Zhang Ping and Wang Hongmiao, 2011). Promote the government supply to health, education, security housing and public service, and drive consumer-oriented economic growth with urbanization. It is necessary to solve the problems of reform of household registration system and land acquisition, making the farmers share the increasing returns to scale brought by urbanization.

## VI. Difficulties to promote China's macroeconomic growth quality

### (I) Efficient industrialization driven by factor marketization and globalization

Under government-oriented growth pattern, the government maintains higher allocation power on important resources, and takes GDP growth as the main assessment criterion of performance. Under the system, the economic growth mainly takes the increasing land input and capital input as premise. The land is controlled by local governments, capital or credit resources are mainly controlled in local governments, state-owned commercial bank and state-owned enterprises. Household registration system and social security system give rise to dualistic labor market, which results that it is difficult to transform extensive growth pattern. Therefore, the driving force of efficient industrialization lies in factor marketization firstly. According to the theoretical logic of Madison (2001), the elementary conditions of successful transition in economic structure are technical progress and improvement in total factor productivity. It is unsustainable to depend on factor input and especially

industrialization with capital accumulation in long term. The industrialization depending on technical progress and institutional innovation and that is realized through improving technical efficiency and resource allocation efficiency is sustainable and efficient (Helpman, 2004). Efficient industrialization road pursues not only 'high scientific and technological content, low resource consumption, small environmental pollution and sufficient exertion of human resource superiority, but also optimizing factor allocation efficiency. The precondition of elevating resource allocation efficiency is sufficient exertion of market mechanism, especially the innovation of market system, rather than transforming to innovation factor-driving from labor and capital factor-driving. If factor-driving pattern ignores the cultivation of factor market, it will inevitably result in the distortion in factor price.

No modern country achieves industrialization in closed conditions. The factors are allocated in global market, indicating that China's efficient industrialization shall set enlarging economic opening as the background. Opening is a powerful means to obtain new knowledge and promote technical progress. Technical spillover effect and competition effect of FDI and trade enable the R&D departments in developing countries to require high in highly-skilled labors, promoting the technical progress in endogenous skills (Yin Desheng, et al., 2011); the quality and industrial structure of China's export products are updated along with the increase of trading scale and market openness degree (Yin Desheng, 2011, 2012). The access depends on various differences between enterprises in a country and even an industry, especially the differences among skill technology labor demand and supply, technical absorption ability and factor reward gaps. For example, if China excessively depends on foreign capital and pursues the import of new enterprises, and ignores the 'learning by doing' of local enterprises, it will decrease the economic growth quality (Yin Desheng and Huang Tengfei, 2010). Efficient industrialization needs to look for new path of economic structure transformation in selection of technical progress direction and reducing environmental pollution. The selection of technical progress direction will influence the direction and depth of capital deepening, while the increase in proportion of capital-intensive department may induce the economic structure changes going against reducing pollution emission. The solutions to such complex issues depend on the market system innovation of efficiency orientation. At present, Shanghai Free Trade Zone tries to reform factor market efficiency through system innovation, with significances of establishing a set of market system acting on international convention and achieving the optimal factor allocation on global market.

## (II) Efficient urbanization driven by spatial efficiency

The spatial agglomeration of urbanization and scale economy effect promote the improvement in technical innovation, service economy and consumption level. Theoretically, the relationship between urbanization rate and investment rate represents a reverse 'U', and the relationship between urbanization rate and consumption rate presents a 'U'; along with the rapid increase in urbanization level, economic structure will evolve from investment to consumption. The turning point happens when the urbanization rate is about 67% (Zhang Ping, Wang Hongmiao, 2011; Zhang Ping, et al., 2011). At present, the urbanization rate in China just exceeds 50%, and is in the golden period to promote structural adjustment depending on urbanization progress. Different from the input-oriented urbanization in economic catching-up period, what matches with 'growth of structure coordination' is efficiency-oriented urbanization. Efficiency-oriented urbanization advocates developing to relatively intensive urban structure from delayering urban structure, in order to achieve the objectives of promoting spatial efficiency, changing government-oriented growth pattern, resource saving and environmental protection.

Fan Jianyong and Li Fangwen (2011) proved that the spatial efficiency in large geographical range is significant in our country, while the spatial efficiency in small geographical range is insufficient. At present, in our country the phenomena of 'obvious agglomeration in large geographical range and insufficient agglomeration in small geographical range' give rise to two pairs of obvious contradictions: massive small and medium cities go against economic efficiency improvement and regional economy coordination, and give rise to resource waste. Land lacking and scale economy determine that China urban system shall choose relatively intensive road rather than delayering urban system. Relatively intensive urban system not only boasts scale economy advantages in non-agricultural land, unit energy consumption and pollution governance (Au & Henderson, 2006), but also a effective means to solve insufficient domestic demand in economic growth, unequal benefit share and low spatial efficiency. On the one hand, the relatively intensive urbanization will promote the government to supply the public products such as health, education, security housing and public service etc., and drive consumer-oriented economic growth. When the urbanization rate reaches 50%, government objectives and constraints will be changed obviously; pursuing public welfare will become the dominant objective of government; and the farmers who provide the lands for urbanization will share the land appreciation and increasing reward income generated along with the urbanization, which are in favor of realizing fair benefit sharing mechanism.

On the other hand, the relatively intensive urbanization may achieve scale economy effect and improve the spatial allocation efficiency of resources. From the perspective of internal scale economy, as for the transformation from delayering urban system to intensive urban system, it is necessary to improve level of big cities further and develop megalopolis. From the perspective of external scale economy, take the core cities as the center to gather several small and medium cities into urban agglomeration in space. Seeing from whole scale economy, it shall form unified urban and rural labor market and public service system in urban agglomeration and megalopolis, in order to promote the free mobility of factor trans-regionally and achieve a new round of system reform dividend.

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The Research Progress in China's Macroeconomic Growth Quality:  
Literature Review and Policy Implications

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**Abstract:** Strategic adjustment of the economic structure is the main direction for transformation of the mode of economic development, which decides China's macroeconomic growth quality. This paper attempts to review literatures on China's macroeconomic growth quality. On the one hand, we clarify the driving force of China's macro-economic growth, the direction of the strategic adjustment of economic structure, and the effect of spatial economic structure adjustment on macroeconomic growth quality. On the other hand, focusing on the key and difficult problems as well as advancing path for enhancing the quality of China's macroeconomic growth, we summarize a series of policy implications, which include the way of changing the government-led growth model, new mechanism for "structural coordinated growth", and the new path of structural adjustment. We advocate that the driving force of economic growth from investment-oriented to efficiency-oriented, which depending on efficient industrialization and urbanization.

**Key Words:** Macroeconomic Growth Quality; Economic Transformation; Government-led Growth Model, Efficiency-oriented Growth

■ Editor Wang Xiaoqing

## Quality System and Law

### Annual Report on Disclosure of the Food Safety Information from Government

Kong Fanhua

**Abstract:** through inquiring and analyzing the food safety information from websites of relevant central departments from June 2012 to July 2013, it is found that China food safety information disclosure is transformed to behavioral norms from institutional construction; significant food safety information is released by the newly-founded China Food and Drug Administration (CFDA). The disclosure of food safety standard information was a highlight in 2012. Problems still exist: the chaotic information releasing subjects are not improved; relevant departments lack accurate understanding about food safety information; the information release contents are not comprehensive; the information can not be released timely; released information is different from public demand. In order to improve the quality of published food safety information, it shall detail the classification of food safety information; based on the principle that ‘who manages and who releases’, straighten out the information release functions of supervision authorities; strengthen the construction of provincial food safety information release platform; immobilize the food safety white paper in a normalization mode.

**Key words:** food safety; government information; information quality

The substantive characteristic of food safety risk is information asymmetry (Yang Yongqing, 2012). Food safety information can be divided into manufacturer-dominant information, consumer-dominant information and neutral information (government, media and consumer organization) (Hornibrook S.A., McCarthy M., Fearn A., 2005). The neutral information released by government is more authorized and creditable with its objectivity and neutrality. The food safety information released by government has the property of public products, which can be divided into active disclosure and disclosure depending on application from the perspective of release mode. ‘Disclosure principle is the important guarantee of food safety and the basic requirement on food safety administration. It is the need of food safety risk communication, overcoming information asymmetry, and guaranteeing and achieving the participation rights of consumers in food safety risk field. (Wang Guisong, 2009) “As the important content of information regulation tool, food safety information disclosure system can indirectly intervene in the trading subjects.” (Ying Feihu and Tu Yongqian, 2010). Based on the category of active disclosure, the paper objectively describes and evaluates the food safety information disclosed by government food safety regulation department from June 2012 to July 2013.

#### I. Annual conditions of food safety information disclosure

##### (I) Introductions to central authority food safety government information network disclosure

General Office of the State Council issued *Arrangement for Key Tasks for Food Safety in 2013* (GBF [2013] No.25) on April 7, 2013, specifying that: perfect food safety information release system, strengthen communication before information release, ensure the scientificity, accuracy and timeliness of information, and release significant food safety information uniformly. Aiming at hot issues of food safety on which much attention has been paid by people, release authoritative information timely, objectively and accurately, and respond to social concern. Before reforming food safety regulation system, there are 13 departments responsible for food safety regulation, such as National Development and Reform Commission (NDRC), Ministry of Science and Technology (MOST), Ministry of Industry and Information Technology (MIIT), Ministry of Public Security (MOPS), Ministry of Finance (MOF), Ministry of Environmental Protection (MOEP), Ministry of Agriculture (MOA), Ministry of Commerce (MOC), Ministry of Health (MOH), State Administration for Industry & Commerce (SAIC), General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ), State Administration of Grain (SAOG) and China

Food and Drug Administration (CFDA). Six departments (MOH, MOA, MOC, SAIC, AQSIQ and CFDA) are directly responsible for administrative law enforcement and administration. Other departments only are proportionally responsible for food safety management, for example, NDRC is responsible for salt industry. Through searching the websites of central government department and especially the above six departments directly responsible for administrative law enforcement and administration, the author analyzes the disclosure of food safety information.

### 1. China Food and Drug Administration (CFDA)

CFDA mainly takes advantages of government websites, press conference and other media or forms to disclose food and drug regulation government information concerning the vital interests of the masses (CFDA, 2012). For example, establish the special column of ‘disposing medicinal capsule with exceeding chrome’ in the website, timely release work progress and supervising selective acceptance condition to the society; timely introduce scientific knowledge; open official microblog of CFDA and introduce the relevant policies of food and drug regulation from the platform; release the quality safety precaution information of ‘four products and one machine’ (drug, health food, cosmetics, catering food and medical equipments) and solve the food and drug safety problems concerned by the public. According to the *Institutional Reform and Function Transition Scheme of State Council* approved by the 1st Session of 12th NPC, the significant food safety information was disclosed by CFDA from MOH after March 2013. However in the ‘special column’ of CFDA website, only the section of ‘catering service food safety regulation’ is related to food, the remaining sections are related to drug. As for the column of ‘public service’, the caution information only involves drug. It is thus clear that the disclosure of food safety information is inconformity with the requirements of laws and regulations whether from width or depth.

### 2. National Health and Family Planning Commission

The newly-established National Health and Family Planning Commission mainly is responsible for food safety risk evaluation and food safety standard establishment with single responsibility in food safety information field. The internal organization ‘food safety standard and inspection and evaluation department’ is related to food safety information disclosure. The original MOH issued *Notice about Implementing Food Safety Standard Information Disclosure* (WJDF [2012] No. 77) on November 30, 2012, specifying that the key point of information disclosure is to promote information disclosure of food safety standard. Through inquiring food safety standard and inspection and evaluation department of National Health and Family Planning Commission, the food safety information published in websites from June 2012 to July 2013 mainly includes risk evaluation information and food safety standard information. The information related to food safety standard is the key field of food safety information disclosure of National Health and Family Planning Commission. In addition to the notice about various meetings, there are 60 notices, specifications and replies directly related to food safety standard. *Annual Report of Government Information Disclosure in Ministry of Health in 2012* specifies that the existing problems and next works of food safety government information disclosure are: ‘intensify the information disclosure related to food safety; specify the contents, forms and division of responsibilities related to information disclosure in health administrative departments at all levels; closely integrate information disclosure, knowledge popularization and public communication; guide vast people to accurately know food safety national standards’. (Ministry of Health, 2012)

### 3. Ministry of Agriculture

Ministry of Agriculture is responsible for quality safety supervision and management of edible agricultural products from planting and breeding, to entering wholesale and detail market or production processing enterprise; responsible for the quality and use supervision and management of veterinary drug, feed, feed supplement and other pesticides, fertilizers and other agricultural inputs in the scope of responsibility; responsible for quality safety supervision and management in livestock slaughter link and fresh milk purchasing link. According to the regulations in *Management Method of Quality Safety Information Release of Agricultural Products (trial)* (NZF [2010] No. 10), the main release contents of agricultural products quality safety information include: (1) the information of routine supervision, supervision and random checking and special monitoring for quality safety of agricultural products; (2) the information of quality safety incidents and processing conditions caused by producing agricultural products; (3) the information of survey and processing conditions about quality safety of agricultural products reflected by consumers or medias; (4) other quality safety information of agricultural products released by agricultural departments legally. Food safety information related to the above functions is scattered in different columns in

website of Ministry of Agriculture. Two hotspots of ‘GMO authority concern’± and ‘national food safety propaganda week’ systematically introduce food safety information concerned by the ordinary people, which are the highlights of food safety information disclosure from June 2012 to July 2013.

#### 4. General Administration for Quality Supervision, Inspection and Quarantine (AQSIQ)

AQSIQ is responsible for the supervision and management of products manufacturing and processing related to food, such as food packing materials, containers and food production and operation tools etc.; responsible for the safety of export and import food, quality supervision and inspection, supervision and management. AQSIQ shall collect and summarize export and import food safety information, and timely report to CFDA. If the overseas food safety incidents may give rise to influence in China, or serious food safety problems are found in import food, AQSIQ shall timely take risk warning or control measures and report to CFDA. CFDA shall take corresponding measures timely.

#### 5. State Administration for Industry & Commerce (SAIC)

CFDA shall be responsible for the investigation of advertising contents for drug, medial equipment and health food. The SAIC is responsible for the supervision and inspection of advertising activities for drug, medical equipment and health food. From the perspective of division of functions, the responsibility of SAIC related to food safety is ‘supervision and inspection of advertising activities for health food’. As for the column of ‘supervision and law enforcement’ in the website, there are two columns related to food safety, ‘food safety regulation’ and ‘advertisement regulation and law enforcement’. The former mainly releases the food safety regulation information in circulation link. After institutional reform, the food safety regulation function in circulation link has been incorporated to CFDA. Obviously, the function transfer shall be completed in a period of time. SAIC issued National System of Industry and Commerce Achieves Obvious Food Safety Regulation and Improvement Results upon Accumulating Regulation Experience and Enriching Working Achievements on June 25, 2013, saying that the system has investigated 0.52 million cases in circulation link by the end of March 2013. The value of these cases is 2.188 billion Yuan. There are 509 cases transferred to judicial office. Along with the completion and rationalization of function transfer, the information will not appear in the website of SAIC any longer. The remaining are the food safety information related to the regulation of ‘health food advertisement’. Upon investigating the food safety information disclosure of SAIC from June 2012 to July 2013, the information disclosure of ‘advertisement regulation and law enforcement’ is relatively good; before institutional reform from June 2012 to February 2013, the food safety information release in circulation link is relatively lacking. So far, it is difficult to find the important information of “sampling acceptability of food in circulation link” in the website.

#### 6. Ministry of Commerce

Ministry of Commerce after reform is mainly responsible in food safety regulation field for drawing up the development plan and policy in catering service and wine circulation. CFDA is responsible for the supervision and management of catering service food safety and wine food safety. The supervision and management responsibility of pig slaughter in fixed position is incorporated to the Ministry of Agriculture. From the perspective of institutional functions, the functions of food safety regulation involved in Ministry of Commerce are relatively single. The emphasis is protocolling development plan and policy, involving no specific administrative law enforcement and regulation. Development plan and policy are manifested in notice, regulation and other normative documents in behavior. This kind of information is government information opened by administrative organization actively, which can be inquired in the special column of government information disclosure. The general office of *Ministry of Commerce issued Key Points of Food Safety in Commerce System in 2013* on May 22, 2013, which is the only department publishing key point about works related to food safety among central state organs.

### (II) Government information disclosure of food safety incidents

The disclosure of food safety incidents plays positive significance in preventing the panic in social food safety. Analyzing from the existing conditions, the information disclosure in this aspect is insufficient, so it is difficult to prevent food safety risk effectively.

#### 1. Normative documents of food safety incidents

According to the regulations of *Emergency Response Plan for National Food Safety Incidents*, a food safety incident means an accident that stems from food and is or may be hazardous to human health, such as food poisoning, food-borne diseases and food contamination. Food safety incidents are classified into four grades, extremely serious food safety incidents, very serious food safety incidents, serious food safety incidents and ordinary food safety incidents. However, *Emergency Response Plan for*

*National Food Safety Incidents* specifies no specific conditions of food safety incidents at different grade. There are hundreds of regulations in the emergency response plan for local food safety incidents, while the regulations are largely identical but with minor differences. The newly issued regulation is Emergency Response Plan for Food Safety Incidents in Xi'an published by Xi'an People's Government General Office on June 17, 2013 (SZBF [2013] No. 78). According to the regulations of Emergency Response Plan for Food Safety Incidents in Xi'an, where it is caught in one of the following situations, it refers to extremely serious food safety incidents: (1) where the polluted food is circulated to over 2 provinces or overseas (including Hong Kong, Macao and Taiwan) and cause extremely serious health damages or the damages are extremely serious upon assessment; (2) other I-grade food safety incidents affirmed by the State Council. Where it is caught in one of the following situations, it refers to very serious food safety incidents (II grade): (1) where the polluted food is circulated to over 2 cities, causing or may cause food poisoning or foodborne disease which can seriously damage the public health; (2) the foodborne disease caused by new pollutant in our country, causing serious health damages and tending to diffuse; (3) the number of poisoned people involved in food poisoning incident is above 100 and death cases are included, or there are more than 10 death cases; (4) other II-grade food safety incidents approved by the governments above provincial level. Where it is caught in one of the following situations, it refers to serious food safety incidents (III grade): (1) the polluted food is circulated to over 2 counties and causes serious health damage; (2) the number of poisoned people involved in food poisoning incident is above 100 or death cases are included; (3) other III-grade food safety incidents approved by the government above city level. Where it is caught in one of the following situations, it refers to ordinary food safety incidents (IV grade): (1) the polluted food with health damage caused serious health damages; (2) the number of poisoned people involved in food poisoning incident is less than 99 and death cases are excluded; (3) other IV-grade food safety incidents approved by the government above county level.

## 2. Information disclosure of food safety incidents

According to the *Management Method of Food Safety Information Disclosure* (WJDF (2010) No. 93) formulated by original Ministry of Health, Ministry of Agriculture, Ministry of Commerce, SAIC, AQSIQ and CFDA on November 3, 2010, the cases involving very serious food safety incidents shall publish 'very serious food safety incidents and processing information', including locality, basic information of responsible unit, casualty amount and remedy, incident reasons, investigation of responsibility, emergency treatment measures, etc. During the period of 2012, there were massive food safety reports. These can only be called as 'hotspots of food safety' rather than food safety incidents, while some are not related to food safety incidents (www.ce.cn, 2013). The hotspot problems about food safety concerned by the public consist of 'food safety incidents' and 'food safety accidents', which are lack of official authoritative data. The information deficiency indicates the insufficiency in food safety information disclosure field. 'Cadmium' rice incident was one of food safety incidents in first half of 2013. It is not allowable to ignore the dereliction of duty of government regulation department in food safety information disclosure. According to the report in Southern Metropolis Daily on May 17, 2013: Guangzhou Food and Drug Administration released the test results of food and relevant products in catering link in Q1 of 2013, and the total acceptability was 92.92%. The acceptability of rice and rice made products is the lowest, which is only 55.56%. The unqualified item is 'Cadmium'. Guangzhou Food and Drug Administration randomly inspected 367 batches of food and relevant products in catering link, 341 batches passed, so the acceptability was 92.92%. Where, there were 310 batches of food and raw materials in total, 287 batches passed, so the acceptability was 92.58%; 57 batches of tableware were involved, 54 batches passed, so the acceptability was 94.73%. 18 batches of rice and rice made products were involved, 10 batches passed. The acceptability was the lowest, which was 55.56%. The reason of 8 unqualified batches was cadmium content exceeding standard. As for the cantering units in Guangzhou whose rice is unqualified, the person-in-charge in Guangzhou Food and Drug Administration showed that only the data rather than list are published. After exposing the incidents, the public appeal the government departments to disclose the specific information. With question of the public, Guangzhou Food and Drug Administration published the relevant units. As for the flow direction of unqualified food, the relevant departments have not provided clear answers. The information concerning the food safety of ordinary people becomes 'a secret that can not be told' of relevant departments. After releasing the information about food safety on May 16, 2013, with the constant question of all sectors of society, Guangzhou food regulation department does not disclose the involved enterprises firstly and then conditionally publishes proportionally enterprises that manufacture unsafe food, stating that some production enterprises and brands are inconvenient to disclose. The

reluctant and passive information release not only does not erase the worry of consumers, but also arouses query in a larger range (Guo Zhengang, 2013). Due to lacking official information, the source of ‘cadmium’ rice, influencing range, affected population and results are unknown, arousing the panic emotion of public on food.

## II. Annual features of food safety information disclosure

### (I) Information disclosure is transformed to behavioral norms from institutional construction

*Food Safety Law, Regulation on the Implementation of the Food Safety Law, Administration of Food Safety Information Disclosure* and other normative documents of local food safety information release constitute the fundamental regulations about food safety information release. The issuing date of these laws, regulations, rules and documents falls in 2010-2012. The normative framework of food safety information disclosure is completed basically. After entering into the second half of 2012, the emphasis about food safety information is transformed to ‘specific actions’ from ‘establishing regulations’. From the perspective of quantity of specifications, there were only three central and local specifications related to food safety information from June 2012 to July 2013. From the perspective of action, taking National Health and Family Planning Commission as an example, there is information released every month. The irregular practice that ‘release information in certain period and there is no information in a period time’ will not occur.

### (II) The subject of information release changes along with institutional reform

According to the Institutional Reform and Function Transition Scheme of State Council approved by the 1st Session of 12th NPC, it shall establish CFDA, which is mainly responsible for the unified supervision and management of safety and effectiveness of food and drug in the links of production, circulation and consumption. Institutional reform scheme adjusts food safety management system. Accordingly, the food safety information released by various departments shall be exercised by new departments along with function transfer. The release mechanism of food safety information before shall implement the mechanism that ‘very serious food safety information’ is released by Ministry of Health and ‘daily food safety information’ is released by other departments. After institutional reform, very serious food safety information is released by the newly-established CFDA. *Regulations of Internal Organizations and Staffing of CFDA* (GBF (2013) No. 24) specifies the internal ‘news publicity department’ is responsible for ‘drawing up unified release system of food safety information, undertaking the popular science propaganda, news and information release related to food and drugs’. Other food safety regulation information is still released by Ministry of Agriculture, National Health and Family Planning Commission, AQSIQ, SAIC, Ministry of Commerce, Ministry of Public Security and other departments in their own responsibility scope. The newly-established CFDA takes main responsibilities in the aspect of food safety information release. Because the organization is established for a short time and the functions are not rationalized, as for information release, drug information outweighs food information. The condition is expected to be improved in next report period. After readjusting functions, the regulation functions of National Health and Family Planning Commission are single in food safety aspect. Compared to that before in the field of information disclosure, the formulation, clearing up and disclosure of food safety standard have become the highlight. It is the best department of central ministries and commissions involving food safety regulation organization in the aspect of food safety information.

### (III) The disclosure of standard information shall be highlighted

There are nearly 1,900 national standards related to food, food additives and other relevant products in China. After implementing Food Safety Law, the relevant departments shall timely clear up and integrate standards. There are 185 newly-released national standards of food safety. There are 2,193 indexes limiting residual of pesticide and veterinary drug. On one hand, it has not yet formed unified food safety standard system, and the problems of deficiency, lagging, repetition and conflict exist in food hygienic standard, quality standard, edible agricultural products quality safety standard and industrial standard (General Office of the State Council, 2012); on the other hand, the disclosure of food safety standard is in a mess and decentralization, so it is difficult to find out. *Ministry of Health issued Notice about Food Safety Standard Information Disclosure* (WJDF [2012] NO. 77) on November 30, 2012, stressing that ‘the health administrative departments shall proactively disclose the following food safety standard information according to *Food Safety Law* and its enforcement regulations as well as their own responsibilities: (1) regulations of food safety national standard, local standard management method and food safety enterprise standard filing; (2) national standard plan of food safety; (3) annual formulation (revision) plan of food safety standard; (4) comment and formulation description of food safety standard; (5) documents of national

standards and local standards about food safety; (6) explanation materials of national standards and local standards about food safety; (7) other food safety standard information which shall be disclosed proactively according to laws, regulations and national provisions. The disclosure modes include: the department website, the department microblog, information public bar, electronic screen, information column or printed materials of notice and public release, significant food safety propaganda activities such as food safety propaganda week and opening day, medias such as newspaper, broadcast, television, network and mobile phone, '12320' hygiene hotline phone and other modes facilitating the public to obtain information. According to the statistics, National Health and Family Planning Commission have released 60 articles of food safety standard information.

#### (IV) Safety information tends to release with special subjects

Food safety information is numerous and massive in types. Whether the release organizations or the public are easily trapped into vast information, causing they have no ways to handle. The categorization and special subject of food safety information are one important ways to solve the problem. The information with special subject is clear at a glance, facilitating the public to check up and utilize. The food safety information before is scattered in the different columns of government website. It cost time and effort to look up. At present, the situation is better. The special column for food safety information is increased, such as 'risk evaluation information' and 'risk warning information' of National Health and Family Planning Commission, 'Genetically modified food safety' column and 'propaganda week of national food safety' of Ministry of Agriculture etc.

### III. Existing problems in food safety information release

There are existing problems in food safety information release. Information asymmetry is still the basic feature in food safety information disclosure.

The release authority of food safety information shall be the government department taking charge of food safety. According to the regulations of *Food Safety Law*, *Regulation on the Implementation of the Food Safety Law*, *Management Method of Food Safety Information Disclosure*, the departments mainly include food and drug supervision and management department, health department, agriculture department, commerce department, quality inspection and quarantine department, industrial and commercial administrative management department, etc. The departments are responsible for collecting, formulating and releasing food safety information. The public have right to know the relevant information. 'The market has unconquerable limitations in food safety information field. It is the inevitable choice of maintaining food safety consumption to correct the severe bias in food safety information depending on government'. (Zhao Xuegang, 2011). If the above departments fail to fulfill responsibilities, the deficiency in the authoritative food safety information will cause information chaos. The hotspot incident of food safety in 2012 distinctly reflects the problem.

As shown in table 1 next page, only the case 'coca cola with chlorine' in 12 food safety hotspots belongs to food safety incident. Although many incidents are proved as non-food safety incidents, the enterprises suffer from huge loss. In addition to the legal government departments, whether other subjects have rights to release food safety information. How to undertake legal responsibilities upon illegal release? The existing laws have not involved these problems. Food safety information release shall follow the principle of law, science, accuracy, comprehensiveness, objectivity & fairness and strict procedure. The final objective shall be conducive to strengthening food safety regulation, maintaining the rights to know and monitor of vast consumers and producers, and guiding the correct market consumption and healthy development of food industry. (Ma Liquan, 2012). The problem of chaotic food safety information release subjects exists all the time. Although the condition is improved to some extent, it does not change fundamentally. Some information involves no responsible subject, and some information is released repeatedly.

Table 1 Hotspots of food safety with public concern in 2012  
 Table -1 Hotspots of food safety with public concern in 2012 (China Economic Net, 2013).

Date	Hotspot	Experts	Comments of experts
March	Spirulina is excessive in lead	Chen Feng	The media makes improper judgment with wrong standards and disclose information before verifying. The incident is non-food safety incident.
April	'Gelatin case'	Sun Ying	There is no evidence for the industrial gelatin contained in yogurt and jelly. The incident is non-food safety incident.
April	Case of Lipton 'pesticide'	Chen Wei	The judgment evidence is wrong. The incident is non-food safety incident.
April	Case of coca cola with chlorine	Sun Baoguo	The enterprise lacks management and control in production process. It is food safety incident.
June	Guyue Longshan rice wine is tested with amino toluene acid ethyl ester.	Xiong Zhenghe	At present, there is no evidence proving that whether the amino toluene acid ethyl ester (content) in rice wine has potential carcinogenic risk. Therefore, the incident is non-food safety incident.
July	Case of Jinmailang 'acid value'	Yuan Xiaomei	Inspection organization withdraws inspection report and states it is invalid. The incident is non-food safety incident.
August	'Florescent materials' exceed standard	Wang Tianzhu	The paper container is in conformity with China relevant standards and is able to guarantee food safety.
August	Pesticide residue in Changyu Red Wine exceeds standard	Shi Xianming	The media report is not comprehensive. The pesticide residue in tested wines is not exceeding standard. The product is qualified.
August to September	Case of 'borax'	Wei Yimin	It is a public operation incident caused by improper law enforcement. The incident is non-food safety incident.
September	Bright Dairy Baby Cheese is charged of containing banned contents	Li Ning	It can not be used before approval according to the relevant regulations.
October	'The bacteria in KFC hamburger exceeds standard'	Liu Xiumei	The cited standard is inappropriate and the judgment evidence is insufficient. The incident is non-food safety incident.
November	The plasticizer in white wine exceeds standard	Xu Yan	It lacks judgment evidences. The incident is non-food safety incident.

Note: The information is cited from www.ce.cn, 2013

## (II) It is insufficient to grasp food safety information accurately

Although *Food Safety Law and Management Method of Food Safety Information Disclosure* specify the connotation of food safety information, it is insufficient to grasp food safety information accurately during actual operation. If food safety information, news report, communication and comments are confused and placed in the same category, it will be difficult to distinguish, greatly reducing the utilizing and checking effect of food safety information. The extension of food safety information should cover: (1) information of total condition about food safety; information of analysis forecast and warning about total tendency of food safety; (2) daily monitoring information of food safety, mainly is the information obtained by food safety regulation departments through daily monitoring, which is reflecting the food safety situation in this locality and the system; (3) information of food safety regulation, including food safety regulation policy measures, planning deployment, plan implementation, local legislation, standard formulation and amendment, supervision and inspection, detection and inspection, risk monitoring and evaluation, special remediation, case investigation, important meetings, significant instructions of leaders, work events and other information; (4) information of food safety incidents and information of food safety risk warning, including complaints about food safety quality problems, significant food poisoning, emergency food pollution incidents, zoonose and other food safety incidents and handling information; (5) food production operation permission and credit information, including food production permission, food circulation permission, catering service permission, business license, certification and credit; food safety system construction, mainly including work organization, publicity training, credit system

construction, significant project construction, scientific research achievements and the application; (6) food safety public opinion, media reports, food safety information which is reported or reflected by media and aroused or possibly will arouse public attention, and other important food safety information. The range and content of food safety information disclosure from government are narrow and the information quality is not high. The disclosure from policy information and media information is numerous and the in-depth information is minor. Most information is from newspapers, websites and other media, causing the contents of food safety information and news reports become a mess.

### (III) Information quality is low

*Key Work Arrangement of Government Information Disclosure in 2012* (GBF [2012] No. 26) specify the promotion of food safety information disclosure will be one key field of government information disclosure in 2012. It emphasizes that: it shall reinforce the strength of food safety regulation information disclosure. Food production and operation permission, special inspection and remediation, investigation of illegal production and operation behaviors and other daily monitoring information as well as risk evaluation and risk warning information shall be opened legally in principle. The administrative department in charge of health shall further intensify food safety standard disclosure, expand the channel of public to draw up food safety standard, ask for the opinions of the public and increase public participation degree. The work arrangement of the State Council specifies the above six categories of information as focus and stipulates that the task is implemented by food safety office and Ministry of Health. As a whole, 'the overall condition of food safety' is the overall evaluation on food safety in certain region, belonging to the important content of food safety information. So far, the very important information is lacking from central government to local governments. Compared to the regulations of the State Council, although the above six categories of food safety information are released, the food safety standard information is numerous and intensive, while other key propelled food safety information disclosure is far from the regulations. Most information is scattered and non-comprehensive whether from point or surface. The content of food safety information disclosure shall give priority to warning and forecast information of prevention first. But seeing from the content and range of China government information release, the inspection and detection, comprehensive monitoring, food safety knowledge, food safety policy and other post-event handling results information are dominant. It lacks the predictive analysis of information and disclosure of before-event warning information of crisis and damages. (Li Hong, 2011) The omission and insufficient action of supervision authority give rise to the deficiency of authoritative information. Seeing from specific events, the food safety information such as 'cadmium rice' is not comprehensive so far. As for the sudden food safety problems such as 'cadmium exceeds standard', it shall actively respond the queries of all parties and provide more information for reference rather than 'silence'. The brand of unqualified food, production unit, sales unit and final direction shall be opened to the public accurately and objectively (Liao Haojin, 2013).

### (IV) It fails to completely release information timely

Food Safety Law and Management Method of Food Safety Information Disclosure specify that food safety supervision and management department shall accurately, timely and objectively publish information. In case of occurrence of food safety incidents, the government shall publish the information at first time. However during practice, many food safety supervision departments are not conformity with legal regulations. After the occurrence of food safety incidents, the reaction speed of government websites is slower than media and net citizens. And even, the government release information is conflictive with media release information. If the public are skeptical about government information, it deepens such conflicts. Taking the incident of 'problematic rice' as an example, Guangzhou Food and Drug Administration released monitoring results on May 16, 2012. As for the catering units using the problematic rice, Guangzhou Food and Drug Administration stated that they only published the data without the specific list. With huge query of the public, Guangzhou Food and Drug Administration published the relevant units immediately. The incident is completed with the information published by relevant departments (Tan Linling, 2013). The information release is achieved under the pressure of the public. The information is not released at the first time. As for the incident, the public wish the relevant departments to investigate the incident, destroy the rice, trace source of rice, dispose the catering units using the rice and make them pay for the incident, so that they will not dare to use the rice any longer. At the same time, the relevant departments shall disclose the information comprehensively and rapidly, in order to meet the rights of the public to know and choose, and prevent the occurrence of events damaging public health. (Lian Hongyang, 2013)

### (V) There is a large gap between published quantity of information and public demand

Food safety information is one of the important government information content in 2012 delineated by the State Council. According to the investigation of Annual Report of China Government Transparency (2012) (Report for short) published by Chinese Academy of Social Sciences on February 25, 2013, many cities are worrying about the situation of food safety supervision and random inspection disclosure. Through investigating 43 quality technology supervision websites in larger cities, only 10 can provide the food production supervision and random inspection information in that month, so the information transparency is only 23%. In addition, the disclosure of safety and credit archive information of food enterprises is still pessimistic. Report discloses that only 16 quality technology supervision departments in larger cities provide credit archive about food enterprise safety. The number of departments which can provide the basic information of enterprises is much less. In addition, as for some important tourism cities, such as Luoyang, Haikou, etc., the food safety information transparency is also not ideal. If the evaluation index grade of food safety information transparency is 10, Luoyang only scores 1.5 and Haikou is 0. The other city scoring 0 is Xining City. (www.e-gov.org.cn, 2013). Under the circumstance, information asymmetry exists between the food safety information published by the government and the information required by the public. The asymmetry makes the net citizens tend to adverse selection in food safety incidents. The public will be increasingly non-confidential on the food safety information released by the government.

#### **IV. Emphasis of food safety information disclosure system construction and reform**

##### **(I) Refine the classification of food safety information**

Seeing from existing conditions, the government offices responsible for food safety regulation published certain amount of food safety information. But the information is numerous and jumbled, which is nonconductive to reading and finding. The information classification is not scientific and information and management departments are in incomplete correspondence. The basic thought to perfect food safety information release system is to classify the information, and correspond to different information and food safety supervision department; the supervision department should definitely list the food safety information range published by the department, and publish the information legally and timely in order to facilitate looking up by the public. Seeing from the region, food safety information includes national food safety information and local food safety information; seeing from the contents, food safety information shall include the following category: (1) information of overall conditions of food safety and national food safety, including overall conditions of national annual food safety, implementations of national food safety risk monitoring plan, formulation and revision of food safety national standards, etc.; (2) food safety risk evaluation and risk warning information, including information of precaution existing or potential poisonous and harmful factors in the food; risk warning information of food with higher degree of food safety risk; (3) very serious food safety incidents and handling information, including locality of very serious food safety incidents, basic information of responsible units, the number of casualties and remedy conditions, causes of incidents, investigation of incident responsibility and emergency handling measures, etc.; (4) other important food safety information and other information need to be published uniformly determined by the State of Council. Establish and perfect the mechanism through taking city, county and administrative regions as unit, regarding government food safety supervision department as responsible subject, choosing food variety with high consuming amount and releasing the safety information of corresponding hotspot food. Timely release the information related to food production and operators. Test food safety directionally or periodically based on the enterprise declaration; release the test results in an authoritative and normative form facilitating the public to know. Establish and release credit evaluation and display system of food production operators as soon as possible (Liu Yong, 2012). The relevant functional departments shall strengthen information collection and analysis ability, in order to form a serialized, specialized and professional information integration system. Clarify and organize the food safety information in various columns of relevant websites, in order to reduce the information asymmetry of online public opinions about food safety. (Wu Linhai, Huang Weidong, 2012)

##### **(II) Rationalize the information release function of supervision department**

The basic principle is 'who manages, who releases'. That is to say, the organizations responsible for food safety supervision are also the subject to collect and make food safety information. They also are obligated to release the information, in order to prevent buckpassing and indefinite responsibilities of information release. The food safety supervision departments above county level have rights to release daily supervision information legally. Due to multiple information exits and levels, it shall strengthen coordination and cooperation between departments, levels and regions as for information release. Firstly, the

relevant departments shall be responsible for daily supervision information release and publish all information to be opened in accordance with their own responsibilities; secondly, where the released information involves above two supervision departments, it shall communicate with the relevant departments closely; if the sensitive information involves other provinces, cities and regions, it shall report to the relevant regions before release and do well in communication and coordination; thirdly, where the food safety risk evaluation information and risk warning information shall be published, it shall be managed and published by health administrative department above provincial level; fourthly, it shall implement unified release system for significant information, strengthen the coordinations as for very serious food safety incident and its processing information and the overall situation of national food safety, and release the information uniformly and orderly (Zhang Yong, 2012). Because the food safety information is numerous and jumbled, it is difficult to release information in high quality, high efficiency and high coverage in short term. At present it is urgent to divide food safety information roughly, specify authorized management responsibilities. Based on the refining and classification of food safety information, the food safety supervision department shall firstly release the important food safety information managed by the department, and gradually perfect food safety information release system on this basis. Table 2 lists the basic information of food safety in the charge of various food safety supervision departments, which shall be regarded as the basic entry to perfect food safety information release. Food and drug supervision and management department is the important organization responsible for food safety information release. The condition of negative act is serious in the filed at present.

Table 2 Connection between important food safety information and food safety supervision department

Table-2 Connection between important food safety information and food safety supervision department

Supervision department	Category of food safety information
	Overall conditions of food safety
Food and drug supervision department	Food safety incidents Administrative Licensing Hotspot incidents of food safety
Ministry of Health	Food safety risk evaluation information Food safety standard information
Ministry of Agriculture	Routine monitoring, supervision and random inspection and special monitoring results of agricultural product quality
Commerce department	Development plan and policy of catering service and wine circulation
Inspection and quarantine department	Food packing materials, containers, food production and operation tools, etc.
Industrial and commercial administration department	Information of health food advertisements

Category of food safety information Food and drug supervision department Overall conditions of food safety  
Administrative licensing of food safety incidents Hotspot incidents of food safety Department of health Food safety risk assessment information Food safety standard information Agricultural department Routine monitoring, supervision and random inspection and special monitoring results of agricultural product quality Commercial department Development plan and policy of catering service and wine circulation Inspection and quarantine department Food packing materials, containers, food production and operation tools, etc. Industrial and commercial administration department Information of health food advertisements

### (III) Strengthen provincial food safety information platform construction

Food safety information release plays a role of information communication between governments, enterprises and the public. As an organic part of food safety risk regulation, food safety risk communication is that the administrative organizations communicate with the public and enterprises and propagandize the activities related to food safety risk information through

certain platforms, such as internet, medias, etc. (Qi Jiangang, 2011). China food safety information disclosure implements the system that the people's government above county level takes full responsibilities and publishes information by levels in longitudinal direction. The disclosure matters of provincial extremely serious food safety information are determined by the provincial people's government. If the food safety information involves two or above cities with districts, or although the information involves one city with districts, it shall be published in provincial level because the problem is serious with generality and tendency, the disclosure matters shall be determined by the provincial people's government. If only involving single link or department business, the corresponding provincial competent department shall be responsible for release in accordance with the responsibilities. Food safety information shall be disclosed to the public through government website, government bulletin, press conference, newspaper, broadcast, television, government affairs public column, electronic screen, electronic touch screen and other modes facilitating the public to know. Because the information release subjects and release channels are multiple, it shall establish a main information release platform as the basic channel for the public to learn the information. The information conference (news conference, information briefing) organized by provincial food safety information network, provincial food safety commission and the offices shall be regarded as the main platform of provincial food safety information release. Provincial administrative region is a connecting link between the preceding and the following. Provincial food safety information network can be regarded as the local food safety information share platform. At present, provincial food safety networks exist in most provinces in China, which have not been completely located as 'provincial information release platform' in contents. Taking <http://www.gdfs.gov.cn/> as an example, the office of Guangdong Food Safety Commission shall regularly make 'Guangdong food safety information' and release the information in the website. Although the information contents are not comprehensive completely, the form will make the public to learn information intensively. It shall strengthen provincial information platform construction afterwards, and regard it as the foundation of central food safety information release.

#### (IV) Perfect the system of food safety white paper

'White paper' is applicable in multiple fields as an illumination formally published by a government of a country and a normative report to be implemented. Since publishing the first white paper in 1991, China has published 85 white papers by May 2013, involving political democracy construction, legal construction, party system, human rights, military control, national defense, non-proliferation, religious problems, population problems, energy, environmental problems, intellectual property problems, food and drug safety, internet, Tibet and Sinkiang etc.(Baidu, 2013). Information Office of the State Council published white paper of Food Quality Safety in China on August 17, 2007, introducing and stating China food quality safety in the aspects of food production, quality overview, food supervision system and regulation, export and import food supervision etc. It is the first time that Chinese government introduces national food safety to the public in the form of white paper. However, the white paper of national food safety is not published every year, and the system of food safety white paper is not generalized nationwide. During the report period, Shanghai, Fujian, Qingdao, Shenzhen and Foshan Shunde District, Shanghai Qingpu District respectively published the white paper describing and reflecting the food safety in administrative regions. *Report of Shanghai Food Safety in 2012 (white paper)* (published on February 5, 2013) is the second document to publish food safety conditions. *White Paper of Fujian Food Safety in 2012* (published on January 17, 2013) and *Report of Qingdao Food Safety in 2012 (white paper)* (published on April 16, 2013) and *White Paper of Food Safety Supervision in Shunde District in 2012* (published on April 2, 2013) are the first white paper to publish food safety respectively. There are members of the CPPCC suggesting that: implement annual food safety white paper system, take the provinces, regions and cities as the unit, and publish white paper of food safety and food market supervision every year in the name of government, making the public learn the annual food safety condition and food safety supervision, and enabling the consumers to be confidential on China food market (Liu Yong, 2012). As a comprehensive description on food safety regulation, the white paper of food safety bears massive food safety information and shall be immobilized in a normalization mode; the author suggests that the central government and provincial governments shall publish the white paper of food safety in the first quarter of each year. The administrative regions below provincial level can voluntarily publish the white paper of food safety in this region.

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## Annual Report on Disclosure of the Food Safety Information from Government

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Abstract: Through browsing the food safety information on some web sites of the government department during June 2012 to July 2013, we find that the emphasis is from system construction to action. The great food safety information is disclosed by the State Food and Drug Administration along with institutional reform. The disclosure about standard of food safety is lightspot of 2012. But the problems remain. The duties of relevant departments are confusing. The content of the information isn't clear. The disclosure is too late. The quality of the information is low. In order to deal with this situation, the food safety information should be classified and different departments' obligation should be distinguished. Besides, information

platform based on province is important. White Paper on food safety should be released regularly.

Key Words: Food Safety; Government Information; Information Quality

■ Editor Wang Xiaoqing



## An Analysis Framework and Model for Quality Safety

### Early-warning Based on Online Information

——A study based on quality risk information of online consumers

YU Hongwei, YU Fan and XU Wei

**Abstract:** Quality safety early warning with quality information published by consumers on internet is a new perspective of quality governance in network times. The paper studies the construction and implementation of an analysis framework and model based on consumer quality safety online early-warning. The analysis framework of quality safety online early warning is designed from three aspects of quality information classification, risk level and warning division, in order to extract general classification forms of consumer online quality information, namely bodily injury information, insecurity information and character change information. Combining with the characteristics of online information, the three categories of information is divided into five different levels according to the seriousness of risk. The division of early warning is determined based on risk level. Specify the construction process of early warning model with evidence theory from three steps of identifying framework construction, obtaining reliability evaluation and recursive fusion algorithm, mixing the quality information in different types and risk levels. The study provides an idea and method for quality online government in big data times.

**Key words:** Quality safety; network warning; analysis framework; model

#### I. Introduction

Quality safety incidents happen occasionally in China. The results of incidents often damage market orders and social justice, seriously damaging the life health and property of the masses and causing huge economic loss. It is urgent to lucubrate the significant problems that how to rapidly grasp risk information and conduct safety early warning accurately, in order to prevent the occurrence of large-scale quality safety risk incidents.

Early warning process is the process collecting information, analyzing information and making decision. Early warning will be like water without source without information. The lager-scale popularization and in-depth of internet provide us with good opportunity to obtain quality information comprehensively. According to the statistics, up to the end of June 2013, the number of internet users and mobile netizens reached 0.591 billion and 0.464 billion respectively; as for the users, the number of users for blogs and personal space was 0.401 billion, and the number of microblog users also reached 0.331 billion (CNNIC, 2013). The consumers as netizens can directly spread the quality risk evaluation information to the society through internet, becoming the potential provider and transmitter of quality safety risk information. Internet information release and transmission are characterized by universality and timeliness. Monitor the massive quality risk information published by online consumers timely by means of informatization, thus it will obtain quality risk information broadly in spatial dimension and rapidly in time dimension, and grasp the quality safety problems of consumers comprehensively, and the results of early warning will be real-time and accurate. Therefore, the quality safety early warning based on the massive quality information of online consumers is a new idea of quality governance in big data times.

The national and foreign study aiming at quality safety online early warning is nearly a blank. More studies focus on the online effectiveness of quality safety early warning depending on the existing information system (Rortais et al., 2010; Tao Xiaocun, 2008; Zhang Dongling, 2010), or the online system structure of quality safety early warning system (Adrie et al., 2006; Peter, 2007; Tom, 2009). These studies involve no online quality information of consumers. Fundamentally, online quality

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information is a kind of online expression about quality defect information. Quality safety online early warning is a kind of early warning of online information in essence. The online quality information of consumers is numerous and complicated. The key point of effective early warning is to process the magnanimity, uncertainty and incompleteness of online quality information. Magnanimity is the quantitative feature of online quality information. The consumers publish massive quality information on internet every day. It shall depend on the method and idea of big data to process the enormous amount of information. Uncertainty is the accuracy feature of online quality information. The online consumers publish quality information freely according to the code of language. The quality information in different types and styles will challenge the correct early warning. Incompleteness finally reflects the risk in physical world. Not all consumers publish quality information online. It is representative to reflect the actual risk through online quality information, so the information is incomplete to a certain extent.

In the face of three outstanding features of online quality information of consumers, the paper holds that the study on quality safety online early warning shall focus on three problems: first is the classification of online quality risk information. Choose the comments published by consumers related to quality safety, and rationally classify the quality information in different types and with different contents, making the early warning information play value in a unified analysis mode. Second is the risk level of online quality information after classification, namely construct the risk early warning level in different classifications according to the quality information risk degree reflected from presentation form and specific contents of information. Third is mixing product quality information in different categories and risk levels. It shall fully consider the uncertainty and incompleteness of information upon mixing, thus the methods related to artificial intelligence shall be taken into account.

Based on the above analysis, the paper constructs a general framework of quality safety online early warning analysis from the three aspects of online information classification, risk level and warning division, and constructs early warning model using intelligentized information fusion method, in order to provide a new kind of online model and method for quality safety early warning.

## II. Analytical framework of quality safety online early warning

### (I) Information classification

The first step of successful early warning is to effectively classify numerous and complicated internet quality information published consumers. At present, the studies and explorations to classify quality safety online information in academic world and practice field are scarce. The representative one is the study of classification model and implementation method about enterprise quality safety of internet information by Cheng Hong, et al. (2012). Based on the quality safety information of online consumers, after extracting three mature classification indexes of product performance, service quality and operation quality from the existing literatures, Cheng Hong et al. (2012) study three new classification indexes of security, public image and economy meeting internet conditions through the empirical analysis of online text data. They also construct enterprise quality safety classification model for 20 indexes based on internet information based on 6 classifications of indexes. Their studies have vital significance on the classification of online quality risk information.

The risk classification index in 6 dimensions constructed by Cheng Hong et al. (2012) is oriented to production enterprises, covering the information category of public image, economy, service quality, operation quality and other information related to enterprise operation management and social responsibilities. What the paper studies is early warning problems. Huang Guansheng, et al. (2006) hold that “warning” is the abnormal condition during development process, which is possible to result in risk crisis. Maslow (1943) puts forward that safety need is the human need next to physiological need, which is an essential need of consumers to product quality. Therefore, the study of quality safety early warning will focus on the safety of quality, choosing the dimension of “safety” with highest attention and sensitivity as the entry point, in order to classify internet quality information. Analyzing from the perspective of consumers, the direct criteria whether the inherent feature of quality is safety are the bodily injury during using process, or possibility of potential damages in quality caused by character changes, or the insecurity caused by harmful facts and insufficient properties. Therefore, according to the study conclusions of Cheng Hong et al. (2012), the paper divides online quality information into three categories, namely bodily injury, insecurity and character change.

First is bodily injury. Bodily injury refers to the body damages when enduring unbearable energy within certain period of time

during touching or using information. It is the direct injury caused by potential safety hazards in quality. The forms of injuries generally are physical injury, chemical injury and biological injury (GB/T22760-2008), such as death, poisoning, skin allergy, diarrhea, etc. US NEISS, EU RAPEX and Japan PIO-NET take the collected information of bodily injury of consumers as the important reference to warn monitoring quality safety risk.

Second is insecurity. Insecurity refers to the uneasiness and fear brought by certain feature of quality to consumers. Even if there is no bodily injury to the user, the consumers will suffer from worry or fear upon using because of psychological changes. The information describing mental feelings exists in the monitoring text data by Cheng Hong et al. (2012). The insecurity comes from the received or perceived quality injury, or the quality injury speculated from quality character changes. It reflects the possibility suffering from similar quality injury perceived by consumers objectively, which is expressed indirectly through the emotion of consumers.

Third is character change. Character changes refer to the changes in physical and chemical characteristics compared to that when leaving factory. The consumers can perceive the changes through naked eyes, or simple test and inference method. The consumer’s description on character change does not directly reflect the quality injury of consumers, which it can reflect the fact of potential safety hazard in quality. The potential safety hazard will become the potential risk endangering the physical health and consumer rights. If the quantity of information is larger, the potential risk will also be higher. The online information describing quality character changes is quite massive, such as the quality risk information containing foreign matters, expiration, mustiness, dysfunction and other words are common in forum, blogs and microblog.

General risk evaluation generally depicts risk information source from two aspects, one is injury degree of quality on body, and the other is the possibility of injury. Compared with general risk evaluation principle, the classification of internet quality information in this paper has two outstanding features. First considers potential risk. The bodily injury reflects the injury degree of quality on body; the insecurity reflects the possibility of injury; the character change reflects the potential risk of quality on bodily injury. The size of potential risk is also depicted in the description of insecurity. Second combines the characteristics of internet. On one hand, the information of character change can reflect the degree of potential risk through amount of online quality risk information; on the other hand, the information of insecurity can reflect the possibility of injury through the character of risk information transmission. The correlation between degree of potential risk, possibility of injuries and information of bodily injury is very strong. The internet combines the three organically. The results and characteristics of quality information classification are as shown in table 1.

**Table 1 Information classification of online early warning of quality safety**

<b>Classification name</b>	<b>Signification</b>	<b>Description connotation</b>	<b>Network Characteristics</b>	<b>Examples of meaning</b>
Bodily injury	Bodily injury during using process	Extent of injury	—	Death, poisoning, skin allergy, diarrhea, etc.
Insecurity	Uneasiness and fear brought by certain characteristics	Possibility of injury	Emotion reflection	“be terrible!” “I am going to die?” “It is extremely cruel.!” etc.
Character change	Changed in physical and chemical characters compared to that upon leaving factory	potential hazard	amount of information	Foreign matter, expiration, moldiness, malfunction, etc.

**(II) Risk level**

Based on the classification of online early warning information of quality safety, it shall conduct risk level on quality safety information in different categories. The quality information of bodily injury category describes the actual injuries on consumers, which can follow the mature division mode of injury risk level; the quality information of insecurity and character change is related to network communication character and information quantity. It shall particularly divide the risk level from the

perspective of internet characteristics.

### 1. Risk level of bodily injury

Many countries have practiced and applied maturely as for the degree division of quality safety on bodily injury. EU RAPEX divides injury severity into three levels, namely slight level, serious level and very serious level; the R-MAP developed by Japanese Union of Scientists and Engineers divides the injury degree into five levels, deadly level, serious level, moderate level, slight level and harmless level; the national standard in General Rules of Safety Risk Evaluation of Consumers in 2009 divides the injury degree into four levels, namely very serious level, serious level, general level and slight level. Referring to the injury level division applied maturely, and considering the complexity of quality information of online consumers, the paper divides the risk of bodily damage in online quality information into five levels: (1) deadly and disastrous injuries, such as death, human vegetable, high paraplegia, etc.; (2) very serious and irreversible injuries with serious negative influence on human body, such as physical disability, large-area face scar, etc.; (3) serious injuries which will recover through emergency treatment or regular hospitalization; (4) moderate injuries which may be processed in outpatient clinic with general influence on human body; (5) slight damages which may be processed at home. The body will be uncomfortable to certain extent and the influence on human body is slight. Details as shown in figure 2:

### 2. Risk level of insecurity

What insecurity depicts is the possibility of injury events. Different from the possibility level calculated and divided by *General Rules of Safety Risk Evaluation of Consumers (GB/T 22760-2008)* through historical data, experiment simulation and expert judgment, the information of insecurity level is measured through the emotion of online consumers. Similar to the transmission law of online public opinion, the correlation between public opinion strength and intensity of words is positive. If the intensity is stronger, it indicates the emotion is higher, so the strength of online public opinion is harder; the intensity of words reflects the degree of public opinion with attention and changes in social emotion. As for quality information, the intensity of words is stronger, indicating the quality safety problems are more prominent and the possibility of quality injury is bigger. Therefore, the paper depicts the possibility of injuries under different emotions through the intensity of words in quality information, in order to determine the division of risk level of unsafe information.

**Table 2 Risk level of bodily injury information**

<b>Bodily injury</b>	<b>Risk Level</b>	<b>Level description</b>
1	Deadly	Death, human vegetable, high paraplegia, etc.
2	Very serious	irretrievably
3	Serious	It can be recovered through regular hospitalization
4	moderate level	It needs to see a doctor.
5	Slight	It requires no seeing a doctor.

The paper measures the insecurity emotion of online consumers after transforming to injury events with Likert Scale. Likert Scale is a kind of measurement scale generally used in modern investigation, which applies to the attitude measurement and evaluation in emotion field (Likert, 1932); the online information about quality insecurity is the expression of consumer's emotion and attitude. Referring to Likert Scale, the insecurity emotion is divided into five levels from strongness to weakness. Combining the description of possible risk in *General Rules of Safety Risk Evaluation of Consumers (GB/T 22760-2008)*, it constructs five levels of insecurity information risk, namely inevitable level, highly possible level, possible level, negligible level and impossible level, as shown in table 3.

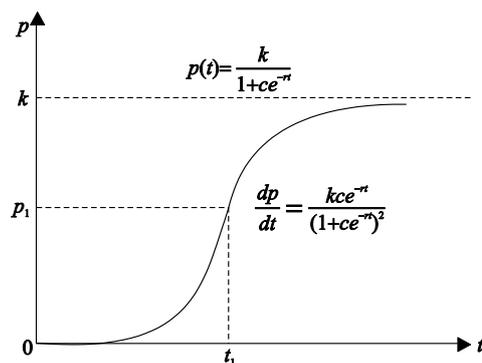
**Table 3 Risk level of insecurity information**

Insecurity	Risk Level	Level description
1	Inevitable	It is extremely angry and terrified due to affirmative injuries
2	Very possible.	It is extremely angry and terrified due to highly possible injuries
3	Possible	It is extremely angry and terrified due to possible injuries
4	Negligible	The censure is mild because the possibility of injuries is negligible.
5	Impossible	It does not care due to almost impossible injuries.

### 3. Risk level of character changes

Similar to the quantity changes of online public opinion information, the paper considers using the total quantity of information to represent the risk level of information in character changes category, without considering the character changes in different forms. That is to say, all information about character changes (such as foreign matters, expiration, deterioration, etc.) is included into total quantity, because the information of character changes of online products reflects the potential risk of product quality safety, not giving rise to actual injuries. And also, the risk information of consumer insecurity will depict the difference to some extent. In case of occurrence of injuries, the relevant risk information will also be included into the category of bodily injuries, so the paper will not consider the classification statistics of different characters. It is usually possible to hold that in the initial stage of product quality safety, the quality risk information related to product character changes will be minor. When more and more consumers purchase and use these products, more and more similar information will turn up, which rapidly increases the information in character changes, indicating the crisis is coming. Therefore, as for the quality safety risk level caused by product character changes, we pay much more attention to the increment of information amount in certain period of time.

The researcher Huang Minggang (2009) constructed the model of increasing law of online crisis incidents. The relationship between information increment and crisis explosion time can be obtained through quantitative calculation, as shown in figure 1. Where,  $p$  is the quantity of post about crisis incidents;  $r$  is the increment rate of posts;  $c$  is a constant, depending on the attention degree of citizens on different crisis types;  $k$  represents the maximum quantity of posts. S-type increasing curve will be close to  $k$  gradually.



Based on the study conclusion, the paper will suppose that the quality risk information of product character changes complies with general online information transmission law, namely the increasing curve is S-type and  $a$  indicates the information change rate when quality safety crisis breaks out (slope of S curve upon crisis explosion):

$$a = \frac{dp}{dt} = \frac{kce^{-rt}}{(1 + ce^{-rt})^2} \tag{1}$$

a is related to product types, reflecting the sensitiveness of consumers to different products. Through comparing the increasing frequency of risk information in unit time and a value of different products, and keeping “bodily injury” and “insecurity” in the same risk level, the paper constructs five levels of frequency characteristics, quite frequent level, frequent level, usual level, sporadic level, rare level. As shown in table 4:

### (III) Warning division

Warning refers to whether the risk development changes and future state deviate from controllable orbit or cause losses; in case deviating from the orbit or causing losses, how about the deviating degree or loss scale? On one hand, warning describes the critical value with-warning and without-warning. On the other hand, it also represents the severity level of warning. Therefore, the division of quality safety online warning is the key link to analyze early warning. The people generally divide the warning into two states, with-warning and without-warning, according to the scale of predicated losses. with-warning is also divided into light warning, moderate warning, serious warning and tremendous warning (Kong Fantao, 2009); in order to reflect the warning results intuitively in practice, the early warning usually utilizes the identification method similar to traffic lights to present different warnings, such as green light, yellow light and red light.

The paper divided the online quality information of consumers into bodily injury, insecurity and character change. Each classification is also divided into five levels of risk. The paper uses five levels of warning (light warning, moderate warning, serious warning and tremendous warning) to present the online warning results of quality safety and takes colors (red color, orange color, yellow color, blue color and green color) to present the level of warning. It shall note that the green color is the lowest risk level, only needing continuous monitoring rather than early warning; the state above green color indicate the quality safety problems are prominent. It shall need early warning and take response measures corresponding to the warning. As shown in table 5.

**Table 4 Risk level of character changes information**

Character change	Risk level	Level description
1	Quite frequent	a
2	Frequent	[a/2,a)
3	Usual	[a/4,a/2)
4	At times	[a/8,a/4)
5	Rarely	$\leq a/8$

**Table 5 Warning division**

Class	Warning	Signal indication	Response measures
1	Tremendous warning	Red warning	First-level response
2	Serious warning	Orange warning	Second-level response
3	Moderate warning	Yellow warning	Third-level response
4	Light warning	Blue warning	Fourth-level response
5	Without-warning	Green warning	Key monitoring

Through the study on classification of online quality information, level of information risk and warning level division, the paper constructs a general analysis framework of quality safety online early warning as shown in Figure 2. It can achieve the input of massive quality information to output of final early warning results.

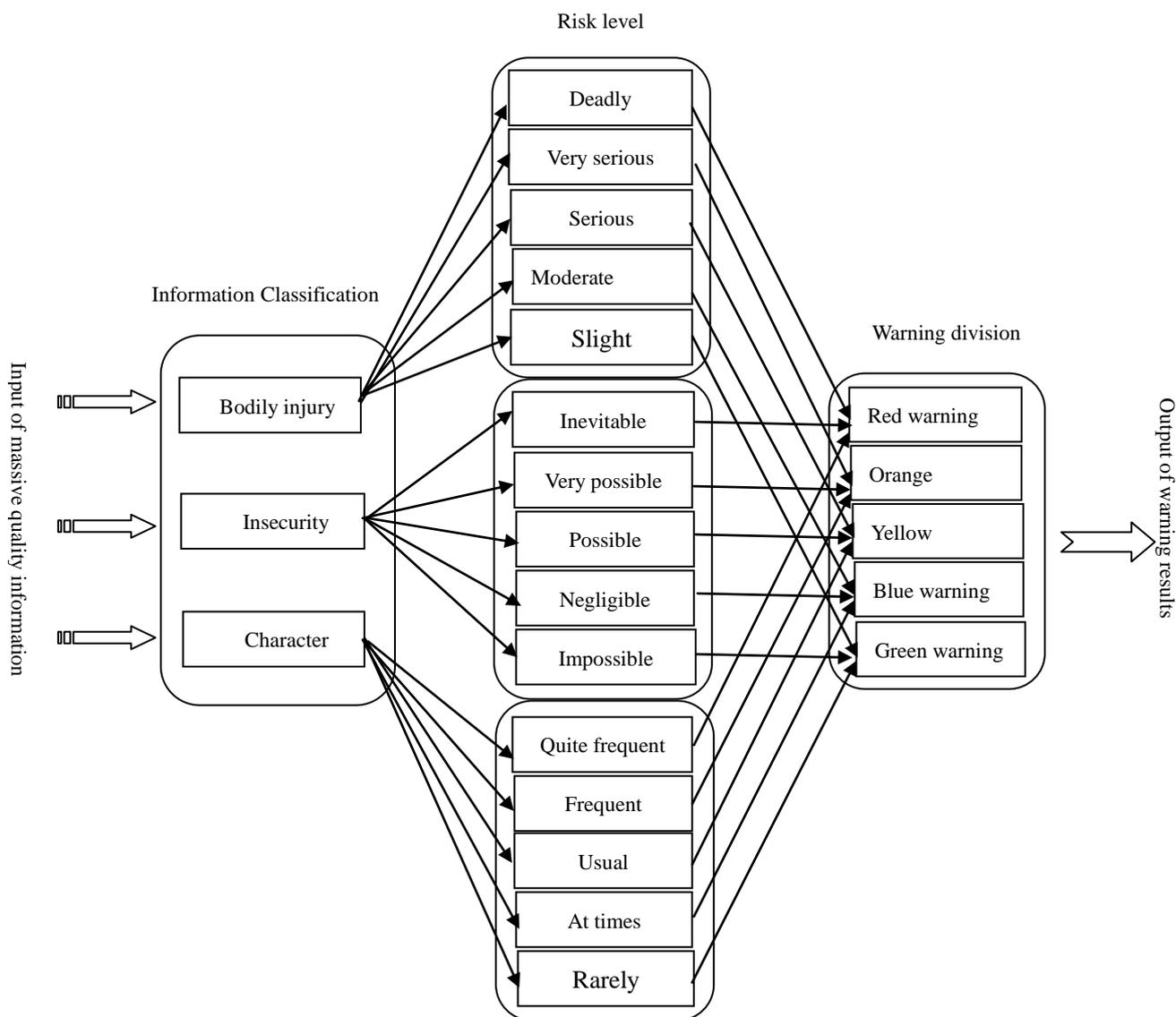


Figure 2 Analysis framework of online early warning of quality safety

### III. Model of online early warning of quality safety based on evidence theory

Under the analysis framework of online early warning of quality safety, in order to achieve the output of final early warning results, it shall construct an early warning model taking information integration as a core, and effectively mix the online quality information in different classifications and levels. Considering the magnanimity, uncertainty and incompleteness of online quality information, the paper achieves the online early warning model of quality safety with the method of evidence theory, in order to integrate online quality risk information. Evidence theory is a kind of incorrect inference theory, belonging to the category of artificial intelligence, which is applied in expert system and able to process uncertain information. As a kind of uncertain inference method, evidence theory is mainly characterized by meeting the conditions weaker than Bayesian Theory of Probability, and it is able to directly express “uncertainty” and “unawareness”. If the online quality information can be fused with evidence theory, it can effectively process the magnanimity, uncertainty and incompleteness of online quality information. The paper will introduce the implementation process of online early warning model of quality safety based on evidence theory from three aspects, namely recognizing framework construction, obtaining credibility evaluation and recursive fusion algorithm.

#### (I) Recognition framework construction

The set of all possible results on early warning judgment of quality safety constitutes recognition framework. Shafer, one of the founders of evidence theory points out that the selection of recognition framework depends on our knowledge, our

understanding level, and what we know and we will know. On internet, we use artificial intelligence to obtain and classify online quality information. Therefore, recognition framework depends on the analysis framework of online early warning of quality safety. Amidst the analysis framework of early warning as shown in figure 2, the warning results can be divided into five levels, namely red warning, orange warning, yellow warning, blue warning and green warning, which are corresponding to five risk levels of 3 clarifications of quality information, namely bodily injury, insecurity, character changes. Therefore, the recognition framework is:

$$\Theta = \{V_1(\text{red warning}), V_2(\text{orange warning}), V_3(\text{yellow warning}), V_4(\text{blue warning}), V_5(\text{green warning})\}$$

One level element in recognition framework indicates the possible results of online early warning evaluation of quality safety. The result comes from the risk level determination of 3 clarifications of quality information, namely bodily injury, insecurity, character changes. As shown in table 5.

## (II) Obtain credibility evaluation

Three classifications of online quality information are judged as the credibility of risk level in recognition framework, namely the credibility evaluation of quality information. Credibility evaluation not only reflects the relative weight of quality information in different categories on early warning results, but also contains the degree that the same quality information is judged as risk in different levels. The credibility evaluation of online quality information can be conducted based on the following steps.

**Table 6 Description of level elements in recognition framework**

Elements of recognition framework	Bodily injury	Insecurity	Character change
V <sub>1</sub> red warning	Deadly	Inevitable	Quite frequent
V <sub>2</sub> orange warning	Very serious	Very possible	Frequent
V <sub>3</sub> yellow warning	Serious	Possible	Usual
V <sub>4</sub> blue warning	Moderate level	Negligible	At times
V <sub>5</sub> green warning	Slight	Impossible	Rarely

Step 1: determine the relative weight of bodily injury, insecurity, character changes, etc.

When evaluating the credibility of online quality information, it shall firstly determine the relative weight of bodily injury, insecurity, character changes, indicating the different attitude on different quality information. use C1, C2 and C3 to indicate the information of bodily injury, insecurity, character changes; use Delphi method to determine the relative weight (W<sub>i</sub>) of various information (i=1,2,3, indicating the information in different types):

Step2: Obtain the intelligent evaluation possibility of quality information in different risk levels.

Due to the magnanimity, uncertainty and incompleteness of online quality information, the judgment results will judge the risk level of each article of quality information, such as ith jth article of quality information (j=1,2, ..., J, J is the total amount of actual online quality information), C<sub>ij</sub> is judged as the evaluation possibility value β<sub>ijk</sub> upon V<sub>k</sub>(k=1, ..., 5) in recognition framework. It meets the credibility inequation:

$$\sum_{k=1}^5 \beta_{jk}^i \leq 1, \beta_{jk}^i \geq 0 (i = 1, 2, 3; j = 1, L, \dots, J; k = 1, L, \dots, 5) \quad (2)$$

Formula (2) allows that each article of online quality information can be evaluated as multiple classification elements in recognition framework with different credibility, in order to accurately judge the uncertain information in different recognition levels; it also allows that the total credibility of the same quality information risk level is not more than 100%. The proportion less than 100% indicates the total quality information is unknown. The evaluation form conforms to the actual characteristics of

online quality information.

Step3: obtain evaluation matrix credibility

The calculation of credibility function of online quality information shall include two processes: one is the relative weight evaluation of different quality information categories Ci (as shown in step 1); the other process is taking the credibility of  $\beta_{ijk}$  to judge each article of quality information Cij as Vk in recognition framework (as shown in step 2). Through above evaluation, it can form the evaluation matrix result as shown in table 7.

**Table6 Matrix table of intelligent evaluation of quality information**

Risk information	Weight	Recognition framework $\Theta$			
		$V_1$	$V_2$	L	$V_5$
Bodily injury $C_1$	$W_1$	$\beta_{11}^1$	$\beta_{12}^1$	L	$\beta_{15}^1$
		L	L	L	L
		$\beta_{j_1 1}^1$	$\beta_{j_1 2}^1$	L	$\beta_{j_1 5}^1$
Insecurity $C_2$	$W_2$	$\beta_{11}^2$	$\beta_{12}^2$	L	$\beta_{15}^2$
		L	L	L	L
		$\beta_{j_2 1}^2$	$\beta_{j_2 2}^2$	L	$\beta_{j_2 5}^2$
Character change $C_3$	$W_3$	$\beta_{11}^3$	$\beta_{12}^3$	L	$\beta_{15}^3$
		L	L	L	L
		$\beta_{j_3 1}^3$	$\beta_{j_3 2}^3$	L	$\beta_{j_3 5}^3$

Therefore, the credibility that quality information Cij is evaluated as Vk in recognition framework is:

$$m_{jk}^i = W_i \beta_{jk}^i \tag{3}$$

The remaining credibility unable to distribute indicates “unknown” of total quality information.

$$m_{j\phi}^i = 1 - \sum_{k=1}^5 m_{jk}^i \tag{4}$$

As for the above two processes, the former is the evaluation of information weight; the latter is the evaluation of information risk level. From the perspective of perceptual intuition, the two evaluation processes can be considered as independence, namely the evaluation on information risk state will not influence the evaluation on information importance.

(III) Recursive fusion algorithm

The fusion of information with evidence theory is conducted based on Dempster synthetic rule. Dempster synthetic rule has commutative law and associative law. It introduces one kind of recursive computation method here.

Mi (Vk) is the credibility that information Ci is judged as Vk;  $M\Phi_i(V_k)$  indicates the remaining credibility unable to distribute further.

Supposed that information Ci contains j=2 quality information,

$$M_i(V_k) = (1 - K_2)^{-1} (m_{1k}^i m_{2k}^i + m_{1k}^i m_{2\phi}^i + m_{1\phi}^i m_{2k}^i) \tag{5}$$

$$M_i^\phi(V_k) = (1 - K_2)^{-1} m_{1\phi}^i m_{2\phi}^i \tag{6}$$

Of which, it refers to the level of similarity between two articles of quality evaluation information  $m_{1k}^i$  and  $m_{2k}^i$ . If  $K_2$  is larger, the difference of two quality information evaluations is larger; if  $K_2$  is smaller, the difference of two quality information

evaluations is smaller.  $(1-K_2)$  is normalizing factor. It will relieve and eliminate the uncertainty during quality information fusion process to certain extent.

It can be concluded that when  $j=l+1(l=1,2, \dots, J-1)$ , the recursive algorithm of synthetic rule of evidence theory is:

$$M_i(V_k) = (1 - K_{l+1})^{-1} (m_{l,k}^i m_{l+1,k}^i + m_{l,k}^i m_{l+1,\phi}^i + m_{l,\phi}^i m_{l+1,k}^i) \quad (7)$$

$$M_i^\phi(V_k) = (1 - K_{l+1})^{-1} m_{l,\phi}^i m_{l+1,\phi}^i \quad (8)$$

The credibility function of each classification of quality information can be obtained using the above synthetic method:

$$M(V) = \{M_i^\phi(V_k), M_i(V_k) | i = 1, L, 3; k = 1, L, 5\} \quad (9)$$

Similarly, re-synthesize the credibility function of three categories of information, it can obtain the credibility set function  $C(V)$  of online quality information judgment, and thus it can obtain the final level of quantization early warning of online early warning of quality safety.

#### IV. Summary

The online early warning of quality safety through collecting quality risk information published on internet is the new topic in quality regulation field. The magnanimity, uncertainty and incompleteness of online quality information make the study on quality safety early warning based on internet information challengeable.

The paper investigates the analysis framework and model based on online early warning of quality safety. Firstly, based on the study of Cheng Hong, et al. (2012), the paper extracts general classification form of online quality information, namely bodily injury information, insecurity information and character change information. Based on literature analysis and practice reference, consider the characteristics of online information, dividing the information into five information risk levels according to the severity of risk and discussing the division of warning degree based on five information risk levels. The analysis framework of online early warning of quality safety is designed from three aspects, namely quality information classification, risk level and warning division. Secondly, based on the three characteristics of online quality information, use evidence theory to fix the quality information in different types and risk levels, and depict the implementation process of early warning model from recognition framework construction, obtaining credibility evaluation and recursive fusion algorithm.

The analysis framework and model for online early warning of quality safety based on online information provides a new idea and method for online government in big data times. The next study can consider the system implementation of analysis framework, to calculate the applicability and accuracy of early warning model and correct the model.

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## An Analysis Framework and Model for Quality Safety Early-warning Based on Online Information

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**Abstract:** In network era, it is a new perspective for quality governance to give early-warning of product safety by using consumer releasing information on the Internet. This paper designs an online early-warning model of product safety in three procedures. First, based on some relative research results, this paper refines a general classification paradigm for online quality information, including information on body injury, feeling of insecurity and characters changes. Then, followed by literature analysis and practical application, this paper respectively divides the three categories of quality information into 5 risk levels. At last, evidence theory is employed to fuse different information categories with different risk levels, and details of the whole fusion process are introduced.

**Key Words:** Online Information; Product Quality; Early-Warning Model

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