



**Improvement of Incentive Mechanisms for Medical Service
Supply**

LI Yiqiang

Thesis submitted as partial requirement for the conferral of the degree of
Doctor of Management

Supervisor:
Prof. Nelson Antonio, Professor, ISCTE University Institute of Lisbon

October, 2019



Instituto Universitário de Lisboa

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Declaration

I declare that this thesis does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

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Abstract

Medical system design is a crucial issue in the reform of medical system in all countries. Top priority has been placed on the medical system design. In China, likewise, there are great difficulties in the reform of medical system. It is a major concern of the whole society to scientifically design a medical service supply mechanism that conforms to China's national conditions. In the provision of medical services, all sides in the society are involved: government departments, medical institutions, patients, experts, scholars and media, which all belong to the stakeholders of medical services. By specifying the contradiction, role and status of the stakeholders, this thesis conducts a comprehensive analysis of the stakeholders of medical service provision from the perspective of suppliers and demanders of medical services, and explores the demands and action strategies of the stakeholders. On the basis of the comprehensive analysis results of the stakeholders, the interests of all sides are coordinated and effective incentive mechanisms are formulated. The ultimate purpose is to figure out an effective incentive mechanism that can improve the medical services, raise the medical service quality, and encourage the stakeholders of medical services to proactively participate in the provision of medical services. Based on the data collection and research questionnaire in Nanning, Liuzhou and Guilin, it is found that raising penalties, adjusting prices and providing fiscal appropriation to local governments are the effective measures for improving the medical services while the subsidy policy is not an efficient motivating measure. Additionally, it is also found that patients are willing to pay more to improve the medical services. In the future, further efforts should be made to subdivide the stakeholders of medical services and carry out empirical analysis from the perspective of dynamic game.

Keywords: Medical services; Incentive mechanisms; Stakeholders; Game

JEL: I18; H51

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Resumo

Quando se pretende reformar um sistema médico a fase de concepção é de crucial importância. A prioridade máxima deve ser colocada na concepção do sistema médico. Na China, como em outros países, existem grandes dificuldades na reforma do sistema médico. A concepção de um sistema de oferta de serviços médicos que tenham em conta as características chinesas constitui uma preocupação de toda a sociedade. Na provisão de serviços médicos, toda a sociedade chinesa está envolvida: departamentos governamentais, instituições médicas, doentes, profissionais da saúde, académicos e meios de comunicação. Os denominados stakeholders dos serviços médicos.

Ao analisar as contradições, o papel e a importância dos diferentes stakeholders dos serviços de saúde, esta tese apresenta uma análise profunda na perspectiva da procura e da oferta e identifica as estratégias dos diferentes stakeholders. Tendo por base os diferentes interesses dos stakeholders a tese propõe mecanismos de incentivo com vista à sua coordenação. O principal objectivo é propor mecanismos de incentivo que sejam capazes de melhorar a qualidade dos serviços médicos e encorajar os diferentes stakeholders a participar de uma forma proactiva na provisão de serviços médicos. Tendo por base os dados recolhidos através de questionários em Nanning, Liuzhou e Guilin, concluímos que o aumento das penalizações, o ajustamento dos preços e a apropriação fiscal pelos governos locais constituem medidas efetivas para a melhoria dos serviços médicos enquanto a política de subsídios não constitui uma medida motivadora. Concluímos também que os utentes estão dispostos a pagar mais para melhorar os serviços. No futuro, os novos estudos deverão ter em consideração uma análise mais fina dos stakeholders e utilizar a metodologia dinâmica da teoria dos jogos.

Palavras-chave: Serviços Médicos; Mecanismos de incentivo; Stakeholders; Teoria dos Jogos

JEL: I18; H51

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摘要

医疗体制的设计是世界各国医疗体制改革中的关键性问题。各个国家都将医疗体制的设计作为医疗改革中的重点和难点加以关注。在中国，改革医疗卫生体制步履维艰。如何设计科学、适合中国国情的医疗服务供给机制，是全社会所关注的重大问题。在医疗服务供给的全过程中，涉及社会各界的方方面面：政府主管部门、医疗机构、患者、专家学者和媒体，以上均属于医疗服务利益相关者。我们通过明确利益相关者的矛盾、角色和地位，全面地分析医疗服务供给的利益相关者，分析的角度是从医疗服务的供给方和需求方出发，探索利益相关者的诉求和行动策略，依据利益相关者的综合分析结果协调各方利益和制定有效的激励机制，最终目的是找到一条可以改善医疗服务、提高医疗服务质量和激励医疗服务的利益相关者积极参与医疗服务供给的有效激励机制。在采集南宁、柳州、桂林统计数据以及调查问卷的基础上，我们发现提高罚款、调整价格和对地方政府提供财政拨款是改善医疗服务的有效措施，补贴政策不是有效的激励手段；此外，患者愿意提高一定的价格以改善医疗服务。未来，有待于进一步细分医疗服务的利益相关者，并且从动态博弈的角度来展开实证分析。

关键词：医疗服务；激励机制；利益相关者；博弈

JEL: I18; H51

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Chapter 1: Introduction

1.1 Research background

Healthcare system design is the crux of the healthcare system reform in countries around the world, as system design is closely related to the coordinated development among people's health, social stability and the economic growth. As one of the important and difficult links in the healthcare reform, healthcare system design has gained worldwide attention. It is also a global challenge—both developed and developing countries have been dedicated to exploring a sound plan for healthcare system design. Given the difficulties in healthcare system reform in China, it is a great social concern how to design a sound mechanism for medical service supply that suits China's national conditions.

Of all the inferences about the medical services, the actor's case is more clearly explained by the benefit of the act. In the past few decades, almost all countries in the world have been reforming medical services, which necessitates the redistribution of limited medical service resources. In this way, some people would be granted new benefits while others may lose vested interests. Those who gain new benefits tend to be vulnerable and poor people, and they almost exert little influence on the direction of medical service reforms. That is why many countries have failed to reform their medical services. China continuously encountered difficulties when implementing relevant medical service policies, such as division of medical treatment and drug sale, public bidding of drug products, classified management of medical institutions. These facts practically illustrate that the reformation of medical service system is a very complex and fiercely competitive process in which interests and stakeholder gaming are involved.

A medical service reform is to improve the fairness and accessibility of medical service and the efficiency of health system through policy design and system reform under the guidance of the government. The above objectives must be achieved through the coordination and cooperation of many different stakeholders who possess diverse resources and different motivations, objectives, modes and degrees of participation in medical services. Whether stakeholders' individual objectives and overall goals of health reform can be achieved and

how well they will be realized depend on the coordination and cooperation of all stakeholders. Only under a reasonable institution, the establishment of a new type of interest balance mechanism can ensure that each stakeholder's individual rational subjective motivations will ultimately bring objective results of collective rationality. Many cases abroad show that the key to the success of medical service reform is to deal with the problem of stakeholders.

Western countries have attached great importance to the incentives and coordination among stakeholders in medical service supply. In the 1960s, the United States launched a managed care program where insurers played a central role in medical service supply; since 2006, private insurance companies in the Netherlands have been held responsible for the operation of social insurance and competed for insurance policies; in Germany, government regulatory agencies, policy-holders, insurance companies and clinics have been closely intertwined through the third-party payment mechanism; and in 1998, contracts were signed between medical administrators and relevant medical service providers in each region of Portugal. Later in 2003, the legislation on Portugal's trust hospitals helped to strengthen the incentive mechanisms for medical service supply (Hu, 2014). However, China is a late comer in the research on the incentive mechanisms for stakeholders' engagement in medical service supply. Although the society is laying increasing emphasis on the role of stakeholders in the healthcare system reform, generally, more attention should be paid to stakeholders' engagement and incentive mechanisms in this respect.

Medical service supply involves many aspects of the society, including the government agencies responsible for supervision and management, medical service providers, as well as patients, experts, scholars and the media receiving medical services—they are all stakeholders of medical services, whose personal interests or action plans will affect medical services and their quality. Given their various stances, how and how much they can influence medical service supply vary widely: patients expect high-quality medical services at a low cost; medical service institutions, a natural monopoly with medical technology as an advantage, try to maximize the profits of medical services and minimize costs; local government agencies, though ultimately responsible for medical service supply and supervising its quality, focus on maximizing both social welfare and local fiscal revenues while seeking good results in the performance appraisal due to bounded rationality. Given the above analysis, the differences among stakeholders' preferences are very likely to be the root cause of the decision-making conflicts, thus leading to uncertainty during the implementation.

Obviously, to minimize the decision-making conflicts in medical service supply and

coordinate the relationship among groups of stakeholders, it is necessary to conduct a thorough and systematic analysis of the incentive mechanisms for medical service supply, so that medical service projects can be improved significantly and sustainably, and that stakeholders can be motivated in medical service supply.

1.2 Research objectives

By making clear the conflicts among stakeholders as well as their roles and status, this research aims to perform a thorough analysis of the stakeholders involved in medical service supply from the perspectives of both supply and demand sides. It also tries to explore stakeholders' appeals and action plans. Based on the analytical results, the research continues to coordinate the interests of all parties and formulate effective incentive mechanisms. The final goal is to find an effective incentive mechanism that can improve medical services and their quality, as well as motivate stakeholders in medical service supply.

1.3 Research dilemma

1.3.1 Theoretical dilemma

As part of public services, medical services are characterized by market failure and strong professionalism, such as information asymmetry between doctors and patients, high cost of medical services, and strong asset specificity and externality. Medical services are associated with the allocation and distribution of financial funds, their choice and supervision, supply and consumption involve a lot of stakeholders, including financial agencies, healthcare authorities, public and private hospitals, communities, patients and the media. It is important for major stakeholders to participate in medical service cooperation and coordinate with each other. However, there has been a paucity in literature on effective incentive mechanisms that coordinate interests among stakeholders and encourage them to engage in medical service cooperation. Moreover, research based on China's national conditions is rather rare.

This thesis investigates and analyzes the development trend of relevant research in incentive mechanisms for medical service supply via literature review. By inputting keywords "medical service" and "incentive mechanism" in the search engine of CNKI database, the author can only find 85 works from SCI, EI and CSSCI between 2014 to 2018. In this respect, there needs to be further investigation in this field.

1.3.2 Practice dilemma

Medical service is a scarce resource all over the world. According to statistics, by the end of December 2017, China had boasted a total of 995,000 relevant medical institutions and 8.91 million healthcare staff, and had witnessed 8.10 billion diagnoses and treatments annually. In the same year, 88.7% of hospital beds were used nationwide, while 99.6% of tertiary medical institutions were overwhelmed with patients. Reasons for inadequate medical service supply vary, but to sustain and promote a virtuous circle for medical service, which is closely related to every aspect of society and people's life, the key is to incentivizing stakeholders (Sun, 2018). Hence, it is an urgent task to improve incentive mechanisms for medical service supply from the perspective of stakeholders.

1.4 Research questions and framework

Medical service, characterized by high investment, information asymmetry and externality, is a representative of naturally monopolized public services. The improvement of medical services requires a sound incentive mechanism. Medical service is a complex system integrating financial allocation and distribution, selection of medical service providers and testing of patients and of service quality, with a wide range of stakeholder involved, including medical institutions, healthcare regulatory authorities, patients and the media. The engagement of major stakeholders in medical services and the coordination of their interests and actions depend on an incentive mechanism for medical service supply.

The research can be boiled down to the resolution of the following three questions:

(1) Who are the major stakeholders of medical service supply? What are their interests, demands, action plans and conflicts? How are medical service supply, management and decision-making influenced by them?

(2) From the perspective of game theory, what is the relationship among the stakeholders of medical service supply? To influence their actions, how do we design an effective incentive mechanism for better medical service supply?

(3) What do the stakeholders of medical service demand prefer in medical service improvement? What influences their willingness to pay?

1.5 Research method

First, stakeholder analysis is conducted. Three steps are involved: (1) literature on stakeholders of medical service supply is reviewed. (2) Based on the features of medical service supply industry and the stakeholder theory, research questions are proposed to lay a foundation for later research. (3) Analysis of stakeholders of medical service supply is performed: their appeals are confirmed through expert interviews and focus group interviews; their conflicts are analyzed based on the questionnaire on stakeholder classification.

Second, game research is conducted on major stakeholders of the supply side. A regulatory game model is conducive to understanding the game relationship between local governments and medical service providers, and exploring the factors behind the strategies of game actors, including such incentives as subsidies, fines and prices. Based on this, the regulatory game model is expanded by taking as policy variables the social costs of the local governments, financial allocation and the reputation of medical service institutions. The expanded model is verified through empirical analysis in three cities.

Third, questionnaire analysis is conducted. The analysis of demand-side stakeholders' willingness to pay should be performed with the adjusted contingent valuation model of respondent uncertainty, the optional experimental model, the ordered Probit Regression Model, the OLS model, the conditional logit regression model and the random-coefficient logit regression model. Based on this, the patients' average WTP to improve medical service quality and the main factors behind are discussed.

1.6 Research significance

The theoretical significance of this thesis includes:

Theories related to medical service supply can be enriched. This research combines the stakeholder theory, its analytical methods, and China's national conditions, as well as takes the lead in categorizing major stakeholders into that of the supply side and that of the demand side according to the characteristics of medical service. Hence, the analytical framework for medical service supply is further improved.

The practical significance of this thesis includes:

(1) It sheds new light on governments' decision-making. The top-down approach of making medical decisions neglects stakeholders' appeals. This research is conducive to the

governments' sound and systematic medical service policy making. The game theory and the survey on demands make it possible to understand the needs of different stakeholders, thus laying a theoretical foundation for the government's formulation of incentives and the successful implementation of relevant policies.

(2) It can improve the management and services of medical institutions. This research helps medical institutions get a glimpse of the game relationship among various medical service systems, and between local governments and medical institutions, thus improving the efficiency of medical services. By investigating patients' preferences for improving medical services, this research, from a market perspective, offers grounds for medical service investment decisions, which is beneficial to improving the efficiency of medical service supply.

(3) It sheds new light on the protection of patients' interests and rights. It is by no means easy for patients to safeguard their rights. However, this research enables patients to make clear the relationship among various stakeholders as well as their action plans and the factors that influence the willingness to pay on the demand side.

Chapter 2: Literature Review

2.1 Public goods

Samuelson first categorized social goods into private goods and public goods, claiming public goods or services are those that an individual can consume without reducing their availability (Liu, 2013). Public goods are possessed of three characteristics: (1) non-exclusiveness, which means that an individual's consumption of public goods will not affect others' same behaviors, or that the cost of exclusiveness is too high to be put into practice; (2) non-rivalry, which means that the increase in the number of consumers of certain products does not lead to decrease in quality and quantity of such products; (3) inseparability, which means that such goods are inseparable, particularly in national defense, diplomacy, and public security.

The confirmation of fundraisers, providers and beneficiaries of public goods highly correlates to their non-rivalry and non-exclusiveness. Hence, it is of vital importance to define public goods. There are many different categories of public goods. For example, they can be categorized as pure public goods and quasi-public goods according to their non-rivalry and non-exclusiveness. Pure public goods refer to non-rival and non-exclusive public goods financed by tax revenues, with the country as the complete fundraiser and all administrative institutions as providers; they are accessible to all people for free. Such public goods include education, national defense and health. Quasi-public goods refer to public goods featuring either non-rivalry or non-excludability (Long & Jiang, 2007). Main fundraisers can be individuals, enterprises, the society and the country, while providers can be the country, market or individuals, but the beneficiaries need to pay for the products or services. Such quasi-public goods include higher education, cultural and recreational facilities and basic medical services.

2.2 Medical services

The understanding of medical services varies widely from one person to another. For example, medical services can be deemed as services tailored for patients, including

preventive healthcare, birth control, child delivery, detection, diagnosis, treatment and rehabilitation, and additional devices and services such as ambulances, ward accommodation, medical equipment, medicines and catering services (Su, 2012). From a marketing standpoint, medical services refer to a spectrum of relevant behaviors which help medical staff and institutions meet social health needs in the form of goods and services. Therefore, medical services can also be deemed as a combination of healthcare and services, which is an important carrier and representation of medical activities (Hou, 2012). Medical services can also be defined in both broad and narrow senses. Broadly speaking, medical services refer to the process where medical professionals use their medical, social and scientific knowledge to fight against diseases, involving healthcare, rehabilitation, health protection and disease prevention. In a narrow sense, from the perspective of diagnosis and treatment, medical services refer to the whole process where medical professionals adopt various methods for diagnosis and treatment. However, from a macro perspective, modern medical services are no longer restricted within hospitals, yet further expanded outside hospitals, including disease and disaster prevention, health examination and management, first aid, disease control, clinical diagnosis and treatment, and rehabilitation. In this sense, medical services can refer to health services provided by medical staff and institutions to the society (Che, 2012).

Thus, medical services can be defined as tangible and intangible services provided by medical service institutions to the society empowered by modern medical technology, in order to meet the people's medical demands. The intangible services are indicative of a wide range of messages, including hospital image, commitment, service attitude, public reputation, reliability and patients' psychological satisfaction, as well as social recognition that can have a positive influence on the society. Healthcare and quality are two aspects of medical service supply and important factors that influence patients' satisfaction towards medical services.

2.3 Nash equilibrium

2.3.1 Introduction

Nash equilibrium is also called non-cooperative game equilibrium. Dominant strategy refers to a certain strategy chosen by one party without being affected by others (Pu, 2012). Therefore, Nash equilibrium can be defined as the respective dominant schemes of two players in a strategy combination to maximize his/her own benefits. Such solution will be followed by other game players as well.

2.3.2 Classification

Nash equilibrium includes two types: pure strategy and mixed strategy. The premise of pure strategy equilibrium is pure strategy, while that of the mixed strategy equilibrium is mixed strategy. Therefore, we must first clarify the definitions of pure strategy and mixed strategy. Strategy set is a set of pure strategies available to the player; the probability of the assignments of each pure strategy forms a mixed strategy, which allows players to choose a pure strategy randomly (Fang, 2007). As each strategy is chosen randomly, mixed strategy game equilibrium can be calculated by probability, which means that when a certain probability is reached, the optimal payment will be realized. Then, there will be an infinite number of mixed strategies, though the strategy set is limited since the odds are continuous. In fact, as the probability of a pure strategy is set as one and the others zero, then pure strategy is a “degraded” mixed strategy.

Pure strategy Nash equilibrium means that all players adopt a pure strategy. However, in mixed strategy Nash equilibrium, at least one player selects a mixed strategy. The prisoner’s dilemma is typical of the pure strategy Nash equilibrium.

2.3.3 Classic case

Thief A and thief B are arrested by the police and interrogated in different rooms. The police inform each suspect that if one of them hands in the stolen goods and confesses, both will be considered guilty and sentenced with conclusive evidence provided. In this case, if the other suspect also confesses, both suspects will be sentenced to eight years in prison; and if the other suspect denies guilty, he will be sentenced to ten years in prison for obstructing official duties, and the suspect that has confessed will be released owing to his contribution; assuming that both suspects deny the crime, the police will not be able to convict the two suspects on theft with a lack of evidence, but the two will be sentenced to one year in prison for breaking into a private house (Ou, 2012).

In this case, the best strategy is that both deny the crime, which will only lead to one-year sentence in prison for each of them. But the reality is that they necessarily think of their own self-interests since they are interrogated separately, and each suspect is a rational economic man. They may think in this way: “if I deny but he confesses, I will be sentenced to ten years; if I confess, that will only be eight years; if we both deny, only one year; if I confess but he denies, I will be set free yet he will be sentenced to ten years.” Hence, the best dominant strategy is to confess. The result is that both confess and each is sentenced to eight

years. Table 2-1 shows the prisoner's dilemma.

Table 2-1 Prisoner's dilemma

A/B	Honest	Disavow
Honest	-8, -8	0, -10
Disavow	-10, 0	-1, -1

As can be seen from this case, in fact, denial is the best choice for both sides because each will only be sentenced to one year in prison. However, as they are separated, they all doubt that the other would betray him for his own sake. As a result, the decision made for their own interests by both sides lead to the loss of a collective. Nash equilibrium makes clear the conflict driven by egoism in market economy, which is that if everyone thinks and acts for their own sake, the collective interests will be undermined.

2.3.4 Impact

Nowadays, Nash equilibrium has emerged as one of the foundations of modern economic theory and mainstream game theory. Over the past decades, non-cooperative game theory gradually has become the center of paradigms of economics in languages and conceptual methods. Today, Nash equilibrium has been widely applied in the field of economics and public goods supply, including medical resource supply.

2.4 New public management

2.4.1 The rise and development of new public management in the West

Since the 1980s, a new theory and model of government governance has emerged in the United Kingdom, the United States, New Zealand and Australia and exerted a profound impact on other developed and developing countries, becoming one of the dominant ideas that lead public administration reform. This trend of thought absorbs the thinking patterns and theories of modern economics, inherits from managerialism and systematically combines government governance with market mechanisms. This trend emphasizes the adoption of private sector-style management in the public sector to integrate economy, efficiency and efficacy of government management in the context of the "Internet+". In general, bureaucratic

theories related to the government are giving way to various economic theories and market rules.

So far, there is no universally recognized concept or concrete model in the new public management. From a broader perspective, new public management attempts to replace traditional public administration, but it is essentially different from traditional bureaucracy. New public management also refers to government reform and the international scheme of government management. Featuring a new managerial approach, it is a summary of government reforms.

The concept of new public management is proposed by Hood. By comparing the public administration reforms of the western countries in OECD in the 1980s, he has summarized some similarities. Then, the term “new public management” officially appeared in the academic community and the public. Hood argued that new public management has five characteristics: clear responsibility, focus on output, administration decentralization, introduction of private sector management approaches, and the absorption of market mechanisms to improve competition (Hu, 2009). From Hood’s analysis, it is clear that public administration reforms have started to abandon the traditional public administration, and market mechanisms have been incorporated into new public management in order to improve government efficiency.

Hughes believed that although there has not yet been a unified definition of new public management, different opinions share much common ground: (1) new public management overturns traditional public administration and instead highlights managers’ personality; (2) greater flexibility is allowed in staffing, organization, and tenure so that the constraints of classical bureaucracy can be broken off; (3) organizational and personnel goals must be measurable, so that performance indicators can be used to measure tasks and comprehensively evaluate work plans; (4) managers in charge of resources are not necessarily politically neutral or non-partisan and often have a political stance; (5) the market is more likely to examine the functions of the government, in which projects are contracted out; (6) the range of government functions will be narrowed by adopting market examination, contract signing and privatization. All of the above commonalities have reflected the shift from traditional management to a result-oriented one (Xiao, 2009). Obviously, the government has gradually accepted the flexible management system of the private sector, and government management takes on strong characteristics of the market, with public goods and services provided indirectly by the government.

Based on the review of the new public management movement in the West, Sun (2013) proposed that the features of the new public management can be summarized as follows: the strategic management practice and the strategic role of the person in charge are strengthened; the focus is shifted from implementing rules to achieving the stated goals, i.e., the transition from administration to management; the power of personnel is decentralized by the heads of departments; the power of the trade unions is further restricted, and the unified wage structure is broken; the strategic planning and management are led by core departments and policy implementation is carried out by an independent organization; stricter financial control and merit pay mechanism are implemented to improve financial management; evaluation and organizational planning are adopted to link the goals with the operation of executing agencies closely; operation assessment is strengthened; high-standard and high-quality customer service is ensured; changes take place in traditional organizational culture; and the “psychological contract” is rebuilt.

Song (2016) holds that the characteristics of the new public management in the UK can be attributed to economy, efficiency and efficacy, namely the “3E”. The core ideas of 3E are as follows: emphasizing management; focusing on performance and efficiency; government institutions serving as user-paid agencies; cultivating markets through quasi-market and contract outsourcing; cutting expenditures; highlighting contract duration, output targets, monetary lever and autonomous management.

Osborne and Gebler (1993) reached the conclusion that “entrepreneurial government” is where government reform should head after analyzing the new public administration reforms of the local governments in the US. They put forward 10 principles in promoting government reform: (1) the government should grasp where the reform has headed and catalyze it, but not directly participate in the reform; (2) the community-based government should empower rather than just serve citizens; (3) competition is an inherent mechanism in the government, which should be reflected through the delivery of service; (4) the government should not stick to the past but have a sense of mission; (5) the government should be result-oriented: financial allocation is based on the results; (6) the government is driven by customer demand; (7) the government should be enterprising: financial funds should be used efficiently; (8) the government must be forward-looking: emphasis should be placed on risk prevention in a bid to avoid dealing with the aftermath; (9) government decentralization is required: importance should be attached to coordination, collaboration and participation, thus weakening hierarchy; (10) government reforms should be market-oriented: the power of change comes from the

market (Zhu, 2016). The above ten principles are how new public management is interpreted.

The OECD member states are doing their best to lend a managerial nature to their public sector. Based on the study of reforms of western governments, OECD offered the core of new public management: (1) efficiency and effectiveness of service delivery, service quality, as well as related results are stressed; (2) the model of decentralized management replaces the traditional hierarchy and highly-centralized systems; (3) communities are more valued in terms of resource allocation and service-related decision-making in a decentralized environment, and more feedback channels for relevant stakeholders and customers are provided; (4) based on the cost-benefit ratio, a better solution is pursued, where the market replaces government regulation and provision through resource allocation; (5) the efficiency of government agencies in providing services should be enhanced by setting productivity goals and introducing competitive mechanisms into public sectors; (6) the strategic capability of the nation is improved, prompting a flexible, low-cost and automatic response to external changes and different interests (Li, 2013). The administrative activities of OECD member states are no longer controlled by bureaucratic authority and regulations, and public goods and public services are provided through the production and supply of the private sector or by improving the performance of public organizations.

Summarizing the above, we can see that the new public management in the West assumes the following characteristics: (1) problems should be solved in a rational manner, and strategic management should play an important role in setting policy objectives and elaborating policy issues; (2) the organizational structure ought to be redesigned to promote the separation between policy formulation and implementation, and to assign responsibility to certain administrations for the delivery of service; (3) changes should be introduced to organizational structure such as a delivering management mechanism to provide managers with more autonomy and help achieve the performance goal; (4) organizational achievement is measured by performance indicators to examine its economy, efficiency and efficacy; (5) current policies are changed to provide public organizations with new public service models, and such corporate culture is highly valued because it adapts to the market and corresponds to the corporate values; (6) new theories and methods of human resource management are adopted, emphasizing individualism rather than collectivism, but the premise of continuous change is employee's support and commitment; (7) public organizations are established to be responsive, learning-driven and flexible: the goal of public service is to respond to the needs of consumers and the customers in the public, so it is no longer dominated by professional

suppliers; (8) the original trusteeship is replaced by a contractual relationship.

The above analysis demonstrates that western countries are trying to free themselves from traditional constraints through public administration reforms. Management approaches of the private sector have been introduced into public management, and new public management focuses more on efficiency, which is in stark contrast to the past when the government paid no heed to efficiency. The in-depth study of new public management by western scholars has also sparked explorations in China. The new public management that Chinese scholars are working on is still in the initial stage, and a theoretical system featuring Chinese characteristics has not yet been formed. At present, Chinese scholars in public management are applying their own research to practice in line with local conditions, thus providing a reference for the reform of the Chinese government.

2.4.2 Practice and development of the new public management in China

The features of new public management could be boiled down to: (1) professionalization of public administration, management specialization of public organizations; (2) clear goals and standards of performance measurement; (3) implementation of strategic management and project budget (for output control); (4) active service response (customer first); (5) small and decentralized (distributed and diversified) public service organizations; (6) introduction of competition mechanism; (7) adoption of corporate management methods; (8) restructuring of the relationship among the public, managers and politicians (Chen & Xue, 2007).

According to Ji (2000), the reform of new public management shows the following trend: (1) “privatization” in public affairs, such as purchase of services by government, privatization of public-owned property, cooperation between public and private sectors, service outsourcing, privatization, and government-sponsored private sectors delivering service; (2) construction of an entrepreneurial government: putting customer first, highlighting performance, innovating management methods, emphasizing efficiency and encouraging competition introduced into governments, hence mobilizing public management organizations in a competent government with high performance; (3) promotion of communitarianism: declining trust toward the government urges a repositioning of the government, market and community, with community highly valued in future public affairs governance; (4) development of NGOs: streamlining management functions and powers from the all-round government to the society, with NGOs assumed the “third agency” to help the government respond to the social needs.

Mao (2017) proposed that enterprise-style management, increasingly fierce market

competition and market orientation are the intrinsic features of new public management. In a word, in government management, weakening Weber-style bureaucracy, adopting the private enterprise-styled management, and improving administrative performance should be built on the enhancement of supervision, the application of accountability mechanism, and the consolidation of power centralization. He emphasized that western countries are governing through the following changes: (1) despite a greater emphasis on the government in the government-market relationship, the need for more markets and a smaller but efficient government have become a consensus and basic philosophy of government reforms in various countries around the world, be they western countries, developing countries or countries in transition; (2) restructuring the government through reforms in the government-market relationship has been widely applied in the United States, with progress made in introducing market mechanisms into the public sector, easing regulations, and building internal markets in the public sector; (3) information technology is further applied in public affairs management; (4) the government has made progress in policy-making and implementing policies efficiently, and more autonomy is given to policy enforcer in government agencies.

Jin (2012) summarized the common characteristics of new public management movements in various countries: (1) new public management redefines social relations and government activities, with civil servants at all levels of governments as responsible business managers, while the public as customers enjoying the services provided; (2) great importance has been attached to the output and results, efficiency and quality of the government's public services and public goods; (3) managing performance targets and loosening regulations are proposed; (4) successful competition mechanisms and private sector-style management are applied in government reforms, such as government bidding and outsourcing contracts; (5) it is necessary to face the political tendency in public administration, where civil and administrative officials have intertwined responsibilities; (6) parts of the public sector have been privatized; (7) management has become more flexible, and human resources management is highly appreciated.

New public management in western countries or in China has different names in government management, but their guiding thoughts and propositions are similar. These ideas include: introducing market competition into public goods and services supply; applying corporate management; improving public service quality and public management through performance management; diversifying public products and emphasizing goal attainment and efficiency improvement.

2.4.3 Impact of new public management on China's medical service reform

Influenced by new public management, a considerable number of pro-market scholars believe that the root cause of the failure of China's medical reform lies in antagonism against market, and it is fair to say that market-oriented reforms have not really taken off in China. Therefore, they propose that market-oriented reform is the trend of medical reform in the future.

Song (2016) pointed out that government's complete monopoly of medical service is best represented in China's planned economy period. However, in today's socialist market economy, market has played a key role in the allocation of medical resources. Medical institutions with diversified ownership should be what the reform should head towards in the future. Even if public medical institutions are to be retained, market should also play a significant role.

Xie (2016) held that if the government still uses propaganda and administrative means to intervene with hospitals and doctors as was in the planned economy period to make medical service available to everyone regardless of their income level, such medical reforms are doomed to fail. However, the root of this failure is the ignorance of the "invisible hand" – the market. Medical reform policy-makers should respect the law of the market. From the perspective of property rights, it is in line with market rules that patients pay for medical treatments, since doctors have the right to be rewarded for their work. A complete ownership system is one of the prerequisites for the optimal allocation of resources in the market economy. Therefore, the reform of medical institutions should further improve the ownership system, and medical institutions should improve the legal person system to deal with market challenges more independently, and to protect doctors' rights to be rewarded.

Zhang (2005) proposed that it is fair to introduce market mechanism into medical and healthcare system reform, but it has always been said that the roots of its failure lie in the unreasonable and excessive marketization. At current stage where China is still underdeveloped in social and economic achievements, the government is not able to cover the medical expenses if it does not adhere to market-oriented reforms. Even if the government can do so, it might not do it well. Tao (2005) stated that information asymmetry, as one of the characteristics of the medical sector, is a serious problem to be solved in market-oriented reforms. At present, the fundamental reason for deception and mistrust between hospitals and patients in China is the failure to improve the market-oriented reform of medical resources. Zhou (2004) pointed out that medical service supply in the market is inevitably diversified,

and the competition mechanism also takes effect in the long run. Hence, information asymmetry will be gradually mitigated. Since the reform and opening-up, the impact of the market economy on medical and health services has been profound, and the medical and health service market system has taken shape. Market mechanism is playing a positive role in the medical and health sector. Zhou (2014) proposed that patients need encouragement and physical care when they are sick. Medical services that meet the above-mentioned needs must be in high quality, yet is a rarity. However, the allocation of medical resources has been unstable and poorly-managed. The fundamental reason is the distortion of the market pricing mechanism. Therefore, China's medical service development will become market-oriented in the long run.

2.5 Stakeholder theory and relevant analytical methods

2.5.1 Stakeholder theory

Stakeholder theory is proposed to achieve the coordination among and meet the needs of stakeholders in the companies. Freeman(1984) suggested that interests of other stakeholders should be taken into account when a company or an organization makes a decision . Over the past 30 years, a sound theoretical framework of Stakeholder theory has been established. The development of it can be summarized as three stages:

(1) “Corporate Dependency” in the early stage. Not only shareholders’ interests but also those of stakeholders should be taken into account because the latter is also of vital importance to the development of a company. It lays a foundation for the development of stakeholder theory (Ansoff, 1968).

(2) “Strategic Management” in the second stage. It is believed that stakeholders should be encouraged to engage in corporate governance, and that their opinions should also be duly valued. This foreshadows stakeholders’ participation in corporate governance (Freeman, 1994).

(3) “Ownership Division” in the current stage. It is believed that stakeholders must invest specific assets in the company and take potential risks if they want to exercise the right to claim and participate in corporate governance. It can be observed that this theory gives a more specific definition of “stakeholders” (Donaldson & Preston, 1995).

Without being confined to corporate strategic management research, stakeholder theory

has been widely applied in the field of public policy, including health care, public transport planning and environmental management. At present, there is still much room for the development of stakeholder theory and improvement for its theoretical framework. But as a cross-disciplinary theory integrating sociology, ethics and management, it is the focus and trend of future research. In particular, there is few researches in its application in medical services. Literature published in recent years exhibits insufficiency of qualitative analysis based on empirical research, but focuses more on the concepts of stakeholders and theoretical modeling.

Specifically, stakeholder theory can be found in the following aspects: (1) literature on strategic management; (2) the works of Chuechman and systems theorists; (3) literature on corporate social responsibility; (4) the works of Rhenman and other organizational theorists; (5) supplements and amendments to the stakeholder theory; (6) Nāsi's revision of the development history of Scandinavia; (7) potential supplementary points.

Based on the analysis of the above aspects related to stakeholder theory, we will focus on the application and practice of stakeholder theory in public policy and related research on stakeholders in the field of medical services.

2.5.1.1 Strategic management

The concept of stakeholder appeared in much literature on strategic planning in the 1970s. Taylor thought that the ultimate goal of corporate operation is to meet the needs of stakeholders, so the shareholder is not the only one to be satisfied (Taylor, 1971). Harsanyi explored the implications of this view for setting corporate goals (Harsanyi, 1977). King and Cleland put forward a method for analyzing customers, claimants or stakeholders in project management (King & Cleland, 1978). Taylor summarized the latest progress in the research by Stanford Research Institute (Taylor & Sparkes, 1977). Rothschild employed the concept of stakeholder to explain the development of the GE Planning process (Rothschild, 1976). Hussey and Langham described an environmental model of an organization and its stakeholder, which was used to analyze the important role that management plays in the development of corporate planning process (Hussey & Labgham, 1978). Derkinderen and Crum used the idea of stakeholder in project strategy formulation (Derkinderen & Crum, 1979). The concept of stakeholder also holds sway in Heenan and Perlmutter's research on organizational development of multinational corporations (Heenan & Perlmutter, 1979). Davis and Freeman introduced stakeholder theory into the management process issues in literature on strategic planning (Davis & Freeman, 1978). Mitroff and Emshoff named the

concept as strategic formulation, a method of strategy assumption analysis, which then was used to deal with ill-structured organizational problems (Mitroff, Emshof, 1979). Through the above literature review, it can be found that managers always have different assumptions about stakeholders, and organizational decision-making depends on thoughtful analysis of various stakeholders.

Different from shareholder analysis, stakeholder analysis must be based on a comprehensive consideration that this group will affect or be affected by major decisions. Managers must think about the interest groups and parties that have a stake in the policy. These groups involve not only shareholders, but also various parties that have a stake in the company. Strategic assumption analysis was later applied to the case study of industrial material enterprises (Mitroff, Emshoff, & Kilmann, 1979).

Dill concluded three major challenges for corporations known for strategic strength. First, the changing environment requires constant evaluation; second, the appropriate countermeasures and solutions should be determined; third, measures should be taken to deal with the impact of active intrusive environment composed of individuals and organizations on the strategic decision-making of corporations. The concept of stakeholder is enriched and further supplemented by Dill's research, in which implication and responsibility are defined as the keywords of stakeholder relationships. Relevant factors have been endowed with a two-way definition: the interactions and mutual needs between stakeholders and the company. He is also committed to figuring out what kinds of important stakeholders should be included in the decision-making of companies (Dill, 1958).

Other types of relations that exist between companies and stakeholders are also covered by Dill's definition. Stakeholders, including employees, raw material suppliers, product distributors, clients, indirect customers, direct customers, students, the public, researchers and analysts, intervene in the management of corporation and the promotion of commercial projects through demonstrations, voting with their feet and administrative intervention. In response to the above stakeholders, Dill also proposed solutions, mainly based on communication. Therefore, Dill's major contribution is pointing out that stakeholders can be active participants in strategic decisions-making.

Dill's research concerning the participation of stakeholders has become a precursor to the growing emphasis on inter-organizational relationships in strategic management, such as joint ventures and strategic alliances (Barringer & Harrison, 2000). At the same time, the concept of stakeholder has also been applied to the strategic planning research at the international

level. After summarizing a series of international forces and changes that made management more difficult, Ringbakk suggested that instead of formal planning systems or usage of empirical management techniques, the key lies in the cultivation of international managers who should be extremely sensitive to the environment and understand that multinational companies will serve stakeholders from different countries in the future (Ringbakk, 1976).

By late 1970s, the concepts of stakeholder emerged in enterprise planning process, such as the pioneering strategic plan described by Rothschild—the planning process developed by General Electric (Rothschild, 1976). In addition, the stakeholder-based approach also emerged in other articles about strategic planning. The concept of stakeholder is also introduced into many program scenarios. Raymond and Greyser argued that art groups need to be well managed like for-profit organizations, and that their sponsors see themselves as the stakeholders of the organizations sponsored by them (Raymond & Greyser, 1978). Similarly, O'Toole criticized the way the US handles business-government relationships—they put stakeholders in an extreme and unproductive position (O'Toole, 1979).

Wommack, when depicting the responsibility of the board, said that an organization should create values for the corporation and society, which means that enterprises' goals should meet the expectations of stakeholders (Wommack, 1979). Puccini and Clarke, by examining the competitive interests of different stakeholders in the US offshore resource management zone, developed a model that maximized the interests of these competitive groups and suggested that coastal provinces should act as an arbiter that rationalizes the implication of stakeholders (Puccini & Clarke, 1979).

Keeley proposed that the role of stakeholders should be considered in performance evaluation. In his definition, stakeholders are those who require organizations to meet their diverse needs while also providing resources to the organization. He also argued that employee performance appraisal should be based on the satisfaction of their stakeholders' needs, which is also of great significance in corporate management (Keeley, 1978).

Slatter claimed that stakeholder analysis, a process that analyzes a corporation's response to the multiple expectations of stakeholders, has expanded from traditional business planning research to the research of developing and maintaining the competitive advantages of corporations in product market segments or strategic business units. This development is undoubtedly correct because it helps the corporation stay focus on key economic issues. Some companies only pay lip service to the concept of stakeholders proposed in the late 1960s and early 1970s, but seldom put stakeholder analysis in a very important position, largely because

it is difficult to identify economic success in practice through analysis. Slatter admitted that there is something wrong in pursuing “correctness” in pure economic efficiency. Slatter also held that since the stakeholder group has invested resources into the company and accordingly caused a threat, public relations can also be studied from the stakeholder perspective (Slatter, 1980).

At the same time, some literature linked economics to enterprise planning, and they found that microeconomics is rarely explicitly applied to the research of enterprise planning (Burton & Naylor, 1980). Instead of rejecting the stakeholder perspective and pursuing purely economic interests, they developed a microeconomic theory of strategic search that identifies key stakeholders and acknowledges the search for incompatible goals.

In the 1980s, with the increasing diversity and complexity of modern society, organizations faced greater pressure in meeting the needs of stakeholders. A stakeholder-oriented business management process will be more efficient in dealing with related issues (Armstrong, 1982).

2.5.1.2 Systems theory

Researchers of systems theory have refocused on stakeholder analysis, arguing that while the problems of enterprises can be solved by Jung’s theory of psychological types, system development is also a powerful tool to solve various problems in social science (Churchman, 1968; Ackoff, 1970). Ackoff applied stakeholder analysis to practice and organizational system, and solve related problems by redesigning the basic mechanism that affects stakeholders in the system (Ackoff, 1974).

The concept of stakeholder in a system differs from that in strategic management. The analysis of systems theory from the level of organization is inappropriate because problems should be viewed in a comprehensive way, rather than just decompose or focus on them. For example, the issue of low returns of shareholders should be analyzed from the whole stakeholder system, instead of just analyzing from the perspective of shareholders and those stakeholders who are related to low returns should be explicated. Ackoff proposed that stakeholders should involve in the design of systems, and that systematic problems must be analyzed from the perspective of stakeholder groups (Ackoff, 1974).

Under the guidance of systematic thinking, collective strategy is a feasible way to form the strategic concept of corporations or organizations. Collective strategy has become an important concept of organizational theory. It is not appropriate to develop a single plan for a

certain organization. From the perspective of the systems, the plan may conflict with the general system as a whole or the sub-system, thus affecting the normal operation of the whole system. Organizational planning must be developed in accordance with the overall goals of the system.

There are two types of variants in this case that deserve attention. The first is the co-optation view where the organization and its stakeholders plan the future of the organization together. The goal of the general system may be ignored or delayed because organization and its stakeholders want to reach consensus on how the organization should move forward. The second variant is that a subset of stakeholder groups cooperates for the future of each.

These variants hope to solve general problems through the systems thinking. Though this point of view is not a starting point or an entry point, it exists holistically all the way. For this reason, the demands of different stakeholders must be accepted and the plans for improvement must be made accordingly. But building systems that include utilities, consumer groups, and other stakeholders is quite difficult, if not impossible. The system model that emphasizes the participation of stakeholder is a far-reaching view in organizational and social realities, which helps solve problems and reflects the trend of application of stakeholder theory.

2.5.1.3 Corporate social responsibility

Another group that also pays attention to the study of original concept of stakeholder at the Stanford Research Institute is the researchers of private corporate social responsibility. The research on corporate social responsibility is too diverse to be classified, but has produced many opinions, concepts and techniques that have a significant impact on organizational changes. In 1960s and 1970s, people began to think about the social responsibility of private corporation, and relevant social movements including the right and interest protection movements of various groups, civil rights movements and anti-war movements.

There is a unique characteristic of the literature on corporate social responsibility, that is, non-traditional stakeholders who used to be regarded as enemies of company are concerned, analyzed and explained from the perspective of stakeholder theory. Generally, the literature on corporate social responsibility emphasizes meeting the expectations of employees, communities, and the public rather than the interests of asset owners.

This period saw the emergence of two major research groups and the appearance of a

sub-discipline of management, which some called business and society and others called social issues in management. Many scholars of the school of management at Berkeley have begun to work on a broader range of issues. Votaw studies the power of corporations in Europe (Votaw, 1964). Epstein conducted a classic study of American politics and business (Epstein, 1969). Sethi analyzed the role of minorities in a company (Sethi, 1970). At the same time, Harvard Business School undertook a research project on corporate social responsibility. The project has produced fruitful results, among which the most important is the development of a practical model of social responsibility known as the corporate social responsiveness model. This model essentially solves the problem of social adjustment, that is, how foresighted enterprises actively cope with the pressure brought by rapid social changes. By focusing the problem on response rather than responsibility, Harvard researchers were able to link the analysis of social problems to the traditional study of strategy and organization (Acherman, 1975; Acherman & Bauer, 1976; Murray, 1976). Of course, the fallacy of separation continues because they avoid clarifying the moral concepts of responsibility.

Most stakeholder analysis is conducted at a generic level, even if some scholars integrate social goals and traditional corporate goals. Hargreaves and Dauman transformed stakeholder audit into a part of a more general corporate social audit (Hargreaves & Dauman, 1975). The purpose of social audit and the literature on social performance are to re-examine the traditional scorecard of corporations. Social audit attempts to construct a balance sheet to analyze the social costs and benefits of corporate behavior. However, due to methodological problems, the research on the balance sheet of social gains and losses has become ambiguous and difficult to understand.

In addition to examining these ideas on corporate social responsibility, scholars have studied a large amount of previous literature. Epstein analyzed the role of corporations in American politics and believed that enterprises should not yield to the restrictions imposed on them by American politics (Epstein, 1969). At the same time, he also agreed that joint political participation should be subjected to information disclosure and lobbying requirements. Epstein pointed out that there are surprisingly few researchers on corporate political behavior (Epstein, 1980). Although concepts like voter and public interest have long existed in the literature on political science, few people have understood and dealt with the complexity of modern corporations.

However, most comments on the study of corporate social responsibility focus on what the essential of corporate social responsibility is. Such a query seemingly intends to spawn

more research on business policy through clarifying concepts. Corporate social responsibility is often considered as an addition to a normal business. In the perspective of managers, this term means that a corporation should shoulder its social responsibility within the scope of its capabilities. This interpretation of the concept invites a split, that is, there will be a gap between profit-making and profit-spending within corporation. This gap still exists in the academic community of management, which is divided into two research fields, i.e., social issues in management and corporation policies and strategies.

Given that business organizations are facing a turbulent external environment constituted by economic and socio-political forces, a theoretical paradigm is needed to integrate and analyze these forces. It is impossible to achieve the analytic goal in management and cognition by simply thinking about economic impact but isolating the economic impact from social problems or vice versa.

In predictive studies of organizational research, the introduction of social and political issues into corporate social responsibility is covered, but how to integrate related issues into the corporate strategic system is not mentioned.

2.5.1.4 Organizational theory

Scholars of organizational theory rarely apply the definitions of stakeholders but they are closely related to the definition in their study. Rhenman directly applied the concept of stakeholders in his analysis of industrial democracy and stated that stakeholders can represent those communities and individuals who are relied on by the organizational goals and the satisfaction of their demands depends on the organization (Rhenman, 1968). Analyzed from this perspective, stakeholders of commercial organizations include creditors, asset owners, employees, suppliers, and clients.

Therefore, we can conclude that Rhenman gives a narrower definition of stakeholders but it is very close to the research of Stanford Research Institute. Rhenman believes that stakeholders do not refer to everyone or every community that is necessary to the survival of the enterprise but the communities who have demands on and receive requests from the organization. Rhenman also believes that industrial democracy can be deduced from the definition of stakeholders and his applications of the concept of stakeholders are similar with those of the Stanford Research Institute. Moreover, he is interested in stakeholders of the general level or stakeholders as special groups. With the word “and”, Rhenman points out the fact that stakeholders and organizations are in demands towards each other and this fact excludes antagonism groups from stakeholders of commercial organizations, because the

organization does not rely on these groups to develop while the latter depends on the former.

Meanwhile, several other scholars of organizational theory focus on the study of the relationship between organization and environment. In the early 1960s, some important theoretical models were developed and the method of open system was widely promoted to be applied in the research of organizations. This method locates organizations in a larger system to define and analyze. Emery and Trist explored to analyze the influence of the environment on organization (Emery & Trist, 1965). Lawrence and Lorsch introduced a model of differentiation and integration, which divides organization into smaller units to cope with specific external environment (Lawrence & Lorsch, 1967).

Aldrich and Pfeffer reviewed literature on the relationship of organizations and environment and proposed some frameworks of meta-concept to understand the studies that are in the ascendant in this field (Aldrich & Pfeffer, 1976). The essay collection published by Nystrom and Starbuck includes some articles studying the status quo of the research on the relationship of organization and environment (Nystrom & Starbuck, 1981). The most important ones are the concept and evolution of organizational population, network analysis that has claimed to outperform the concept of organization sets, and the attention on stakeholders. Pennings analyzed the idea of strategic dependent organization and proposed a series of strategies to help organization cope with the uncertainties caused by dependence (Pennings, 1981). Other essays in the collection and in two collections published by Adams and Joyce all include opinions and thoughts of applying stakeholder theories to strategic management.

In his classical studies on organization, James Thompson reapplied the concept of client to represent external communities and proposed the concept of task environment (Thompson, 1967). "We are cooperating with the organizations in the environment and the environment would influence the organization on the problems to be considered." There is no doubt that the foundation of the concept of stakeholders is the opinion of the communities that can influence the organization. Starting from the standpoint of strategies, this opinion is more vivid because strategic management is mostly about managing the relationship of the organization and those communities influencing the organization. Mahon clearly stated that if Thompson's opinions on social responsibilities of the organization are included, it can be anticipated that these opinions imply the opinions of stakeholders (Mahon, 1982).

Pfeffer and Salancik constructed the organization-environment interaction model (Pfeffer & Salancik, 1978). They analyzed the interaction mechanism of organization and the

environment that provides resources for the organization through literature review. The concept of stakeholders is not directly applied in the research but the two scholars stated that the fundamental of organization development lies in benefits and the source of benefits is managing demands, especially the management of demands of some special groups. To satisfy these demands, it is necessary to provide support and organize resource supply.

The two scholars then claimed a radical opinion of the external view of organizations, which believes that scholars should regard environment as the most important explanatory power in the organizational theory. They stated that although many scholars claim to focus on external environment, almost no theorists develop the organizational theory and include environment into the formula of organization. Although there was no relevant reference in literature of strategic stakeholder management, the two scholars gave a definition of stakeholders similar with the one given by Stanford Research Institute, because the two scholars conducted related studies from the perspective of resources and path dependence. Therefore, we can conclude that there are certain gaps between organizational theory and the research of strategic management. Hence, the research of organizational theory has not yet developed a framework of setting and implementing the organization directions. There are no inevitable connections in logic among strategic theory, organizational theory, systems theory, and social responsibility theory but these theories lay a solid foundation for the research of stakeholders from perspectives of ethics, mode of thinking, transaction, and value creation. There is a shortage of relevant research and further efforts in this regard.

2.5.1.5 Supplements and revisions of stakeholder theory

There are many supplements and revisions of the development history of stakeholder theory. To begin with, Giles Slinger stated the development history of stakeholder theory in Stanford Research Institute that is slightly different but very important (Slinger, 1998). Afterwards, Näsi introduced the applications of stakeholder theory in Scandinavian Peninsula and different stages of history of relevant studies (Näsi, 1979). Eventually, many scholars such as Lee Preston and Melissa Schelling pointed out that the history of thoughts of main opinions of stakeholder theory is much longer than relevant research in Stanford Research Institute conducted recently (Preston, 1986; Schilling, 2000). In this thesis, we would elaborate the above histories one by one.

Revisions of Giles Slinger on the development history of Stanford Research Institute

In his doctoral dissertation in University of Oxford, Slinger reviewed the origin of the concept of stakeholders (Slinger, 1999). Slinger began from the development history of

stakeholders and then made some important supplements and some reinterpretations. To begin with, he reestablished the relationship among personnel in the Stanford Research Institute, who are the same personnel mentioned in the works of Freeman. However, Slinger obtained more details of the origin of the concept of stakeholders because he could consult many original documents in Stanford Research Institute while Freeman could not. Slinger told his readers how the term “stakeholder” gradually comes into being.

Subsequently, Slinger connected the early development of opinions of stakeholders through interpersonal relationship. The early studies were mainly conducted in the Tavistock Institute in London and the National Training Laboratories in Bethel, Maine, the US. The early achievements of interpersonal relationship theories were known by stakeholder theorists in the 1960s because of the research on the significance of participation and inclusiveness in group work, the research on self-organizing work group in coal mining, and many other empirical studies including some psychological analyses conducted by Bion.

The Tavistock relationships is an important supplementary to Freeman 's research. In the 1980s, Trist was a member of the Wharton School at the University of Pennsylvania and one of the participators in the early Wharton Seminars. The seminar tried finding the statistical significance of the relationship of stakeholders and a new phenomenon of creating economic values for stakeholders. Slinger stated that the background subjects which are suitable for stakeholder theory are psychology and social psychology, especially group theory and the interdisciplinary relationship between these two disciplines. There is no doubt that business studies are important but this discipline is established based on the assumption that stakeholders can be ignored and stakeholder relationship does not belong to commerce. Trist also believes that the definition of stakeholders given by Freeman comes from the later ideas in the Stanford Research Institute but not the original definition. Trist proposed that the prerequisite for a determined goal of the enterprise is that the information of stakeholders of the enterprise should be acquired and analyzed. (Stakeholders include all communities that have directly invested stakes in the operation of the enterprise, such as the owners, the employees, and the suppliers.) (Slinger, 1999).

The earliest research focused on the path for the enterprise to realize the expectation of stakeholders in its survival environment and the development of the enterprise was not discussed. Therefore, the original intention of stakeholder theory is not to redefine enterprises with the concept of stakeholders but to help the enterprise cope with the external demands. In brief, the original idea of the concept of stakeholders seems to be more corresponding with

the value of motivation and contribution.

2.5.1.6 Revisions of Näsi on the development history of Scandinavian Peninsula

Näsi described a slightly different development history after the introduction of stakeholders into Scandinavian Peninsula, especially in Finland and Sweden. Fairly, Näsi considered that some literature promotes the development of stakeholder theory even though these works are ancient. He also pointed out that although the concept of stakeholders may have been marginalized in the US or other regions in the world, it has widely influenced the Scandinavian Peninsula. Näsi proved this opinion through reviewing relevant works of Rhenman. In these works, “Rhenman clearly summarizes the method of stakeholders and the stakeholder theory proposed by himself” (Näsi, 1995). Rhenman defined stakeholder as follows (Rhenman, 1964):

Stakeholders can be regarded as the communities that need to realize their own goals by depending on the organization while it needs their contribution and resources.

It is very interesting that this original definition of stakeholders can be regarded as the one which both include the broad definition of stakeholders given by Freeman since it mentions that the success of individuals relies on many other communities and the narrow definition of stakeholders, i.e., the definition of enterprise survival.

Näsi also found that these early theorists in Scandinavian Peninsula believed that the concept of “transaction” plays a more important role than the concept of “benefits” or “stakes”. Näsi wrote that:

People on the Scandinavian Peninsula are more willing to discuss the contribution of stakeholders to the enterprise and the return for the stakeholders, which shall correspond with their contributions. There are various forms of contributions and returns, such as money, goods, information, status, power, and prestige (Näsi, 1995).

Stymne strongly supports the above opinion and proves it in his latest autobiographical essays. He stated that in this period, they observe that goals are generated in the interaction of various stakeholders constituting an enterprise. In the debugging process, contribution and return can temporarily form an unstable equilibrium, in which a stakeholder contributes to the return for another stakeholder. Just like a drunken man going back home from the tavern, the enterprise seeks the balance that could be broken at any time in stumble. If it can be estimated, the goal of the enterprise can be estimated from this perspective where it is an unstable equilibrium for survival instead of the one set by the managers or the owners (Stymne, 2004).

This paragraph comes from the research of stakeholders of the Carnegie School and its opinions on incentives and contribution. However, the opinion of “unstable equilibrium” is very interesting because it arouses the idea that we have discussed in the first chapter, i.e., equilibrium and power of the entrepreneur. The fundamental of innovations of the organization comes from the interaction of stakeholders. Essentially, the interaction can protect modern enterprises from the persecution of the fate of bureaucracy assumed by Schumpeter.

Indeed, in his *Administrative Behavior* published in 1947, Simon regarded clients, employees, suppliers, and entrepreneurs as the organizers and participators in the model of motivation and contribution, the foundation of behavior theory (Simon, 2013). The goals of the organization are aimed at all these communities instead of a specific community. The view of organization and research of behavior theory proposed by Mach and Simon are significant pioneers of stakeholder theory. Certainly, these scholars give the credit of their research to Barnard. It is Barnard instead of his followers in the Carnegie School who understood the centrality of morality more accurately, which is known as the ethics in capitalism, essential to managers at least. Barnard predicted that the development of modern opinions of ethics in commerce would be rooted in stakeholder theory (Barnard, 1938).

The post of managers (1) means complicated moral problems, and (2) requires stronger sense of responsibility, (3) which, with the conditions for activities, needs to (4) force a certain amount of general or specific technical abilities as moral strength, in addition, it is necessary to (5) advocate to create morals for themselves.

There are multiple dimensions in morals as the foundation for continuous cooperation, which originates from the world, develops worldwide, roots in the past, and faces the endless future. This moral is more demanding in abilities and would cause more serious failures. However, the quality of leadership, the persistence of the influence of the leadership, the durability of relevant organizations, and the power of the cooperated shareholders all depend on the height of moral passion and the width of moral foundation (Barnard, 1938).

Herein, Barnard clearly stated the issues of creating values as well as transaction and ethics in capitalism and thinking patterns in management. We can conclude that Barnard does lay a solid foundation for the development of modern stakeholder theory.

2.5.1.7 Supplements of potential opinions

Many scholars believe that apart from the known researchers, many other researchers can

be regarded as early stakeholder theorists. Preston and Sapienza reviewed early documents of Johnson & Johnson and Sears, Roebuck, and Company from Stanford Research Institute and Rhenman to track the potential opinions from which the concept of stakeholders originates. They believed that the fact is that over the past decades, the essence of the concept of stakeholders (if not only the concept itself) has already been reflected in the speeches or works of some thoughtful analysts and managers (Preston & Sapienza, 1990). A classical formal statement from the manager of General Electric, quoted and approved by Dodd is to divide the main stakeholders of the enterprise into shareholders, employees, the client, and the general public. The famous supplementary of Dodd was proposed in his debate with Berle, who is the defender of the traditional opinions. After more than 20 years, Berle admitted that Dodd was always right and similar opinions can be found in the works of Rostow (Rostow, 1959). Afterwards, Johnson & Johnson listed the stakeholders of “a rigorous enterprise”, i.e., clients, employees, managers, and shareholders (managers are an important supplementary), which was firstly published in 1947 (Johnson, 1947) and finally evolved into the famous “beliefs” of Johnson & Johnson. In 1950, D. Wood, the chief executive officer of Sears, Roebuck, and Company listed the four parts of any enterprise as clients, employees, communities, and shareholders (Worthy, 1984).

Miller followed a same path and elaborated the responsibilities of managers. He pointed out that managers have to use their powers to be responsible to the shareholders, clients, suppliers, employees, governments, communities, and the society. This example does not apply the concept of stakeholders but it clearly describes the modern stakeholder theory (Miller, 1991).

Slinger traced back to earlier times when some parts of the concept of stakeholders could be found in the opinion that enterprises are regarded as social system, which was proposed by scholars including Robert Owen and John Ruskin (Slinger, 1998). Slinger divided this opinion with the modern ideas of stakeholders by emphasizing inclusiveness and he stated that enterprises were not seen as the exclusive property of shareholders in the Christianity groups in the 1930s. In particular, he mentioned the research of George Goyder and Samuel Courtauld, which regards shareholders as one of the many communities in organizing an enterprise. Bowen further proposed the concept of social audit and corporate responsibilities and he was regarded as one of the pioneers of the corporate social responsibility theory (Bowen, 1953).

Slinger, Freeman, and many other scholars neglected the research conducted by Mary

Parker Follett. In the significant essay published by Schilling, Follett convincingly proved that although the work of Barnard and later scholars of Carnegie School has been elaborated in the literature of stakeholder theory, the theorists neglected the opinions of Follett (Schilling, 2000). Her view of the relationship between the individuals and the organization is a better starting point than Barnard's view of "the significance of managers". In fact, Follett can also be named as one of the founders of the human relations school, who triggered the follow-up studies of Lewin.

Eventually, Shah and Bhaskar in their latest research believed that the fundamentals of modern stakeholder theory can be traced back to the ancient Indian scriptures and they persuasively proved that the essence of commercial activities, known as "value creation and transaction", can be understood with the concept of stakeholders (Shah & Bhaskar, 2008).

2.5.1.8 Stakeholder theory in public policies

Some detailed studies have thoroughly analyzed stakeholder theory, but they mainly focus on technical and normative research on managing stakeholders, but there are not many studies exploring the normative realm of stakeholders or promoting the space-time borders of this realm. To begin with, we would connect the normative foundation of stakeholder theory with some basic research in this field and afterwards, we would discuss the significance of emphasizing the terms and tools of stakeholder analysis in formulating public policies.

In the literature of public policies, there have long been the history and conceptual basis of stakeholder analysis, and policy analysts have realized for a long time the significance of interest groups in formulating policies and the necessity to describe and classify the levels of interest and power which would impact certain policies (Brugha & Varvasovszky, 2000). Therefore, in view of this perspective, people can find how these authors understand the origins of stakeholder analysis scattering in the literature of policies, including works of power structure (elitism, pluralism, Marxism, corporatism, professionalism, and technocracy), policy network and community approaches, and gradualism and political mapping. Under such literature background, stakeholder analysis becomes one of the series potential tools to reflect the management of the organized community, power, and goal realization.

Bryson provided a continuous discussion of stakeholder theory, especially the detailed progress on technologies analyzing specific stakeholders (Bryson, 2004). He sighed the relative shortage of stakeholder theory and stakeholder analysis in policy documents and encouraged to further emphasize the development of stakeholder theory and specific tools for analysis.

Bryson noted that the communities that can be easily identified, have discourse power, or have powers shall be the ones studied by stakeholder theory. However, the theory should also discuss those organizations, communities, and individuals that do not have discourse power or rights.

In other words, Bryson quickly went to more traditional fields and discussed the significance of stakeholder analysis on creating and maintaining the “winning league”. He believed that the analysis would promote the success of the organization as time goes. Bryson claimed that the key stakeholders have to be satisfied to the least extent and the organization needs to pay attention to the information and focus of stakeholders. Meanwhile, Bryson remained open in the mission of organization of public sectors but he did state that stakeholder analysis is conducted through accomplishing specific tasks in the broad sense of creating public values.

The idea of analyzing the relevance of stakeholders and the path to improve the management of public sectors have been proposed, among which, there are some methods to determine the feasibility of the goal, to realize the goal, to satisfy the stakeholders, and to guarantee the justice, legitimacy as well as rationality of the procedures (Bryson, 2004). Based on these insightful opinions, the application of stakeholder analysis system would optimize the production of the public sectors. According to Bryson, there are a series of 15 specific technologies consisting of “stakeholder analysis” in public sectors. He repeated the target of such a research, which is to observe the changes occur as the time goes by and apply specific adjustment technologies to realize a greater goal. In other words, policy analysis is an art to solve problems and stakeholder analysis provides a set of necessary tools, which are not only used to solve problems that need to be settled but also used to constrain the necessary means that is needed to solve these problems.

In order to discuss the decision of public policies, Mason applied stakeholder theory and relevant analysis modes, such as the issue that the professional American football team Houston Oilers moved to the State of Tennessee (Mason & Slack, 1996). His key reference used in the analysis of this case is the method which takes the interaction mechanism as the basis and components as the center. In his article, Mason increased the significance of stakeholder analysis and emphasized to improve the positive powers of policy management. He also included these two points into the analysis of public policies. In literature of evaluating stakeholder theory, Mason believed that applying the perspective and principle of stakeholders and satisfying the demands of stakeholders can realize the goal of the

organization in the medium term and in the long term. After thoroughly considering the challenge of balancing all demands and requirements of stakeholders, Friedman and Mason concluded that the works of Freeman are not refined enough and they apply the “four steps” process. Firstly, they drew a preliminary sketch map of key stakeholders. Secondly, they revised the map so that it adapts to the unique background environment and the specialty of the involved stakeholders. Thirdly, they analyzed the case to track how key stakeholders managed to win the support and reduce the objections. Fourthly, as the time goes by, they reevaluated the important event and stakeholders to reflect the changes of the situation (Friedman & Mason, 2005).

By analyzing the organization network in the public sectors with stakeholder theory, Provan and Milward pointed out that the consideration of the network and the involved multi-level analysis greatly challenge the researchers (Provan & Milward, 2001). Meanwhile, the two scholars believed that the cooperation in this network of the public sectors is an important development and is worthy of attention. They pointed out some challenges, i.e. network effectiveness can be interpreted and analyzed from three levels: society, network, and participators of the organization. Provan and Milward applied agency theory and group analysis technologies of stakeholders and brought the standards of effectiveness into different levels. They scrutinized every level and discussed how to design these three levels from three perspectives, i.e. levels of analysis, key stakeholder groups, and measures of effectiveness. In the evaluation, they noted multiple obstacles in cross-level analysis. Work to solve the main problems on a certain level may be proved ineffective on another level or even go the opposite way. The two scholars stated that a special challenge is that from the network to the activities of certain organizations, the opinions and attitudes of external stakeholders would often miss the connection with a larger network and activities of the network. Despite of the existence of these difficulties, the two scholars firmly believe that it is vital to analyze the network effectiveness in such manner.

Another application of stakeholder theory that is worthy of attention is the aspect of its role, in which the theory has been compared to the new political order in the democratic politics. Although stakeholder theory does not aim to meet such an application, Barnette followed the former British Prime Minister Tony Blair, discussed the relevance of stakeholder theory as a way of thinking, and reflected how politics play its role in the democratic society, especially in the modern Britain, which is deeply influenced by Thatcherism (Barnett, 1997). For Barnette, “benefit sharing system” provides a brand-new perspective to treat democracy

in Britain, i.e., the way of distribution and practice of power. The inspiration of the relevance of stakeholder theory on political life is that opportunities are widely distributed and no group or class is excluded; policy-making can be positive and the real fortune of the society is broader than the value in the stock market; no one should be excluded from the society and the poor in the lower class should be tolerated; we should set up a new form of right to speak and political participation to establish a more inclusive society and political structure; power should be widely shared.

At present, there has not yet been more literature concerning the normativity of stakeholder theory. We have considered the matter of purposiveness brought by public policies, especially the question that which one is the most important, the goal or the benefit of a specific group. Therefore, these problems are neglected or assumed to be solved through stakeholder participation pattern. Just as the same as the research on medical and healthcare, the research on public policies mainly focus on the analytic technologies applied in stakeholder theory and researchers have conducted new work and developed new methods.

2.5.1.9 Stakeholder theory in management

In management journals, many researches on stakeholders act as the core of relevant discussion and are subject to the interdisciplinary field of the stakeholder theory and strategic management. However, management covers the field of behavioristics, such as organizational behavioristics, organization theory and human resources management, and traditionally, includes management sciences as well as manufacturing and operation management.

2.5.1.9.1 Views of stakeholders of soft management

The earliest utilizer of the stakeholder theory in management literature goes to Studivant (1979): His articles were based on his work in the Center for Application Research at Wharton School of University of Pennsylvania, in which he probed into the discrepancy of attitudes between managers and members from rights-keeping groups, pointing out that the former should seek coordination with the whole stakeholder system. Although his books did not make a great impact among mainstream researchers then, Studivant did put an emphasis on management.

Mitroff (1983) is another pioneer to study management with the stakeholder theory. He analyzed human's sophisticated methods in developing organizations, environmental images and their own according to phenomenology, ethnography and social action theory, and concluded that people can comprehend symbols, a more in-depth aspect of human system,

through so-called archetypes, a series of special realities of stakeholder. Later, he further developed his thoughts by analyzing enterprise policy-making, the impact of external stakeholders on managers and their personalities as well as pointing out that people see organizations in social sciences from a different angle.

Since Mitroff's early contribution to the stakeholder theory, leadership has become the most affected topic in behavioristics. In 1990s, many scholars discussed effective leadership with the theory. For example, Taylor (1995) insisted a broad concept of the theory be used during the fundamental revolution of management in turmoil. From the perspective of the stakeholder theory, Friedman (1995) studied the impact of the reaction of a manager during power handover on the newly-appointed CEO's leadership efficiency. In addition, Weide (1996) built a stakeholder-based framework of leadership development including evaluation of power basis and implementation of political negotiation strategies. Heller (1997) examined shared leadership with the stakeholder theory. His research is interesting because he found that civil law countries have a broader view of stakeholders than common law countries do. Moreover, he explored the differences in shared leadership between stakeholders and organizations. Laws and formal structures facilitate shared leadership with staff, but as is often the case, clients have limited influence on major market mechanism.

In recent years, some institutional scholars have discussed leadership with the stakeholder theory in a more direct and comprehensive way. In this respect, Schneider (2002) took the lead by developing the stakeholder leadership model based on "organization--environment--coordination" co-evolution framework. Against the background of ambiguous organization boundary, flat corporate relations and increased outsourcing services, the stakeholder theory is flexible enough to adapt to different leadership, and thus lays an adequate foundation for this framework. Other applications of leadership in behavior management literature include leadership development strategy, moral leadership, post-M&A leadership and leadership system model. Literature about practitioner-oriented leadership is strongly affected by the stakeholder theory.

Apart from leadership, the stakeholder theory is also applied in the evaluation of organization performance. Cameron (1980) described four methods of evaluation, among which the strategic partner method aims to meet key stakeholders' demands and expectations at the bottom line. One crucial step in this method is stakeholder audit, which helps enterprises identify all supporters that affected by organization performance, according to Kinicki (2008). Besides, Daft (2001) tested organization performance with the stakeholder

theory, along with goals, outlook on resources and internal process method. He also regarded the method as sufficiently broad to cover multiple angles. Furthermore, goal setting, which is closely related to organization efficiency, also involves the stakeholder theory.

Other contributions in the literature concerning organization behavioristics indicate the flexibility of the stakeholder theory. Ostas (1995) did research on mental atmosphere of several hundred retailers and approximately 20,000 salesmen. He found that work atmosphere can be defined as staff welfare and other stakeholder benefits, and concluded that diverse standpoints of stakeholders promote the research on mental atmosphere. In a more traditional study, based on the stakeholder theory and the social contract theory, he further stated that strict surveys can be and should be absorbed in enterprise relations practice. In his recent research, Carter (2006) focused on reputation management of the listed powerhouses in Fortune 500 and found that their relevant activities aim at more important stakeholders.

Human resources management is also involved, which, at least, is the result of such an opinion that enterprises with effective and reliable stakeholder management can attract candidates with higher quality (McNerney, 1994). Certainly, specialists in human resources realize that the human resources system must be able to handle sustainable and changeable competitive benefits among organization stakeholders. Thus, the stakeholder benefits should be reflected in human resources management policy to ensure the organization's long-term development.

Early records of the stakeholder theory in the research on human resources can be traced back to Jansen and Glinow (1985), both of whom studied the conflict of behaviors, attitudes and standards between organization incentive system and the stakeholders. For instance, they discovered that although stakeholders prefer honest and open reports, the organization incentive system encourages information tampering and confidentiality. Otherwise, they estimated the function of old-fashioned organization systems in an all-round quality test, and drew a conclusion that these systems were inadequate and should be changed with regards to organization flow and measurement as well as value concepts and behaviors of key stakeholders.

Dipboye's (2007) observation showed that the stakeholder theory has penetrated human resources management. He suggested treating an organization system on a whole through identifying different stakeholders' points of view, ways of interaction and their impact on the system. According to him, an advantage of applying stakeholders' views to human resources management is that it contains just elements of an organization. He also indicated that the

theory helps establish the standards for human resources. Nonetheless, he criticized the existing literature, holding that it is necessary to launch guiding theoretical studies on human resources, which helps explore critical topics with various research methods, and that apart from enterprise management, the demands of different stakeholders should also be considered.

At the same time, the stakeholder theory is seen in the development of human resources system. For example, identify the supporters and their focuses when selecting, developing and evaluating personnel, and set up career guidelines of the efficiency evaluation of human resources management. In addition, the theory proves beneficial in the building of strategic human resources development system, management revolution, risk handling and cost cutting.

2.5.1.9.2 Views of stakeholders of hard management

The so-called hard management mainly deals with flows of materials and math or computer-based managerial models. Although these are obviously related to man, they are often not regarded as man's behaviors. The stakeholder theory concerns individuals and groups and aims to combine human factors with purely quantitative scientific management models, for instance, applying stakeholder recognition and hypothesis to the development of body decision support system, and stakeholder's constructive participation in discussions on public welfare.

Jones (1990) made use of the stakeholder theory in project management literature in an early period. As a CEO of an aerospace company, he studied the political background against project management, and found that the representative level and decision-making level of a stakeholder in target structure significantly affects internal political level. Besides, the stakeholder theory is increasingly popular in project management literature. The case in point is Oral, Kettani, and Cinar (2001), who evaluated and sorted out international projects with the useful idea. Another example goes to Karlsen (2002), who discussed the impact of several stakeholders on project management, and developed a formal, systematical project management flow partially based on project managers in Norway. What's more, after making a meta-analysis on project management, Achterkamp and Vos (2008) summarized that people widely accept that effective stakeholder management is vital to the project outcome.

So much for project management, on production the stakeholder theory has a two-side impact: the one of production on stakeholders, and vice versa. Steadman (1996) was a supporter of the former. He explained the complicated relations among new production techniques, such as flexible production system or computer integrated manufacturing system

(hereafter referred to as “CIMS”), and different stakeholders. In his analysis, Steadman recognized an impressive group of broad stakeholders, including educators, trainers, direct managers, auditors, suppliers, clients, HR specialists, shareholders, labor union, financial groups, environmentalists, senior management, staff, government, local community, board of directors and bond holders, whose impact on production is manifested in the research against quality management background and the one concerning development strategy in manufacturing.

The stakeholder theory also gives itself into full play in improving production system. As early as 1990, Maull (1990) developed a method to design and carry out CIMS thanks to an understanding of key stakeholders. In his opinion, it is indispensable to analyze stakeholders when offering a strategic framework to standard manufacturing system and CIMS. On the contrary, Morelli (2006) highlighted practice rather than the leading end. To be specific, he thought that it is stakeholders’ frequent boycott against operation revolution in medical health care agencies that leads to poor execution. Therefore, he advised positive stakeholders to join in the research process.

In terms of the performance of environmental improvement, Clarkson (1995) discussed stakeholder’s influence on environmental issues. With the help of virtual network learning model, Manring (2006), along with his colleagues, integrated the economic, ecological and social dimensions of clean production. They then proved their model with a case in textile wet processing industry in North Carolina, USA. Moffat and Auer (2006) described the partnership-based initiative put forward by the Canadian government, the purpose of which was to promote innovation and environmental performance. The above-mentioned studies are just a part of the cases where the stakeholder theory plays a significant role in friendly manufacturing industry.

Stakeholders, in their unique way, begin to influence R&D progress of products and services. McQuater, Peters, and Dale (1998) ascertained the management issues influencing product development. They compared the issues to a disease with imperceptible symptoms and undefined causes. The stakeholder analysis serves as one of the five classified plans to find out the root of these difficulties. Likewise, Elias (2002) perfected the R&D project with the stakeholder analysis. His methods are rational analysis, progress analysis and trade analysis. Considering its dynamics, Elias applied the stakeholder analysis to the road pricing project in New Zealand.

Such discussions imply the stakeholder theory has been applied in specific fields

including project management, production management and flow improvement. Moreover, the stakeholder concept is used to develop multi-function tools. For instance, Cardinal (2001) formulated a problem-solving framework to help organizations work out contradictions and conflicts among stakeholders with corresponding tactics. This framework follows Rule of Trust and an in-depth analysis on prisoner's dilemma. Cardinal's literature regarding operations research is special in that it depicts interpersonal communication in intricate occasions such as fear, attraction and temptation, all of which can be felt by participants. Other interesting solutions include coordinated emulation, development and analysis on strategic option, risk-based uncertainty handling and optimized-evaluation-based strategic option (Hjorts, 2004).

There is an inalienable relation between decision support and problem solution in the work involved operations research, where we can find a number of applications of stakeholder theory. For example, Bryson (1996) extended analytic hierarchy process (hereafter referred to as "AHP") to adapt to equivocal decision background. He developed a multi-criteria decision program in order to understand key stakeholders in an organization. He deemed that once a decision is made, it is of great significance to carry it out properly. Similarly, Ferrell (2008), integrating 0-1 goal planning and AHP, established the method of decision support in which a single decision must be made when there are more than one stakeholder. Other correlated examples can be found in relevant literature.

Since information system (hereafter referred to as IS) supports management decision, information technology facilitates people to better understand the stakeholders (Griffin, 1998). Schonberger (1980) applied the theory at an early stage. His application is earlier than the operational ones discovered later. Schonberger regarded information system in a broad view, holding that in some cases, ethnography may find it appropriate to allow a certain stakeholder to lead the project design. Such thought was new in that era. Apart from this, he agreed that an organization consists of not only staff but also clients, suppliers, community creditors and other interested followers to hold its standpoints. He also defended himself with the organization system theory (Schonberger, 1980).

Additionally, the stakeholder theory is viewed in IS literature. Gupta (1995) insisted that the evaluation of the impact on information strategy must surpass enterprise analysis and cover a wider range of stakeholders. Following this trend, Kumar (1998) put forward the constraint theory in information technology management and identified the constrained position with the stakeholder theory. In another research, Tesch and Klein (2003) developed a

framework in line with multiple stakeholder concept to confirm experts' skill requirement. Besides, based on the key system thought, they came up with IS planning, which, before selection and design, had analyzed stakeholders' opinions.

Apart from IS planning, the stakeholder theory takes its advantage in supply chain management, real-time management system, risk management, green logistics as well as moral issues such as operations research and IS management.

2.5.1.9.3 Discussion on the stakeholder theory in management

From the perspective of resolving issues with respect to creation of value and trade, stakeholder management is equal to management itself. This review is useful for analysis, but people may separate the core stakeholder theory from other management theories. This is not our destination. After all, the theory has proved to be suitable in all kinds of management issues.

There are numerous opportunities in future academic activities. Given social guidelines and expectations, the institutional theory emphasizes the consistency of organization and discusses the impact of institutional environment on the organization. Despite that the stakeholder theory and the institutional theory are conceptually similar, the former is neglected in practice. Consequently, it creates a chance for interaction and integration between the two theories. Notwithstanding a wider range of organization followers except social factors, the institutional theory of corporate social responsibility (hereafter referred to as "CSR") raised by Campell (2007) is a useful starting point. In fact, the next step of Campell's research after logic is to take in more stakeholders.

That Dipboye's (2007) calling for more scientific research methods on human resources management indicates another opportunity. He underlined that the various stakeholder view enables more adequate research on the ways of impact of human resources system on stakeholders and vice versa. The stakeholder theory can better account for the reason why some strategies in human resources management perform better than others do. In addition to this, one can develop a human resources system and receive information from external stakeholders. This work is at its preliminary stage, and globalization makes it possible to study human resources with the stakeholder views in the future.

Researchers and other management scholars in operations research have the strength of developing the input-output tool for stakeholders. Some researchers have embarked on this area by designing a performance evaluation model for the affected stakeholders and applying

it to ICUs in three hospitals. Moreover, they allow stakeholders to develop software measurement programs (Dey, Hariharan, & Clegg, 2006). When it comes to soft research on management, measurement regarding immoral behaviors in work space is developed according to the stakeholder theory in a more comprehensive way, compared with that in the past literature (Kaptein, 2008).

In accordance with relevant literature reviews about the stakeholder theory, Laplume, Sonpar, and Litz (2008) gave their advice in hope of enriching future studies. They noted that insufficient practical research on stakeholder management in small enterprises, family business, start-ups and non-profit organizations was carried out, and that people should know how are stakeholders born and affected by leadership. They expected a growing number of case studies to enhance the understanding of recognition, management flow, motivation of stakeholders and enterprise behaviors. Last but not least, they realized the necessity to establish a more feasible framework to study profit balancing for enterprises.

The rapid technological development and globalization sophisticates the decision-making environment, while the various stakeholder method helps work out this issue. Theys and Kunsch (2004) pointed out that there was no available tool for managers to improve stakeholders' management skills, and that even in operations research, we should pay more attention to moral sensitivity.

2.5.1.10 Stakeholder theory in medical and health care

2.5.1.10.1 Application of stakeholder theory in medical and health care

The term “stakeholder theory” has influenced scholars in the field of medical and health care and has been clearly stated in many articles. Many of these studies focus on the instrumentality and descriptiveness, which is to analyze the working strengths in medical and health care industry using the term “stakeholder theory” and study these strengths to improve the performance of the organization. Some articles thoroughly analyze the normativity of stakeholder theory and propose more explorative questions to construct medical and health care systems or challenge some practices or priorities in the medical and health care industry. Ezekiel J. Emanuel wrote a detailed article and discussed the dimensions of normativity of stakeholder theory (Emanuel, 1999). This article is based on right of choice and right of representation. Emanuel believed that if the ethics created by shareholder values remain dominant, the medical and health care system promoted by our current employers representing the employees would be filled with conflicts of interests. The only way to resolve

the conflicts in the system is to apply stakeholder theory in the enterprise and emphasize the creation of total wealth, considering many stakeholders instead of only the shareholders. Emanuel concluded that the theory has not been widely practiced and there should be significant changes in the regulations of the enterprise, which shall be extensively accepted by the norms of the commercial practice.

In another article, Gilmartin and Freeman discussed the stakeholder theory and the influence of normativity and they pointed out that stakeholders are vital for us to understand the basic commercial concepts of the enterprise strategies. Cowboy capitalism is interpreted as an entirely free way to develop relevant commerce of shareholder theory, which is flawed fundamentally and has led to many concerns that commerce would influence medical and health care. Analyzed from this point of view, the conflict of commerce and medicine, the conflicts concerning the benefits of patients, and a fair system of medical and health care, would advocate the isolation of medical and health care from the influence of “commerce”. Correspondingly, paths for all stakeholders to create values and the modeling of core values in the activities of the organization become directions to establish a fair and sound system of medical and healthcare. Therefore, Gilmartin and Freeman noted that medicine needs to be influenced by capitalism more—at least medicine needs to understand stakeholder capitalism and the six core principles determined in the capitalism—without eliminating the effect of commerce and competition (Gilmartin & Freeman, 2002). Eventually, Fottler and Slovensky in their essay studied a case of the evaluation procedures in evaluating stakeholders. Although this essay aims to emphasize the trend of stakeholder analysis, the authors provide a rather mature literature review of stakeholder theory, emphasize the non-financial dimension of value creation, and include these normative considerations into their evaluation methods through “report card” (Fottler & Blair, 2002).

However, most of the literature on medical and health care rarely quotes normative literature of stakeholders in business ethics. Blair, Rock, and Rotarius noted that medical and health care have gradually come into being and senior executives in the medical and health care institutions need to identify the key stakeholders, especially these stakeholders are changing with the unprecedented speed and is very likely to change continuously. The rapid changes in payment of medical and health care as well as the development of the necessary communities of health care payment and cost control refers to the high complexity of management in medical and health care. That is to say, the degree and speed of structural changes happened in this industry is “unprecedented in the post-industrial society” (Blair,

Rock, Rotaries, Bosse, & Driskill, 1996). Given this situation, these scholars focus on the correct classification of stakeholders and would treat these stakeholders with the proper management strategies, i.e. to minimize the threats and maximize the opportunities. This essay claims that the senior executives should classify stakeholders into the four categories, namely, the supporters, the people with mingled hope and fear, the non-supporters, and the marginalized. Moreover, senior executives should manage stakeholders with general strategies, including participation, cooperation, defense, and monitoring as well as control. If the senior executives correctly classify the stakeholders and apply appropriate strategies corresponding with the stakeholders, the performance of the enterprise would be improved while the performance would be impaired conversely. Scholars found in empirical research that the core groups of key stakeholders roughly remain the same from 1984 to 1989. However, their results show that there are still mismatches, especially when senior executives overemphasized the cooperation with stakeholders but failed to protect their institutions from more and more potential threats.

Blair and Fottler continued to regard stakeholder theory as the context of their analytical tools and defined the process of managing stakeholders as a development process of strategic analytical tools (Blair & Fottler, 1990). They found the following six discontinuous stages: (1) identify stakeholders; (2) evaluate stakeholders; (3) diagnose and classify stakeholders; (4) develop strategies of stakeholders; (5) implement strategies of stakeholders; (6) evaluate the effectiveness of stakeholder management. Based on the aforementioned research, Savage emphasized the assessment of stakeholders in empirical research. They collected data and evaluated on four communities, namely, comprehensive payment system/network, managed medical and health care institutions, doctors, and hospitals (Savage, Taylor, Rotarius, & Buessler, 1997). When considering the possibilities of the stakeholders as being a threat or a partner, Dymood (1995) emphasized four key questions: (1) the possibilities of every stakeholder controlling the practice of the interviewed group; (2) the possibilities of every stakeholder cooperating with the practice of the interviewed group; (3) the degree of control of stakeholders on the resources of the practice of key interviewed group; (4) the relative power of every stakeholder related to the practice of the interviewed group (Dymond, Nix, Rotarius, & Savage, 1995).

The main conclusion of the research is that the senior executives need to perform their work better, so as to create a prospect for their future interaction with key stakeholders and better understand the legal obligations they shoulder for these stakeholders.

In the next several essays, Blair and Buessler surveyed a series of problems in the opportunities and threats in the management of stakeholders in the constantly changing environment, but this time they focused on improving the accuracy of the force analysis of the industry. Based on the research of Michael E. Porter, especially his Five Forces Analysis Model, they applied the model to conduct stakeholder analysis. Porter stressed the function of powers while Blair and Buessler believed that cooperation is as important as power in determining the performance of the stakeholders, which is to determine whether the stakeholders would threaten the enterprise or cooperate with it (Blair & Buessler, 1998). A difficulty in the research is that the two scholars claimed that managers need to deal with specific problems and the attitude of stakeholders towards the core organization would vary with the changes of the problems. For example, a cooperative stakeholder in some respects might become not supportive in other specific problems. The two scholars still focused on the observation of the environment, the assessment of stakeholders, and the classification corresponding with general strategies, all of which are to manage stakeholders to realize the intended goals of the organization. Blair, Savage, and Whitehead stressed the significance of negotiation in stakeholder theory and believed that negotiation provides a comprehensive method of managing stakeholders “from strategies to procedures” (Blair, Savage, & Whitehead, 1989). In order to improve the current negotiation literature emphasizing groups or interpersonal negotiation, the three scholars worked on providing “an analysis of the organization level integrating all these macro and micro aspects”, which can cross over the entire matrix of the enterprise-stakeholder relations. They explored this topic by connecting negotiation with larger strategic dynamics and the background environment of the hospital.

Other studies also highlight more conventional strategic positions where senior executives try “managing” stakeholders for the sake of enterprise benefits. Lim, Ahn, and Lee developed an approach to manage competitive stakeholders in the environment of medical and health care and they praised this method as “essential weapon for strategic management” (Lim, Ahn, & Lee, 2005). The three scholars claimed that the core focus of the approach is to “take advantage of conflict stakeholders to maximize the economy of scale of the enterprise”. The scholars admit the relations of stakeholders and attach importance to corporate social responsibilities. Their discussion provides a way for managers to cope with the complex modern medical and health care industry and take the initiative to manage. In order to help managers to develop their strategies, the scholars propose a four-stage procedure, including stakeholder analysis, strategic recovery, strategies revision, and strategies implementation.

Previous cases and existing regulations help managers learn practical appropriate strategies and the procedure would be expanded by referring to the wisdom developed from the cases and the regulations. Stakeholder theory integrates the aspects that are often dealt by managers separately in a systematic manner, including strategic management, marketing management, human resources management, public relations, organizational politics, and social responsibilities (Fottler, Blair, Whitehead, Laus, & Savage, 1989). The scholars believe that this is a significant innovation of the “middle-range theory”, which helps guide hospital managers on how to understand and manage key stakeholders. A majority part of the article discusses the work corresponding with other discussed instrumental work up to now, and emphasizes how to classify stakeholders, assess their powers, and “manage” them for the strategic benefits of the hospital. It should be noted that the author pointed out the corresponding degree of the values held by stakeholders with the ones held by the hospital groups. In particular, their survey results show that 75% of the interviewees consider that the values held by key stakeholders do not correspond with the ones held by the hospital.

Savage, Taylor, Rotarius, and Buessler stressed the importance of network and system theory as the modes of thinking when considering medical and health care (Savage, Taylor, Rotarius, & Buessler, 1997). They understand the complicated dynamic operation mechanism in medical and health care from the perspective of stakeholder theory, believe that “senior executives of medical and health care have to learn to manage the combination of stakeholders”, and comprehend the strategic significance of the stakeholders. A deeper assumption of the research is that stakeholders are both opportunities and threats. Therefore, managers should transform from emphasizing the management of specific stakeholders to considering multiple relationships and manage stakeholders for the sake of the benefits of the organization. An interesting finding of the essay is that it examines the financial performance and social responsibilities of the hospitals and lays stress on the governance challenges brought by the integrated payment system network to the organization.

2.5.1.10.2 Discussion and future directions of stakeholder theory in medical and health care

Varvasovszky and Brugha (2000) reviewed the influence of stakeholder theory in health care policies and literature of the more extensive public policies. The author found some origins of stakeholder theory in the works of public policies, describing the theory as “a way to analyze the policies”, which makes the article an excellent turning point to review literature of public policies. As for the use of this term in literature of medical and health care as well as

health care policies, scholars emphasize to accurately use the term “stakeholder analysis” and distinguish it from other forms of analysis. Since Philips raised his concern on how to use the term “stakeholder theory”, many authors discover that a lot of scholars use the term “stakeholder analysis” in a rather liberal manner since all these scholars just mentioned a specific stakeholder community or the benefit of the community (Phillips, 1997). A lot of documents of health care policies stress on the retrospective or synchronous analysis in formulating health care policies in different environment (Brugha & Varvasovszky, 2000). Comparatively, stakeholder analysis includes more anticipation and is more systematic and well-organized than other tools used by researchers in this discipline. Brugha and Varvasovszky state that the term “stakeholder analysis” should only be used when there is “systematic analysis of the role, relations, benefits, and influences of stakeholders” in the process of decision-making.

2.5.2 Methods of stakeholder analysis

Stakeholder analysis refers to forecast the impacts on organizational decision-making, explore the feasibility of policy implementation, summarize the background of policies and formulate stakeholder management strategies by specifying stakeholders’ willingness, actions and logical relations.

Stakeholder analysis can be divided into three categories: descriptive analysis, instrumental analysis and normative analysis (Donaldson & Preston, 1995). Descriptive analysis should make clear the following questions: Who are important stakeholders? Why are they important? When are they important? And how to distribute the limited resources? The effective management of stakeholders is closely related to the success of enterprises, which is the emphasis of instrumental analysis, because enterprise performance is subject to the direct influence of stakeholders. Normative analysis emphasizes that enterprises must pay attention to the interests of stakeholders. By classifying the three kinds of analysis mentioned above, Reed summarized the application of the three kinds of analysis to different disciplines and proposed eight research methods.

Stakeholder analysis can be summarized as three steps: identify main stakeholders; classify and analyze the main stakeholders; and analyze conflicts and mutual relationships among the main stakeholders. Methods for each step are as follows. Step one is to identify the main stakeholders through expert consultation, focused discussion, semi-structured interview and snowballing. Step two is to analyze the relationship among the stakeholders via actor

relation matrix, social network analysis and experience mapping. Step three is to analyze the conflicts and mutual relationships among stakeholders through the methods of system dynamics (Reed, Graves, & Dandy, 2009).

2.5.2.1 Classification of research methods of stakeholders

Multidimensional segmentation is widely applied to the researches of stakeholders and Mitchell score-based approach is very common.

2.5.2.1.1 Multidimensional segmentation

Multidimensional segmentation refers to binary and multivariate segmentation of stakeholders based on certain principles. The most representative researches were conducted by Clarkson, Wheeler, Charkham and Carrol. From different perspectives, Clarkson proposed two classification principles: first, stakeholders are classified into active ones and passive ones according to the ways of risk taking; second, stakeholders are classified into primary ones and secondary ones based on their relationships with company interests (Clarkson, 1995). According to the intimacy of social attributes, Wheeler and Sillanpaa believed that stakeholders can be classified into three levels (Wheeler & Sillanpaa, 1998). Level-1 social stakeholders are directly related to enterprises. Level-2 social stakeholders are indirectly related to enterprises via social activities. Level-1 non-social stakeholders are not directly related to individuals but they have direct relationships with enterprises while level-2 non-social stakeholders are not directly related with individuals or enterprises. Charkham believed that stakeholders can be classified into public ones and contractual ones based on the contractual relationship between stakeholders and enterprises (Charkham, 1992). Multidimensional segmentation enriches people's understanding of stakeholder theory and subdivides stakeholders from different perspectives. But these methods are not universal, which are unfavorable to the application of the stakeholder theory under different backgrounds.

2.5.2.1.2 Mitchell score-based approach

After reviewing the proposal and the development of stakeholder theory, Mitchell, Agle, and Wood proposed Mitchell score-based approach based on power, urgency and legitimacy (Mitchell, Agle, & Wood, 1997).

Urgency refers to managerial staff's swift attention to the requirements of a certain organization and their attention from stakeholders. Legitimacy refers to an organization's ownership of legal claim. Power indicates an organization's action strategies and abilities to

realize organizational goals. Based on different combinations of the three attributes, stakeholders can be divided into definitive ones, expectant ones and latent ones.

Definitive stakeholders have their own power, legitimacy and urgency at the same time. They play an extremely important role in the realization of organizational objectives and the survival and development of enterprises. Managerial staffs and other stakeholders pay close attention to their needs and actions.

Expectant stakeholders own two of the three attributes (power, legitimacy and urgency). Based on different combinations of the attributes, expectant stakeholders can be further divided into three categories: dependent ones, dangerous ones, and dominant ones. Dependent stakeholders only own legitimacy and urgency and thus they usually achieve their goals by forming alliance with other stakeholders. Dangerous stakeholders only own legitimacy and urgency and thus they generally achieve their goals via extreme actions. And dominant stakeholders only own legitimacy and power, and they regularly participate in decision-making and management, thus their requirements usually receive high attention from executives.

Latent stakeholders only own one attribute. Without power and legitimacy, demanding stakeholders only have urgency and thus it is difficult for them to attract the attention of managerial staffs and other stakeholders. Dormant stakeholders have power and they gain more attention when they threaten to use it. Being lack of power and urgency, discretionary stakeholders have different roles to play as the organizations develop or the surrounding environment changes.

Mitchell score-based approach is conducive to the application of stakeholder theory to the practice. The combination of the definition and classification of stakeholders is highly valued by the academia. Drawing from Mitchell score-based approach, Heidrich added future influence and importance in the classification model and conducted dynamic analysis of stakeholder relationships in industrial waste management systems (Heidrich, Harvey, & Tollin, 2009). Based on Mitchell score-based approach, Stanghellini also carried out stakeholder analysis of water management. His innovation was to add proximity in the classification model (Stanghellini, 2010). On the basis of the research of financial subsidies for public sports facilities, Friedman and Mason proposed that Mitchell score-based approach was an ideal way to promote a sound distribution of limited resources between managerial staffs and stakeholders (Friedman & Mason, 2005).

Varvasovszky and Brugha believed that stakeholders' "impact of issue" is of great

significance (Varvasovszky & Brugha, 2000). Medical services, which are studied in our research, are public goods. Therefore, “impact of issue” fits in with our research. The research on stakeholders of medical services should be conducted under the backdrop of public policy analysis. Based on Mitchell score-based approach, “impact of issue” is added to investigate the influence of public policies on medical services.

2.5.2.1.3 Analysis of stakeholders’ conflicts

There are many instruments for the analysis of stakeholders’ conflicts, among which interest-influence matrix is the most influential one. Interest-influence matrix is conducive to guarantee the sustainability of policy development and implementation, so that relationships among stakeholders can be coordinated. Based on stakeholders’ power and demand for interest, their roles in decision-making, management and organizational activities should be explicated to make sure their way of participation. Stakeholders’ legitimate rights to certain issues or legal claim on other groups can be defined as “interest” in the matrix. “Influence” refers to stakeholders’ means, abilities and resources that influence other stakeholders’ decision-making or the development that affects certain issues.

Key players are the stakeholders with high influence and demand for interest. They play a significant role in the realization of the management goals and the development of policies. They also take an active part in management decision-making. Subject players refer to stakeholders with low influence but high demand for interest. They usually “ally” themselves with other stakeholders to achieve their own goals. Context setters need to be paid more attention to prevent from any potential risks. After all, they have high influence, even though they do not indirectly participate in decision-making and they have low demand for interest. Crowd players are characterized by low influence and demand for interest. They hardly participate in organizational decision-making and management. Therefore, it is unnecessary to provide them with excessive resources.

Stakeholders’ interest and influence may change over time. They may also “ally” to boycott or promote certain policies or the realization of certain goals, which become an effective tool for analyzing the contradiction and conflicts of stakeholders. When the interest-influence matrix is used for analysis, it is necessary to consider the possibility of stakeholders’ future alliance and their influence.

2.5.3 Theoretical basis of stakeholder supplier regulations and incentives

Medical services belong to public goods, whose supply requires enormous capitals. They

have strong asset specificity, high sunk cost and long sunk period. Effective market competition is impossible in the medical service market. In addition, there is an obvious information asymmetry in medical services. For instance, it is rather difficult for governments to understand the costs of health care services provided by medical institutions and patients fail to have a better understanding of their own medical conditions and the medicine price. Therefore, an effective incentive mechanism is of utmost importance for the long-term stable development of medical institutions and the information disclosure of medical services.

2.5.3.1 Game theory

Hurwicz is the first to use game theory to discuss the resource allocation against the backdrop of information asymmetry, laying a theoretical foundation for incentive mechanism. According to Hurwicz, effective resource allocation and information transmission as well as compatible incentives are unique characteristics of an efficient incentive mechanism (Hurwicz, 1973). The key to an incentive mechanism is incentives and information. Incentive compatibility is an effective instrument for the coordination between social goals and personal interests. Effective information transmission is conducive to the sound control of costs. A scientific and reasonable incentive mechanism should propel the realization of both individual goals and organizational ones. The design of incentive mechanism can be further improved. For example, some complicated problems such as social selection can be simplified into game of incomplete information (Myerson, 1979). Maskin believed that the selection mechanism that can be executed must be monotonous (Maskin, 1999). He defined the mechanism with incentive compatibility as executable mechanism, and put forward “Nash equilibrium executable mechanism”. It can be observed that game theory is an efficient way to propose an effective incentive mechanism when facing “principal-agent” issues.

Game theory hypothesizes that players have complete information and they are complete rational persons. In the face of various alternative proposals, based on expected utility theory (ETU), the selection of maximum personal utility is the basis of the optimal proposal. The practice of personal utility function in game theory indicates the influence of others’ decisions on individual benefits. Decision makers generally use game theory to learn about the influence of policies and decisions on people’s benefits and actions, and the influence of relevant policies and decisions on others’ revenue and behaviors as well as the influence of other peoples’ behaviors and strategies on organizational goals, so as to find the optimal strategy. Therefore, game theory is an instrument for the research on the interaction and balance in decision making among stakeholders.

2.5.3.2 Regulation Game Model

Based on game theory and principal-agent theory, the author discusses the incentive mechanism for medical services and explores the principal-agent relations and other conflicts among stakeholders in decision-making in China's medical services. This thesis establishes and improves the executable incentive mechanism for medical services, that is, use modeling of game theory to analyze the game relations between principals and agents. Interests and goals of principals and agents in the principal-agent regulation game are usually not consistent. Without any motivation to maximize principals' utility, agents tend to try their best to reduce their own costs and maximize their own interests. It is difficult for principals to observe and know the quantity and quality of agents' completed tasks when facing information asymmetry. As a result, principals' interests may be damaged if agents jeopardize effective resource allocation. After all, agents own information advantage. If principals aspire to optimize the resource allocation, they need to have agents' information in hand and regulate their actions, which can only be achieved via an effective incentive mechanism.

Incentive mechanism should achieve a win-win result in interests, which should be ensured by effective measures including subsidies, penalties and pricing. In this way, the relations among stakeholders in game can be adjusted to realize incentive goals. From an economist's perspective, governments tend to pursue vanity projects due to the pressure of tight fiscal budget and GDP performance, and ignore the investment in medical services. In addition, medical institutions are legal persons that have their own interests and aim to achieve the maximum utility, but local governments can resort to economic measures or punitive mechanisms, such as price regulation and quality supervision, to provide guidance for medical institutions. As medical institutions do not have the right to determine the price of their services, they may be plunged into high operational risks, such as excessive costs for services, when the costs of medical services are changed dramatically. For long, the price of services in China's medical institutions has been relatively low, which undermine their motivation to improve service quality. As the ultimate beneficiary of medical services, patients should bear partial medical expenses. Governments can offer subsidies to restrain the rising medical service prices. However, government subsidies and medical service prices have always been controversial. It is of great necessity to explore the incentive policy for medical services on a theoretical and quantitative basis. Based on the government research and theory of corporate supervision game of Tapiero and Dong, the author launches a game between local governments and medical institutions in service costs and pricing.

Tapiero (2004) established a supervision game model between companies and environmental administrative agencies. The model proposes the following hypotheses: pollution rate (p) and unit cost of sewage treatment technology for polluters [$C_p(p)$] satisfy $\partial C_p / \partial p < 0$, $\partial C / \partial P < 0$, $C_p(0) = \infty$. The smaller p is, the higher sewage treatment costs are. If the cost of pollution-free treatment is infinite, polluters' unit cost is referred to as CF , and partial cost of sewage treatment is borne by environmental protection agencies, that is, cost subsidies (β). The unit profit of a company can be referred to as

$$(1-t)[\pi F - (1-\beta)C_p(p) - CF] \quad (2-1)$$

In Formula 2-1, t refers to tax rate of companies; πF refers to average profits; then $\pi F = [\theta Q - C(Q)]/Q$. $C(Q)$ is the function of a company's production costs, $C'(Q) > 0$. When the unit price is θ , Q refers to sales volume.

If pollution prevention measures are not taken by enterprises, there will be two situations: pollution (probability: p) and no pollution. Profits in the context of no pollution can be referred to as

$$(1-t)[\pi F - (1-\beta)C_p(p)] \quad (2-2)$$

In the context of pollution, supervision of environmental protection agencies is directly related to company losses. The objective function of environmental protection agencies includes environmental costs (costs of supervision, pollution losses, and technology-aided treatment) and part of the tax revenue from polluters. $\pi_s = f(Q, t, p)$.

Based on Tapiero's research, Dong included tax incentives, equipment subsidies and fines in his game model (Dong, Li, & Li, 2010). Dong's research focused on the game model of clean production decisions between electroplating companies and local governments. It is assumed that enterprises' tax rate imposed by the local governments is t , and the net production profit of the electroplating companies before clean production is πF . If the local government does not implement any supervision, the electroplating companies will not be punished. Electroplating companies' benefit is $(1-t)\pi F$, and the local government's benefit is $t\pi F$. The cost of supervision by the local government is CS , and the electroplating companies will pay a fine of F (if it does not perform clean production, and the risk of accepting fines is θ). The revenue of the electroplating companies is $(1-t)\pi F - F\theta$, and that of the local government is $t\pi F + F\theta - CS$. However, if the electroplating companies perform clean production, the cost needed is CF , and the revenue is π_0 as a result of recycling. If the government supervision department adopts a laissez-faire attitude, $t(\pi F - C_F + \pi_0)$ will be the

government's revenue, while that of the companies is $(1-t)(\pi_F - C_F + \pi_0)$. If the government implements supervision and provides equipment subsidies of β and tax incentives of α to the companies, then $\alpha t[\pi_F - (1-\beta)C_F + \pi_0] - \beta C_F - CS$ is the revenue of the local government, and that of the electroplating company is $(1-\alpha)t[\pi_F - (1-\beta)C_F + \pi_0]$.

The above-mentioned research models have presented very clearly the game between companies and governments, clarified the influence of promoting new technologies, and analyzed the influence of subsidies and fines on companies' and governments' respective strategies. However, little consideration has been taken into the influence of price policies on the strategies. In fact, the price of medical services is an important factor affecting stakeholders' behavioral decision-making in medical institutions. Based on the models mentioned above, the author tries to build a supervision game model between medical service providers and important stakeholders, explore the best policies for improving medical service quality, and discuss the influence of subsidies, fines and prices on the behavioral strategies of governments and medical institutions, which lay a theoretical basis for the incentive mechanism for stakeholders in medical services.

2.5.4 Theoretical basis of willingness to pay of the demand side of stakeholders

2.5.4.1 Consumers' willingness to pay and measurement

Willingness to pay (WTP) refers to consumers' willingness to pay for the maximum price for certain goods or services. A clear WTP is the key to predict the market demand of new products and to determine the optimal product price. Consumers' willingness and ability to share the costs resulting from service improvement and the launching of new products can be evaluated via WTP. In medical services, the accessibility to WTP information facilitates governments and medical service institutions to formulate policies. Currently, the revealed preference methods and stated preference methods, as the economical price valuation methods for non-market products, are commonly used.

Through one or more hypothetical scenarios and subjective evaluation, stated preference (SP) generally obtains the value of certain goods and services without market mechanism measurement, which do not have real market data and whose market value cannot be obtained through indirect market. SP includes contingent valuation method and choice experiment method. The disadvantage of SP is that it may lead to hypothesis bias, because respondents' WTP is obtained based on hypothetical scenarios. For non-market values that can be measured indirectly based on other commodity information but without direct market

information, revealed preference (RP) is usually adopted, which means the value of non-market goods or services needs to be estimated through market's revealed behaviors. RP includes travel cost method, benefit transfer method and connotation asset method. The advantage of RP is that it is based on consumers' actual choices, and it has gained more and more attention. However, due to the limited application scope of RP, it is only applicable to evaluate the current or past value levels of non-market goods or services.

2.5.4.2 Theoretical basis of WTP contingent valuation method

The contingent valuation method (CVM) refers to evaluate the value of public goods that have intangible benefits, such as medical services. In order to obtain the respondents' WTP for non-market services or products in a hypothetical market, the questionnaire method is often adopted to understand the value of such public goods or services.

2.5.4.2.1 Basic principle of contingent valuation method

Hanemann was the first to lay the theoretical foundation of CVM and studied how to incorporate the random utility maximization (RUM) into the single-boundary CVM. He believed that the choice of maximum personal utility would put an end to the discrete dichotomous valuation problem (Hanemann, 1984).

It is assumed that personal income "y", socioeconomic characteristics "s" and the state of non-market goods "q" are all function sets of consumer's personal utility "U". Then the functional formula of "U" is shown as follows:

$$U=V(q, y, s)+\varepsilon \quad (2-3)$$

In formula (2-3), "ε" refers to the understanding of respondents on their preference for target goods, which is a random error item, but the personal preference of each respondent is still unclear to the researchers.

The utility function of consumers under q₀ and q₁ is:

$$U_0=V(q^0, y, s)+\varepsilon_0 \quad (2-4)$$

$$U_1=V(q^1, y, s)+\varepsilon_1 \quad (2-5)$$

In formulas (2-4) and (2-5), "ε₀" and "ε₁" are independent variables. If the quality of the goods and services are improved, the formula is expressed as q¹ > q⁰, and certain costs must be paid. If a consumer's personal welfare utility remains unchanged, the questionnaire can also be used to consult respondents whether they are willing to pay the random amount "M".

As the income “y” increases monotonically, the utility function “U” will also increase. If the respondents accept “M”, the utility difference will be $\Delta U \geq 0$, namely:

$$V(q^1, y, s) + \varepsilon_1 \geq V(q^0, y, s) + \varepsilon_0 \quad (2-6)$$

The probability “Pr(Y)” that the respondents accept the amount “M” can be expressed as:

$$\Pr(Y) = \Pr\{V(q^1, y, s) + \varepsilon_1 \geq V(q^0, y, s) + \varepsilon_0\} \quad (2-7)$$

Based on the equivalent residual theory, it is assumed that the probability that respondents accept the amount “M” is “Pr(Y)” and otherwise “Pr(N)”, then Pr(Y) and Pr(N) can be expressed as the following formulas respectively:

$$\Pr(Y) = \Pr\{E(q^1, q^0, y, s) = WTP \geq M\} \quad (2-8)$$

$$\Pr(N) = 1 - \Pr\{E(q^1, q^0, y, s) = WTP \geq M\} \quad (2-9)$$

If the random difference is in line with the Logistic distribution and the random item “ε” conforms to the Weibull distribution, the probability that respondents accept the amount “M” is shown as follows if the personal utility of consumers is a linear function.

$$\Pr(Y) = [1 + \exp(-\beta_0 + \beta_1 M)]^{-1} \quad (2-10)$$

The formula (2-10) can be expressed in the form of Logit, which is shown as follows:

$$\ln \left[\frac{\Pr(Y)}{1 - \Pr(N)} \right] = \beta_0 - \beta_1 M \quad (2-11)$$

In formula (2-11), “β₁” is the requested coefficient while “β₀” is the constant term.

2.5.4.2.2 Main biases of CVM

The accuracy and reliability of CVM are usually doubted because the data obtained through this method is the subjective measurement through the hypothetical scenario of the respondents, instead of the true reflection of the market after transactions.

There may be four possible bias of CVM (Mitchell & Carson, 1989): First, payment vehicle bias, which means that different respondents prefer different payment methods, and they are familiar enough with payment methods such as taxes, donations and prices. Second, starting-point bias, which indicates that the researchers propose an amount of WTP and the distribution of WTP varies with this amount. Third, strategic bias, which suggests that the researchers may hide their true preferences for some reasons, and WTP may be too high or too low, thus affecting the results of the research. Fourth, hypothetical bias. Respondents

assess the value of non-market items under the simulated scenario. Due to uncertainties in respondents' estimation of the value of such items, there are differences between the estimation results and the real market.

Obviously, the root causes for these biases lie in the unreasonable design of the questionnaire, the cognitive differences and improper communication between the respondents and the researchers. In order to correct and reduce the above biases, appropriate research methods, accurate questionnaires and appropriate statistical survey are required. However, we should be aware that the CVM research is based on the uncertainty of the respondents and is a subjective evaluation based on the hypothetical scenarios, and its accuracy has been doubtful. Therefore, special efforts should be made to carry out corrective research on the hypothesis bias.

2.5.4.3 Correction method for respondents' uncertainties

Among the applied researches of stated preference methods in the past twenty years, preference uncertainty has gained attention from all sectors of society.

A large number of experiment results show that the uncertainties of the respondents affect the accuracy of the valuation results, and there are a lot of preference uncertainties in response to the contingent valuation problem due to the uncertainties of the respondents, because the respondents have insufficient information of the goods and there is information asymmetry. In order to obtain a more accurate WTP valuation result, the uncertainties of the respondents should be introduced into the valuation process of the goods in order to reduce the hypothetical bias. Besides, the welfare estimation efficiency of the model may also be affected by relevant correction models. In general, the model and research methods are controversial.

Respondents' unfamiliarity with the evaluated services and goods is the root cause for their uncertainties. Akter's study shows that respondents' unfamiliarity with the perceptions of the evaluated subjects is the main cause for uncertainties (Akter & Bennett, 2013). Previously, Champ and Bishop also proposed similar views to the one proposed by Akter (Champ & Bishop, 2001). Hanley's research pointed out that as respondents become more familiar with the goods, their uncertainties gradually reduce (Hanley, Kristrom, & Shogren, 2009). Wang believes that alternatives or supplements of non-market goods or services will affect the value of goods and services. In addition, important factors that cause the uncertainties of the respondents also include time, interest, ability and credibility of the research agencies (Wang, 1997).

According to Loomis and Ekstrand, respondents have high certainty when the bidding amount is very low or very high, and respondents' certainty is relatively low when the bidding amount is at a middle level (Loomis & Ekstrand, 1998). Petrolia proposes that the uncertainties of respondents are closely related to the credibility of suppliers, ownership of public goods and payment mechanisms (Petrolia & Kim, 2011).

In order to narrow the gap between hypothetical behaviors and actual ones, the following five approaches can be adopted to resolve uncertainties:

(1) Weighted likelihood function model (WLFM). Numerical certainty scale (NCS), usually ranging from 0 to 100%, is to be added behind the critical valuation questions to measure the uncertainties of the respondents, and the percentage result is considered as the weight of the likelihood function, which is a dually weighted to the binary answer of the respondents (Li & Mattson, 1995).

(2) Asymmetric uncertainty model (ASUM). The certainty information of the respondents is obtained via multi-selection methods. Respondents' answer of "affirm" is recorded as "Yes" and the rest as "No" (Ready, Whitehead, & Blomquist, 1995).

Champ considered respondents' affirmative answer as a source of uncertainties, and the respondents' certainties were measured by NCS, with values ranging from 1 to 10. A "Yes" answer with a score below 10 is coded as "No" (Champ & Bishop, 2001).

(3) Symmetric uncertainty model (SUM). The certainty information obtained by NCS encodes the variables 0 or 1 as a continuous variable $[0, 1]$; the answer value of "Yes" is 1 and the answer value of "No" is 0, which correct the binary option of CVM answer as "Yes" and "No" (Loomis & Ekstrand, 1998). The advantage of SUM is that the option of "Don't Know" can be expressed by a value of 0.5, which is suitable for the situation in which respondents cannot choose when the bidding amount is close to WTP.

(4) Random valuation model (RVM). This method does not require a certainty scale. Wang believes that when respondents conduct value assessment, there is no fixed valuation point but only implicit distribution section (Wang, 1997). If the consumer surplus is equal to the bidding amount, the "Don't Know" option can be introduced. When the consumer surplus is relatively smaller or larger than the bidding amount, the respondent will answer "No" or "Yes".

(5) Fuzzy model (FM). If the respondents' answers belong to the fuzzy set and the exact value of the goods is uncertain, the WTP fuzzy estimation calculated by the FM method is

found to be lower than half of the measured value calculated by WLFM. This is a typical example of the application of FM. On this basis, Sun and Kooten developed a fuzzy random utility maximization model (Sun & Kooten, 2009).

2.5.5 Theoretical basis of WTP choice experiment method

Louviere and Hensher first proposed the choice experiment method (CEM) (Louviere & Hensher, 1982). CEM means that respondents choose their preferred program based on their own preferences in a combination of different attributes (Train, 1986). CEM began to shift from transportation market research to non-use value assessment of non-market goods and services in resource environments (Adamowicz, Boxall, & Williams, 1998). The advantage of CEM is that it cannot only estimate the changing value of individual or multiple attributes of goods, but also estimate the overall value of goods. Because CEM can decompose the value of the goods to be evaluated into the implied value associated with a special attribute, the profit and loss comparison of public goods that have multiple attributes can be solved by CEM.

CEM is based on consumer choice theory and random utility (Lancaster, 1996). Respondents choose alternatives, which are an option set of different attribute levels, and they choose an item with the maximum utility among the alternatives.

The random utility theory expresses the sum of the random error term and the observable portion of the system as a utility function. The selected personal utility “U” of an individual respondent (“n”) can be expressed as:

$$U_{in}(X_{in}, S_{in}) = V(X_{in}, S_{in}) + \varepsilon(X_{in}) \quad (2-12)$$

In formula (2-12), the observable and system utility of the option “i” selected by the respondent “n” is expressed as $V(\bullet)$, while $\varepsilon(\bullet)$ is the error term of the utility function, and X_{in} is used to indicate the attribute characteristics of option “i” selected by the respondent “n”, with S_n representing the socioeconomic characteristics of the respondent “n”.

The option between alternative scenarios is expressed in the form of a probability function. The probability (P_{ni}) that the respondent “n” chooses an alternative scenario “i” higher than the other scenarios is expressed by the following formula:

$$\begin{aligned}
 P_{ni} &= \Pr ob(U_{ni} > U_{nj}, \forall j \neq i) \\
 &= \Pr ob(V_{ni} + \varepsilon_{ni} > V_{nj} + \varepsilon_{nj}, \forall j \neq i) \\
 &= \Pr ob(\varepsilon_{nj} - \varepsilon_{ni} > V_{ni} - V_{nj}, \forall j \neq i)
 \end{aligned} \tag{2-13}$$

Probability P_{ni} is in line with the accumulative distribution, therefore:

$$P_{ni} = \int_S I(\varepsilon_{nj} - \varepsilon_{ni} > V_{ni} - V_{nj}, \forall j \neq i) f(\varepsilon_n) d\varepsilon_n \tag{2-14}$$

Formula (2-14) is a multidimensional integral of the density function $f(\varepsilon_n)$ for the unobservable portion. In the above formula, the indicator function is $I(\bullet)$. If the item in parentheses is true, it is equal to 1, or otherwise 0. When the experimental method is used for estimation, the IID (Independently and Identically Distributed) method is generally adopted and the MNL (Multinomial Logit) model is used for valuation calculation. The probability that the consumer “n” choose i from the option set J can be expressed as:

$$P_{ni} = \frac{\exp(\lambda V_{ni})}{\sum_{j=1}^J \exp(\lambda V_{nj})} \tag{2-15}$$

In formula (2-15), λ is a scalar constant and is routinized as 1. The indirect utility function of the MNL model is:

$$V_{jn} = ASC + \sum \beta_{jk} X_{jk} + \sum \phi_{jn} (S_n \cdot ASC) \tag{2-16}$$

In formula (2-16), ASC refers to alternative specific constant. X_{jk} is the characteristic attribute value k of option j ; β_{jk} is the coefficient term of attribute k ; S_n is the socioeconomic characteristic variable of the respondents; and ϕ_{jn} is the coefficient vector of the socioeconomic characteristic variable. As the coefficient of socioeconomic variables cannot be directly estimated, it can be estimated by interacting the socioeconomic variables with attribute variables in the option set or ASC.

The marginal rate of substitution of the attribute i and the attribute j can be calculated by the estimated parameters obtained by formula (2-16):

$$MRS = -(\beta_i / \beta_j) \tag{2-17}$$

The marginal rate of substitution can be used to calculate the implicit price of an attribute when the price is used as one of the attributes of the selection experiment. According to formula (2-17), the utility value of attribute j is shown as follows:

$$WTP_j = -(\beta_i / \beta_M) \quad (2-18)$$

In formula (2-18), the monetary term of the utility function is β_M , while the estimated coefficient of the attribute term is β_j .

Welfare measure for different scenarios is calculated based on the compensating surplus (CS) of different combinations of calculated attribute levels relative to the initial state:

$$CS = -\frac{1}{\beta_M} \left(\ln \sum_i \exp(V_{i0}) - \ln \sum_i \exp(V_{i1}) \right) \quad (2-19)$$

In formula (2-19), V_{i0} is an indirect utility function in the initial state, V_{i1} is an indirect utility function in the improving state, and β_M is the marginal utility of the price.

In conclusion, the positive role of stakeholders in the supply of medical services has been highlighted in existing literatures. However, it is necessary to conduct in-depth research from the qualitative and quantitative aspects to coordinate the needs of stakeholders and promote their cooperation. Therefore, we will take these two points as the analysis points of the research. From the perspective of stakeholders, we aim at improving medical service supply, comprehensively analyze the stakeholders of medical service, and discuss the incentive mechanism of medical service supply.

Chapter 3: Research Design and Research Methods

3.1 Research steps

Firstly, the author introduces the analysis and research background of stakeholders of medical services. Based on the summary of literature review and considering the features of medical service industry and stakeholder researches, the author summarizes the research questions, which provides directions and lays a foundation for the follow-up analysis.

Secondly, the author analyzes the applications of stakeholder theory to medical services. The key stakeholders in medical services are determined by focus group and expert interviews. The author combs the demand strategies of key stakeholders, conducts questionnaire surveys on classified stakeholders, and then analyzes conflicts and contradictions among stakeholders.

Thirdly, based on the systematic analysis on the stakeholders of medical services in the supervision game model between local governments and medical institutions, the author analyzes the supervision game among key supplier stakeholders. By analyzing how incentives policies such as fines, subsidies, and prices influence the choice of game players, the author testifies the analysis results of the model through empirical research in three cities.

Fourthly, the author analyzes WTP of stakeholders in the demanders of medical services. The questionnaire is drafted based on the experiment design, which is based on contingent valuation WTP model as the experiment model. The author forms ordered Probit Regressions Model, ordinary least squares (OLS) model, conditional logistic regression model, and random parameters logistic regression model and conducts data analysis. Based on the comparison of the contingent results of the two survey methods, the author analyzes the average WTP of patients and the main influencing factors.

Lastly, based on the supervision game analysis of supplier stakeholders, WTP analysis of demander stakeholders, and comprehensive analysis of stakeholders of medical services, the author summarizes the interest coordination of key stakeholders and improves the design framework of incentive systems for medical services. By summarizing the analysis conclusions, the author proposes limitations of the research and future research trends.

3.2 Questionnaire survey and sample analysis

3.2.1 Research program

Based on reviewing policies and regulations and related literature, we conducted semi-structured interviews with 39 interviewees, including medical institution workers, government department staff, community property sector employees, patients, experts, scholars, media and experts in medical service sector of non-governmental organizations (NGOs) in June 2018. Firstly, we listed the potential stakeholders of the medical services and identified their needs and roles. Then, 25 experts from government departments (accounting for 41.38%), medical institutions (27.59%), scientific research institutions (20.69%) and medical service associations (10.34%) voted to select key stakeholders. Finally, the respective roles and relationships of stakeholder groups are clarified through questionnaires. The improved Mitchell scoring model and the “interest-influence” matrix are used to carry out classified studies and conflict analysis. The research will be carried out from the following three aspects: first, identifying the key stakeholders of medical services; second, conducting a classified study on the key stakeholders of medical services; finally, displaying and analyzing the contradictions and conflicts between the key stakeholders.

3.2.2 Questionnaire survey

The questionnaire for stakeholders of medical services consists of three parts: the first part is the basic information of the interviewees, including their age, work unit, educational level, years of working in medical service institutions, familiarity with the medical service industry, and personal income. The second part helps interviewees understand the questionnaire investigation through background introduction to the questionnaire and explanation about medical services and stakeholders. In the third part, a grade will be given to the main stakeholders of medical services from five dimensions (importance, legitimacy, influence, urgency and impact). Likert scale is adopted: 1 stands for “least important”, 2 for “less important”, 3 for “generally important”, and 4 for “relatively important”, and 5 for “most important”.

The research objects are stakeholders of medical services, including government departments, community property sectors, universities and research institutions, medical institutions, media, medical associations, NGOs and patients. From July to September 2018, 300 questionnaires were distributed, with 287 collected, registering a recovery rate of 95.7%.

The number of valid questionnaires was 269, and the effective rate was 93.2%.

3.2.3 Descriptive analysis of samples

Among the valid samples of the questionnaires, the distribution of socioeconomic characteristic variables is listed in Table 3-1.

As for the age, as the questionnaire is professional to some extent, we did not survey respondents under the age of 20. Respondents over 60 years old, from 51 to 60 years old, from 41 to 50 years old, from 31 to 40 years old, and from 20 to 30 years old account for 1.49%, 6.32%, 12.64%, 26.39%, and 53.16% respectively. In terms of years of working, 19.70% of the respondents have worked in the medical industry for not more than one year; 24.16% for 1-5 years; 11.90% for 6-10 years; 7.81% for 11-20 years; and 2.23% for more than 20 years. As for educational level, respondents with doctoral degree, master degree, bachelor degree, and junior college degree account for 9.29%, 35.32%, 32.34%, and 17.10% respectively. In terms of personal income, 31.23% of the respondents have a monthly income ranging from 5,001 to 101,000 yuan, and other respondents' monthly income is less than 5,000 yuan, accounting for 48.69%. As for work unit, 20.07% of respondents work in medical institutions, 13.01% in government departments, 10.04% in pharmaceutical enterprises, 17.10% in universities and research institutions, 7.81% in community property sectors, 3.35% in media, 1.86% in medical associations; and patients account for 26.77%. The samples of the questionnaire meet the requirements of statistical analysis.

3.3 Case study

We take the medical services improvement programs in Nanning, Liuzhou, and Guilin as three cases and conduct model validation to testify the implementation effects of the supplier model in the game of actual cases. The data of the three cases are respectively collected from “Price Regulations of Medical Services in Guangxi Zhuang Autonomous Region (for Trial Implementation)”, “Notice of Prices of New Medical Services Programs (the 5th Batch) in Guangxi Zhuang Autonomous Region”, and “Notice of Prices of New Medical Services Programs in Guangxi Zhuang Autonomous Region”. Moreover, the data is mainly collected from monitoring reports of the medical industry and healthcare policies as well as laws and regulations in China.

Table 3-1 Distribution of socioeconomic characteristic variables

Item	Classification	Number	Percentage	Item	Classification	Number	Percentage
Age (years old)	Below 20	0	0	Years of working in Medical service industry	Within 1	53	19.70%
	21-30	143	53.16%		1-5	65	24.16%
	31-40	71	26.39%		6-10	32	11.90%
	41-50	34	12.64%		11-20	21	7.81%
	51-60	17	12.64%		Above 20	6	2.23%
	Above 60	4	1.49%	Outsiders of the industry	92	34.20%	
Education Level	High school and below	16	5.95%	Familiarity with medical service industry	Do not know	37	13.75%
	Junior College	46	17.10%		Basically know	42	15.61%
	Bachelor's degree	87	32.34%		Average	55	20.45%
	Master's degree	95	35.32%		Familiar	81	30.11%
	Doctoral degree	25	9.29%		Very familiar	34	20.07%
Work units	Medical institutions	54	20.07%	Personal monthly income (yuan)	≤5000	131	48.69%
	Government departments	35	13.01%		5001-20000	84	31.23%
	Pharmaceutical enterprises	27	10.04%		10001-15000	33	12.27%
	Research institutions	46	17.10%		0	17	6.32%
	Community property sectors	21	7.81%		15001-20000	4	1.49%
	Media	9	3.35%		>20000		
	Medical associations	5	1.86%				
	Patients	72	26.77%				

3.4 CVM and CEM

As one of few methods measuring the value of public goods, the stated preference method is highly praised, but this method may have hypothetical bias, which is related to the uncertainties of the respondents. So far, there has not been an effective way to correct these uncertainties, which is also the difficulty and focus of this research. In addition, CVM and CEM will also be adopted in this research. Firstly, based on correcting the condition models of respondents' uncertainties, OLS regression and OLS regression are used to analyze the factors affecting patients' WTP, to make a comparison of the WTP valuation results between different correction models and clarify the reasons for the uncertainties of the respondents. In addition, Logit regression conditions of random parameters and Logit regression are used to

analyze the influencing factors of WTP. At the same time, CEM is adopted to clarify the compensative surplus of various programs of medical service projects and the implicit value of each attribute. Finally, based on the comparison of the valuation results of the two methods, the theoretical and empirical analysis of incentive mechanism is conducted in the demand side of medical services.

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Chapter 4: Stakeholder Analysis of Medical Services

4.1 Definition of stakeholders of medical services

4.1.1 Identify stakeholders of medical services

By summarizing the documents and conducting expert interviews and symposiums, 15 potential stakeholder groups of medical services identified: medical associations, university research institutions, pharmaceutical enterprises, news media, community property sectors, patients, development and reform commissions at all levels, price bureaus, finance bureaus, disease control centers, health bureaus, and governments at all levels. Finally, the main stakeholders of medical services are determined by experts' voting.

Experts suggested that the overly detailed classification of stakeholders might bring difficulties to relevant research. Therefore, the relevant administrative competent departments are classified as government departments; staff members of medical institutions, investors and managers are collectively referred to as medical institutions, and medical service associations are referred to as NGOs. As a final decision, eight main stakeholder groups of medical services were identified, namely government departments, patients, research institutions, pharmaceutical enterprises, community property sectors, media, NGOs, and medical institutions.

4.1.2 Analysis of the needs and strategies of major stakeholders

The roles, needs and strategies of the eight main stakeholders are listed in Table 4-1.

(1) **Medical institutions.** Medical institutions are the main producers and suppliers of medical services. They treat patients by improving their medical standards and adopting appropriate medical solutions. Pursuing maximized profits, they are “economic men”. They may sacrifice social benefits in order to pursue economic benefits. In the absence of effective government regulations and incentive measures, there may be extortionate prescription and excessive examinations in medical institutions. It is necessary for the governments to offer guidance and incentives to and impose restraint on medical institutions.

(2) **Government departments.** Government departments are the ultimate responsible body for the provision of medical services, and they are responsible for formulating laws and regulations on medical services and supervising medical institutions. Government departments use the following means to influence the decision-making of medical institutions: adjusting the price of medical services, providing subsidies and imposing penalties. Government departments have limited rationality, as they must guarantee medical services on the one hand, and maximize local fiscal revenue and achieve economic development goals on the other hand. Therefore, effective incentive policies are needed to encourage government departments to carry out proactive supervision.

Table 4-1 Stakeholders of medical services

Stakeholders	Roles	Needs	Strategies	Impact
Medical Institutions	Supply medical services	Maximize profits	Select drugs, medical equipment	Subject to supervision
Government Departments	Supervision	Maximize social welfare and minimize cost	Formulate supervision and regulations	Government performance
Patients	User of medical services	Medical services	Exert joint pressure	Health standards
Pharmaceutical Enterprises	Provide drugs and medical equipment	Maximize profits	Public relations	Subject to supervision
Community Property Sectors	Provide medical services for community residents	Maintain stability in communities and maximize the effectiveness	Cooperate with medical institutions	Subject to public opinion
Research Institutions	Provide knowledge	No direct needs	Intellectual support	No direct impact
Media	Guidance of public opinion	No direct needs	Express public opinion	No direct impact
NGOs	Spokespersons of patients or medical institutions	No direct needs	Indirectly exert pressure	No direct impact

(3) **Patients.** Patients are the end user of medical services and they have a rigid need for a qualified medical service supply. At present, China's medical service information is not transparent. The patients are scattered in different sectors, with limited channels of participating in medical decision-making, making it difficult to directly affect medical services. At the same time, patients should also bear part of the medical expenses.

(4) **Pharmaceutical enterprises.** Pharmaceutical enterprises are "economic men" that pursue profits and expect to reduce production costs and increase corporate profits as much as possible. They sell as many services and products as possible to medical institutions by promoting "public relations". However, as their products concern public health, it is necessary for the government, the public and the news media to supervise the behaviors of pharmaceutical enterprises.

(5) **Community property sectors.** At present, community hospitals are fully popularized in cities of China. Community hospitals and community property sectors jointly provide services for community residents by conducting cooperation in venues, management and funding. In particular, with China's accelerating population aging, elderly people living alone are in dire need of health care services, community care services provided by family doctors. Therefore, the cooperation between community property sectors and medical institutions has become an overall trend of present and future development.

(6) **Research institutions.** Research institutions are mainly responsible for related research on medical technologies, medicines and medical equipment. At the same time, they undertake the educational functions of medical services and disseminate professional knowledge. Some medical service institutions are also required to participate in emergency management when group medical risks occur. Research institutions themselves have no direct interest demands for medical services.

(7) **Media.** As the "fourth power", media bear the responsibility of supervising medical institutions and government departments. There are many means of media supervision, such as scooping the problems of medical institutions and governments in providing medical services through news reports, and propelling medical institutions to improve medical services through the news exposure and public opinion pressure, so as to construct a bridge of communication among the governments, medical institutions and patients. However, the media themselves have no direct interest demands for medical services and are not directly affected by medical services.

(8) **NGOs.** NGOs in medical service sectors include various types of urban medical service associations. They have no political constraints, with relatively independent sources of funds, and a rich pool of talents, and certain advantages in medical services. However, NGOs are still in the early stages of development in China, with weak strength and weak impact on medical services.

4.1.3 Importance ranking of major stakeholders

Through questionnaires survey and descriptive statistics of importance (see Table 4-2), it is found that medical institutions, government departments, patients, and pharmaceutical enterprises have higher importance dimensions, with average scores of over 4. Therefore, these four types of stakeholders are of relatively high importance. However, the importance for community property sectors and NGOs is lower, standing at 3.517 and 3 respectively, which are followed by research institutions and the media.

Table 4-2 Descriptive statistics of importance of stakeholders

Stakeholders	Valid Sample	Minimum	Maximum	Mean	Standard deviation
Medical institutions	269	3.00	5.00	4.669	0.517
Government departments	269	2.00	5.00	4.435	0.681
Patients	269	1.00	5.00	4.219	0.989
Pharmaceutical enterprises	269	1.00	5.00	4.032	0.938
Community property sectors	269	1.00	5.00	3.517	0.858
Research institutions	269	1.00	5.00	3.264	1.001
Media	269	1.00	5.00	3.413	0.945
NGOs	269	1.00	5.00	2.996	1.060

In order to verify whether there are significant differences between the mean difference of the importance scores of relevant stakeholder groups and “0”, the “paired-samples t-test” method was included in the research. Scientific research institutions and media are not statistically significant because their mean scores are not significantly different from zero.

The mean score of the importance of scientific research institutions is higher than that of the media, indicating that research institutions and the media have the same importance. Medical institutions, governments, patients, pharmaceutical enterprises, community property sectors, research institutions and the media are also of relatively high importance. In addition, a classified study on stakeholders was also conducted to further identify their characteristics of influence and interests.

4.2 Classified research of stakeholders of medical services

The attribute impact is introduced (Varvasovszky & Brugha, 2000) in the score-based approach proposed by Mitchell and Wood. And the classification of stakeholders of medical services is conducted based on power, legitimacy, urgency, and impact.

Power refers to the competence and action strategies that would influence medical services. Legitimacy means the right to claim on medical services legally or morally. Urgency indicates the competence of gaining attention from the administrative departments in medical services or other stakeholders. And impact is the influence of medical services on a certain group. Based on different combinations of the four attributes, the stakeholders can be divided into four categories, namely, definitive stakeholders, expectant stakeholders, latent stakeholders, and marginal stakeholders. Definitive stakeholders have all four attributes and their support is highly essential to medical services. Expectant stakeholders only have three or two attributes and the supply of medical services also requires their attention. Marginal stakeholders only have one attribute.

The scores of stakeholders of medical services in different attributes are listed in Table 4-3. Based on relevant researches of Stanghellini (2010) and the average scores of the investigation samples in this research, “3.5 points” is considered as the critical point for the rating of the above attributes. The average scores lower than 3.5 are regarded as low grades and average scores equal to or higher than 3.5 are considered as high grades. The average scores of the four attributes of definitive stakeholders are all equal to or higher than 3.5 while the average scores of two or three attributes of expectant stakeholders are equal to or higher than 3.5. The average score of only one attribute of latent stakeholders is equal to or higher than 3.5. As for marginal stakeholders, the average scores of all four dimensions are lower than 3.5. Based on the data analysis, it is concluded that medical institutions, government departments, patients, and pharmaceutical enterprises are definitive stakeholders; research

institutions and media are expectant stakeholders; community property sectors are latent stakeholders; and NGOs are marginal stakeholders.

Table 4-3 Ratings of stakeholders from different dimensions

	Legitimacy	Power	Urgency	Impact	Classifications
Medical institutions	4.6059	4.6320	4.5539	4.4126	Definitive
Government departments	4.8030	4.7286	4.7100	4.9368	Definitive
Patients	3.9814	3.5539	3.8848	4.6766	Definitive
Pharmaceutical enterprises	3.7398	3.8662	3.7361	3.6617	Definitive
Community property sectors	3.3941	3.3123	3.2045	3.5688	Latent
Research institutions	3.1041	3.6011	3.5420	2.9294	Expectant
Media	3.0706	3.5725	3.8736	2.9368	Expectant
NGOs	2.8476	2.8513	3.0260	2.7658	Marginal
Average	3.6933	3.7647	3.8163	3.6111	

The above four kinds of stakeholders can be further subdivided into three ways of participation, namely, co-working, co-thinking, and co-knowing. Co-working participation requires stakeholders' joint management decision-making and active participation in management and it exerts direct influence on medical services. Co-thinking participation requires stakeholders' joint negotiation on management. And co-knowing participation requires that the stakeholders' right to know should be guaranteed.

Owning all four attributes at the same time, medical institutions, government departments, patients, and pharmaceutical enterprises belong to definitive stakeholders of medical services. Their decisions, action decisions, and immediate interests are closely related to medical service provision. Therefore, the improvement of medical service provision

requires the co-working participation of the above four kinds of stakeholders, especially the active participation of definitive ones.

Owning power and urgency, media and research institutions are expectant stakeholders of medical services. Due to the influence of media and research institutions, other stakeholders and decision makers pay attention to the medical service provision of media and research institutions. Therefore, the medical service provision requires the co-thinking participation of expectant stakeholders. In this regard, media and research institutions can participate in the management of medical services as consultant agencies.

Only owning impact, community property sectors are latent stakeholders of medical services. It is hard for them to gain attention from decision makers and other stakeholders. Under China's present national conditions, NGOs do not have any attribute and thus they are marginal stakeholders. Therefore, the co-knowing participation of community property sectors and NGOs should be guaranteed to ensure their rights to know relevant information of medical services.

4.3 Conflict analysis of stakeholders of medical services

We are intended to construct an “interest-influence” matrix of stakeholders of medical services, aiming at figuring out the roles of and conflicts among different stakeholders and explore ways of medical service provision. In the matrix, the “interest” is defined as legitimacy, which refers to the legitimate rights of a certain group of stakeholders on the medical service provision, or legal claims of other groups or individuals. Influence refers to the effects of stakeholders on other stakeholders by using resources, competence, and methods.

Government departments, medical institutions, and pharmaceutical enterprises are key players in medical service provision, having relatively high interest demands and influence. They are willing to actively participate in the medical service provision, so as to gain more benefits for themselves. They have the most direct and crucial influence on the medical service provision and such provision is the result of the game among these three kinds of stakeholders. Especially, the game and balance between government departments and medical institutions have a greater influence on the medical service provision. Therefore, government departments and medical institutions require extra encouragement and guidance in making action decisions.

With relatively high interest demands for but insufficient influence on the medical service provision, patients belong to subject players. They often ally themselves to obtain benefits. Efforts should be made to maintain relations with these stakeholders and attention should be paid to their demands to prevent them from adopting some abnormal and uncooperative methods. To guarantee their right to know, patients can be provided with prompt and comprehensive information on policy, regulations, medical knowledge, and the medical service provision.

Research institutions and media have the competence and methods to influence the medical service provision but they have relatively low interest demands for medical services. Therefore, they are context setters, whose influence is often brought out by certain events. For example, a sudden outburst of medical accident would promote research institutions and media to actively participate in the medical service provision. Generally, they are passive participants in the medical service provision and management decision-making. Moreover, great importance should be attached to the professional advice given by research institutions and media as well as their influence on the management decision-making in the medical service provision.

Community property sectors and NGOs have low interest demands for and weak influence on the medical service provision. Therefore, they are regarded as the crowd players in the medical service provision. They hardly gain attention from other stakeholders or receive medical service resources. At present, there is no need to pay excessive attention to them.

Chapter 5: Supervision Game of Stakeholder on the Supply Side and the Willingness to Pay of Patients on the Demand Side

5.1 Supervision game of stakeholders on the supply side

5.1.1 Game model between the local government and the medical institution

5.1.1.1 Model hypothesis

In order to build a 2×2 static game model, the author chooses the medical institution and the government as the game players and makes the following hypothesis.

Firstly, the medical institution and the local government should be considered as limited economic men and they are in static games of complete information. The medical institution can choose whether they would invest or not in medical services to improve the services while the local government can choose whether to supervise the medical services.

Secondly, the local government supervises medical services and monitor the medical institution on a regular basis. The author marks C_R (yuan) as the supervision expenses the government is going to pay, β (%) as the unit cost subsidies provided by the government to the related medical institution, P (yuan/item) as the unit price of medical services, which can be adjusted by the government, and F (yuan) as the fines that the medical institution which does not upgrade their services or is not up to standard are going to pay.

Thirdly, the unit production cost of the medical institution is marked as C_0 (yuan/item), the initial cost of unit medical services as P_0 (yuan/item), and the tax rates paid by the medical institution as α . In order to meet the standards of medical services, the upgrading costs of medical services are tagged as C_u (yuan/item). If the institutions choose not to upgrade their services, they need to pay the fines marked as F (yuan) and the risks of paying the fines are tagged as r . However, since local government does not monitor all the medical institution in practice, it is possible for the medical institution to get away with the fines although they do not upgrade their medical services.

Fourthly, the volume of medical services provided is equal to the volume of medical services required with a large quantity Q daily because medical services are required

fundamentally and are often monopolized by medical services of large scales.

Fifthly, social costs can be neglected, since many medical services in China meet the standards and a relatively small social loss is caused in medical malpractices.

Table 5-1 lists the parameters and policy variables in the model. The policy variables include fines (F), cost subsidies (β), and the rising price of per medical service (P), while the rest are considered as background parameters. The parameters are fixed and only policy variables can be adjusted to influence the decision-making of the local government and the medical institution.

Table 5-1 All variables in the game-theoretical model

	Variables	Definitions
Policy Variables	F	Fines to be paid when medical services are not up to the standards (yuan)
	B	Cost subsidies for upgrading the services (%)
	P	Price rising range of per medical service (yuan/item)
Fixed Variables	C_0	Unit supply cost before upgrading the medical services (yuan/item)
	C_u	Unit supply cost increased after upgrading the medical services (yuan/item)
	Q	Supply volume (item)
	C_R	Supervision costs of the local government (yuan)
	P_0	Initial unit price (yuan/item)
	A	Taxes paid by the medical institution (%)
	R	Risks to be penalized if the medical institution do not upgrade their services and do not meet the standards of the services

5.1.1.2 Model building

Suppose the benefit local government gains as U_{ij} ($i, j = 0, 1$), and the benefits the medical institution gain as π_{ij} ($i, j = 0, 1$). If the local government chooses to supervise, i will be valued as 1. If local government chooses not to supervise, i will be valued as 0 and if the medical institution chooses to upgrade their services, j will be valued as 1 and if the medical institution does not upgrade their services, j will be valued as 0.

If the medical institution upgrades their services and local government choose to supervise, the medical institution would charge the rising prices P for their upgraded services, and local government would subsidize the costs of related institutions with the proportion tagged as β . Therefore, the benefits of local government and the medical institution are

respectively calculated as:

$$U_{11} = \alpha [(P_0 + P) - C_0 - (1 - \beta)C_u]Q - \beta C_u Q - C_R \quad (5-1)$$

$$\pi_{11} = (1 - \alpha) [(P_0 + P) - C_0 - (1 - \beta)C_u]Q \quad (5-2)$$

If the local government chooses to supervise but the medical institution does not improve their services, the two benefits can be calculated as:

$$U_{10} = \alpha (P_0 - C_0)Q + rF - C_R \quad (5-3)$$

$$\pi_{10} = (1 - \alpha)(P_0 - C_0)Q - rF \quad (5-4)$$

If the local government does not supervise but the medical institution upgrades their services, the two benefits would be calculated as:

$$U_{01} = \alpha (P_0 - C_0 - C_U)Q \quad (5-5)$$

$$\pi_{01} = (1 - \alpha)(P_0 - C_0 - C_U)Q \quad (5-6)$$

If the local government does not supervise and the medical institution do not upgrade their services, the two benefits would be calculated as:

$$U_{00} = \alpha (P_0 - C_0)Q \quad (5-7)$$

$$\pi_{00} = (1 - \alpha)(P_0 - C_0)Q \quad (5-8)$$

Table 5-2 The Payoff Matrix of the medical institution and local government

		The medical institution	
		Upgrade services	Not upgrade services
Local Govern- ment	Supervise	$\alpha [(P_0 + P) - C_0 - (1 - \beta)C_u]Q - \beta C_u Q - C_R;$	$\alpha (P_0 - C_0)Q + rF - C_R;$
	Not Supervise	$(1 - \alpha) [(P_0 + P) - C_0 - (1 - \beta)C_u]Q$ $\alpha (P_0 - C_0 - C_U)Q$	$(1 - \alpha)(P_0 - C_0)Q - rF$ $\alpha (P_0 - C_0)Q$
		$(1 - \alpha)(P_0 - C_0 - C_U)Q$	$(1 - \alpha)(P_0 - C_0)Q$

5.1.1.3 Analysis on related games

It is clear that $\pi_{00} > \pi_{01}$, i.e. when the local government does not supervise (see Table 5-2), it is likely that the medical institution does not upgrade their services. In fact, if the medical institution does not upgrade their services, the local government will benefit more when it chooses to supervise because the cost of law enforcement is smaller than the limits of the fines ($rF > C_R$). In order to urge the medical institution to upgrade their services, the benefits of the institutions after upgrading their services should be at least equal to the

benefits before the service upgrades, i.e. $\pi_{11} \geq \pi_{10}$. If the local government chooses to supervise, the benefits should be calculated as:

$$(1-\alpha)[(P_0+P)-C_0-(1-\beta)C_U]Q \geq (1-\alpha)(P_0-C_0)Q - rF \quad (5-9)$$

Based on the fourth hypothesis, medical services are provided with a great volume Q and the limit of the fines F is relatively small ($Q \gg rF$) and the formula would be changed into:

$$P \geq (1-\beta)C_U - rF / [(1-\alpha)Q] \approx (1-\beta)C_U \quad (5-10)$$

We can regard formula (5-10) as the actual unsubsidized unit cost for upgrading, which can be compensated by the rising unit prices. This is the premise to determine the limits of rising prices of the upgrading services in the medical institution.

Under different policies, there is a difference in game equilibrium between the medical institution and the local government. Based on the differences between the rising range P of unit price of water and the rate β of cost subsidies, there are two game equilibriums in the game models:

(1) If the benefits of government choosing to supervise are no less than the benefits of not supervising while the medical institution upgrades their services, there would be a steady and single game equilibrium, i.e. the medical institution upgrades their services and the local government supervises the institutions, which results in $U_{11} \geq U_{01}$ shown as:

$$\alpha[(P_0+P)-C_0-(1-\beta)C_u]Q - \beta C_u Q - C_R \geq \alpha(P_0-C_0-C_U)Q \quad (5-11)$$

If the government has a much smaller cost to supervise than the fines for the medical institution to pay ($Q \gg rF$), formula (5-11) will be changed into:

$$P \geq [\beta C_U Q(1-\alpha) + C_R] / \alpha Q \approx [\beta C_u(1-\alpha)] / \alpha \quad (5-12)$$

From formula (5-12), we can conclude that the actual cost subsidies provided by the local government to the medical institution should be smaller than the tax benefits brought by rising prices.

(2) If the medical institution upgrades their services while the benefits of government choosing to supervise is smaller than that of not supervising, and $U_{11} < U_{01}$, then

$$\alpha[(P_0+P)-C_0-(1-\beta)C_u]Q - \beta C_u Q - C_R < \alpha(P_0-C_0-C_U)Q \quad (5-13)$$

Likewise, formula (5-13) can be written as:

$$P < [\beta C_U Q(1-\alpha) + C_R] / \alpha Q \approx [\beta C_u(1-\alpha)] / \alpha \quad (5-14)$$

Unlike formula (5-12), the benefits that the local government gains from rising prices cannot compensate for the net subsidies provided to the medical institution. Therefore, it should be represented by formula (5-14).

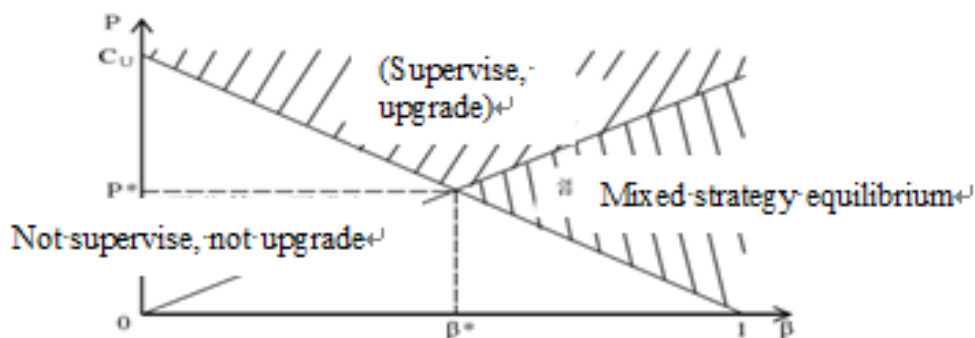


Figure 5-1 The game equilibria under various policy conditions

Figure 5-1 demonstrates the solutions of the game equilibria between local government and the medical institution with different policies. If the policy conditions required by formula (5-10) and formula (5-12) are satisfied, the preferable strategies will be that the local government chooses to supervise and the medical institution upgrade their services. The single mixed strategy game equilibrium will occur when the price rising range P , and the rate of cost subsidies β meets the requirements in formula (5-10) and formula (5-14). Otherwise, the medical institution will not improve their services and local government will not supervise. As is shown in Figure 5-1, under the policy of $P \geq \text{Max} [(1 - \beta) C_U, \beta (1 - \alpha) C_U / \alpha]$, which requires that the price rising range is at least equal to the sum of the actual unit upgrading cost paid by the medical institution and local government, the ideal game equilibrium, i.e. the improvement in medical services and government supervision can be realized. Formula (5-10) shows that when the price rising range is not less than $(1 - \alpha) C_U$, i.e. the unit cost of the medical institution upgrading their services, and limits of the fines are equal to 0, i.e. $F = 0$, the lowest range of price raising should be $[(1 - \alpha) C_U, C_U]$ and the lowest subsidy rate should be the tax rate α . On one hand, medical services cannot be overcharged since they are people's basic needs. Otherwise, the public would voice their opposition. On the other hand, the local government is limited in financial capacities and there is a limit in financial expenditures. Therefore, in order to realize the ideal game equilibrium, i.e. local government supervision and improvement of services in the medical institution, the subsidy rate should be equal to the tax rates for the medical institution to pay, i.e. $(\beta^* = \alpha)$,

which is the optimized tax rate. Besides, the actual unit costs paid by the medical institution to upgrade their services should be equal to the range of rising prices, i.e. $P^* = (1 - \alpha) C_U$, which is in the optimized range. If social welfare and social equity can be guaranteed, the largest range of rising prices should be at most equal to the unit rising costs because of upgrading medical services. The optimized range of rising prices will be $[\alpha, 1]$, which is also that of cost subsidies. This will be the ideal time for game equilibrium.

5.1.1.4 Analysis on the influence of incentive policies

In order to discuss how the three policy variables (fines F , subsidy β , and rising prices P) will influence the choices of strategy of the local government and the medical institution, the author chooses to conduct a comparative static analysis in the mixed strategy equilibrium results under conditions of $P \in [(1 - \beta) C_U, \beta (1 - \alpha) C_U / \alpha]$ and $rF > C_R$.

If μ refers to the probabilities of the medical institution improving their medical services, $(1 - \mu)$ refers to the probabilities of the opposite situation. If η represents the rate of local government supervision, $(1 - \eta)$ shows the rate of local government choosing not to supervise. Therefore, μ^* and η^* respectively refers to the rates of the medical institution improving their services and the local government choosing to supervise. If there is a game equilibrium, the future benefit of the local government will be calculated by formula (5-15) and the one of the medical institutions will be calculated by formula (5-16).

$$U(\eta) = \eta[\mu U_{11} + (1 - \mu)U_{10}] + (1 - \eta)[\mu U_{01} + (1 - \mu)U_{00}] \quad (5-15)$$

$$\pi(\mu) = \mu[\eta\pi_{11} + (1 - \eta)\pi_{01}] + (1 - \mu)[\eta\pi_{10} + (1 - \eta)\pi_{00}] \quad (5-16)$$

The local government and the medical institution all aim to maximize their benefits. Formulas (5-17) and (5-18) refer to mixed strategies in the game equilibrium model, which are the optimized first-order derivations of formula (5-15) and (5-16).

$$\mu = (rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_U - \alpha P]\} \quad (5-17)$$

$$\eta = (1 - \alpha)C_U Q / [(1 - \alpha)(P + \beta C_U)Q + rF] \quad (5-18)$$

In the mixed strategy of game equilibrium, the probability of the medical institution upgrading their services is $(rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_U - \alpha P]\}$ while the probability of local government supervising is $(1 - \alpha)C_U Q / [(1 - \alpha)(P + \beta C_U)Q + rF]$. In other words, there would be the medical institution with the proportion of $(rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_U - \alpha P]\}$ choose to upgrade their services and local government with the proportion of $(1 - \alpha)C_U Q / [(1 - \alpha)(P + \beta C_U)Q + rF]$.

$C_U Q / [(1 - \alpha) (P + \beta C_U) Q + r F]$ will supervise the medical institution on a random basis.

5.1.1.4.1 Influence of prices

If we conduct first-order partial differential on range P of rising prices from formulas (5-17) and (5-18), we can conclude the following two formulas.

$$\delta_u^* / \delta_P = \left[(rF - C_R) \alpha Q \right] / \left\{ rF + Q \left[(1 - \alpha) \beta C_U - \alpha P \right] \right\}^2 > 0 \quad (5-19)$$

$$\delta_\eta^* / \delta_P = \left[-(1 - \alpha)^2 Q^2 C_U \right] / \left\{ (1 - \alpha) Q \left[P + \beta C_U \right] + rF \right\}^2 < 0 \quad (5-20)$$

When $rF > C_R$ in a game equilibrium, the first-order partial differential value of probability μ^* of the medical institution upgrading their services is above 0 and partial differential value of first order of the probability η^* of local government supervising is below 0. Formulas (5-19) and (5-20) show that in mixed strategy equilibrium, increasing P , i.e. rising prices, would increase the probability of the medical institution upgrading their services and decrease the probability of local government supervising. Rising prices not only increases the benefits brought by upgrading services in the medical institution but also increases the benefits of taxes when government supervises. Therefore, the medical institution would actively improve their medical services because they believe that government would strengthen its supervision while the government would decrease its supervision because it believes that the medical institution will take the initiative to improve their medical services. Therefore, rising prices would be effective to encourage the medical institution to improve their services.

5.1.1.4.2 Influences of the fines

If we conduct partial differential of first order on the fines F with formulas (5-17) and (5-18) respectively, we can conclude the following two formulas.

$$\delta_u^* / \delta_F = r \left\{ C_R + Q \left[(1 - \alpha) \beta C_U - \alpha P \right] \right\} / \left\{ rF + Q \left[(1 - \alpha) \beta C_U - \alpha P \right] \right\}^2 > 0 \quad (5-21)$$

$$\delta_\eta^* / \delta_F = \left[-r(1 - \alpha) Q C_U \right] / \left\{ (1 - \alpha) Q \left[P + \beta C_U \right] + rF \right\}^2 < 0 \quad (5-22)$$

Since $P \in [(1 - \beta) C_U, \beta (1 - \alpha) C_U / \alpha]$, the partial differential of first order of μ^* on F is above 0 and the first-order partial differential of η^* on F is below 0. Formula (5-21) and (5-22) show that in mixed strategy equilibrium, increasing the value of F , which is to raise the limits of fines for the medical institution, the probability of the medical institution improving

their services will increase while the probability of local government supervision will decrease. Therefore, raising the limits of the fines will increase the benefits of local government supervision and decrease the benefits of the medical institution not improving their services. Hence, the medical institution will take the initiative to improve their services to avoid the fines while the local government will weaken its supervision, which reduces administrative costs. Therefore, we can conclude that the fines are effective to encourage the medical institution to improve their services.

5.1.1.4.3 Influences of the subsidy

If we conduct first-order partial differential on the rate of cost subsidy β with formula (5-17) and formula (5-18) respectively, we will have the following two formulas.

$$\delta_{\mu}^*/\delta_{\beta} = \left[-(rF - C_R)(1 - \alpha)QC_U \right] / \left\{ rF + Q[(1 - \alpha)\beta C_U - \alpha P] \right\}^2 < 0 \quad (5-23)$$

$$\delta_{\eta}^*/\delta_{\beta} = \left[-(1 - \alpha)^2 Q^2 C_U \right] / \left\{ (1 - \alpha)Q[P + \beta C_U] + rF \right\}^2 < 0 \quad (5-24)$$

Since $P \in [(1 - \beta)C_U, \beta(1 - \alpha)C_U/\alpha]$ and $rF > C_R$, the values of μ^* and η^* are below 0 in the first-order partial differential of β , i.e. the values of first-order partial differential on the rate of cost subsidy are below 0 with the probability of the medical institution improving their services and the probability of local government supervising. Therefore, when increasing β in the mixed strategy equilibrium, i.e. raising the cost subsidies for the medical institution to improve their services, the probability of the medical institution improving their services will decrease, so as the probability of local government supervising, because raising the subsidies decreases the benefits of government supervision but increases the benefits of the medical institution improving their services. Hence, the medical institution believe that local government will decrease supervision to save financial expenditures and they will be less motivated to improve their services. Therefore, the subsidy policy is not effective to encourage the medical institution to improve their services.

5.1.2 Extensive-form game model

5.1.2.1 Influence of reputation damage of the medical institution

Since people pay more attention to their legal rights, the medical institution attaches more importance to social responsibility and social reputation. Therefore, we need to consider reputation damage and its influences as factors when analyzing the medical institution not improving their services. Reputation damage (D) refers to the damage the medical institution

in the supervision game model come across when they do not improve their medical services and the game-payoff matrix is shown as Table 5-3.

Table 5-3 The modified payoff matrix by introducing reputation damage (D)

		The medical institution	
		Upgrade services	Not upgrade services
Local government supervise	Supervise	$\alpha [(P_0 + P) - C_0 - (1 - \beta) C_u] Q - \beta C_u Q - C_R;$	$\alpha (P_0 - C_0) Q + r F - C_R;$
		$(1 - \alpha) [(P_0 + P) - C_0 - (1 - \beta) C_u] Q$	$(1 - \alpha) (P_0 - C_0) Q - r F - D$
	Not supervise	$\alpha (P_0 - C_0 - C_u) Q$	$\alpha (P_0 - C_0) Q$
		$(1 - \alpha) (P_0 - C_0 - C_u) Q$	$(1 - \alpha) (P_0 - C_0) Q - D$

From Table 5-3, we can see that after introducing the variable of reputation damage, the game equilibrium remains the same while the medical institution and local government reach a new mixed strategy equilibrium.

$$\mu_D^* = (rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_u - \alpha P]\} = \mu^* \quad (5-25)$$

$$\eta_D^* = [(1 - \alpha)C_u Q - D] / \{(1 - \alpha)Q[P + \beta C_u] + rF\} < \eta^* \quad (5-26)$$

From these two formulas, we can conclude that the probability of the medical institution improving their medical services does not increase with reputation damage of the institutions. However, if the medical institution suffers from more severe reputation damage, the probability of government supervision will decrease, which also shows that the adjustment on the differences between the payoff and benefits of local government will influence the choices of strategy in the medical institution.

We conduct first-order partial differential of D on μ_D^* with formula (5-26). μ_D^* refers to the increasing probability of government supervision after reputation damage.

$$\delta \eta_D^* / \delta_D = (-1) / \{(1 - \alpha)[P + \beta C_u]Q + rF\} < 0 \quad (5-27)$$

Formula (5-27) shows that with the medical institution suffering greater reputation damage, the probability of local government supervising will decrease monotonically.

This shows that in socialist market economy, market plays a key role in allocating medical resources. When the medical institution suffers a great loss in its reputation, it will also suffer from declining patient flows and its revenue, which will result in a serious threat to

its survival and development. Therefore, the institution is bound to take measures to improve the quality of its medical services, which will reduce the probability of local government monitoring. We can conclude that the cause of the failure of China's medical reform lies in antagonism against market, and it is fair to say that market-oriented reforms have not really taken off in China. Therefore, market-oriented reform is the trend of medical reform in the future.

5.1.2.2 Influence of social costs of the local government

Neglected in our primary game model are the social costs of the local government, which mainly refer to the damage caused by medical malpractices in this research. However, there are medical malpractices in China, and our original hypothesis has limitations. Therefore, we introduce social costs as a new influence on the strategies of local government and the medical institution. As is shown in Table 5-4, in game model, if the medical institution does not improve medical services, the local government has to pay social costs S to compensate for social damages.

Table 5-4 The modified payoff matrix by introducing social cost (S)

		The medical institution	
		Upgrade services	Not upgrade services
Local government	Supervise	$\alpha [(P_0 + P) - C_0 - (1 - \beta) C_u] Q - \beta C_u Q - C_R$;	$\alpha (P_0 - C_0) Q + r F - C_R - S$;
		$(1 - \alpha) [(P_0 + P) - C_0 - (1 - \beta) C_u] Q$	$(1 - \alpha) (P_0 - C_0) Q - r F$
	Not supervise	$\alpha (P_0 - C_0 - C_u) Q$;	$\alpha (P_0 - C_0) Q - S$;
		$(1 - \alpha) (P_0 - C_0 - C_u) Q$	$(1 - \alpha) (P_0 - C_0) Q$

Although the social costs of the local government increase, the local government does not change its strategies. The new mixed strategy Nash equilibrium of the medical institution is calculated as:

$$\mu_S^* = (rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_u - \alpha P]\} = \mu^* \quad (5-28)$$

Formula (5-28) shows that even though there is an increase in the social costs of the local government, the probability of the medical institution improving their services does not increase because when local government chooses between “to supervise” or “not to supervise”, the difference in benefits of the two strategies does not change with the increasing social costs. Therefore, the medical institution does not change their strategies.

5.1.2.3 Influence of financial allocation from the government at higher levels

The local government will provide financial support for the medical institution upgrading their services to compensate for the costs of the institutions. However, since the local government lacks the motivation for service upgrades, it is possible that the government supervises passively in order to save financial expenditures.

The author proposes that attempts should be made to change the benefits of payoff of the local government to optimize the choice of strategy in the medical institution. It can start from providing financial allocation for the local government. If the government at higher levels allocate funding (R) to the local government, a new game payoff matrix comes into being, shown as Table 5-5.

Table 5-5 The modified payoff matrix by introducing financial funding (R)

		The medical institution	
		Upgrade services	Not upgrade services
Local government	Supervise	$\alpha [(P_0 + P) - C_0 - (1 - \beta) C_u] Q - \beta C_u Q - C_R + R;$	$\alpha (P_0 - C_0) Q + r F - C_R;$
	Not supervise	$(1 - \alpha) [(P_0 + P) - C_0 - (1 - \beta) C_u] Q$	$(1 - \alpha) (P_0 - C_0) Q - r F$
Local government	Supervise	$\alpha (P_0 - C_0 - C_U) Q;$	$\alpha (P_0 - C_0) Q;$
	Not supervise	$(1 - \alpha) (P_0 - C_0 - C_U) Q$	$(1 - \alpha) (P_0 - C_0) Q$

The increase of financial allocation does not influence the benefits of the medical institution or the choice of strategy in the local government. The new game equilibrium of the medical institution is shown as:

$$\mu_R^* = (rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_U - \alpha P] - R\} > \mu^* \quad (5-29)$$

Formula (5-29) shows that the payoff equilibrium of the medical institution is influenced by financial allocation and it is more probable for the medical institution to upgrade their services. The ideal condition of formula (5-11) can be reached when R reaches certain values, i.e. the financial allocation reaches a certain volume. Therefore, the game relation between the medical institution and the local government is optimized. Then we conduct partial differential on R with formula (5-29) and get:

$$\delta\mu_R^* / \delta R = (rF - C_R) / \{rF + Q[(1 - \alpha)\beta C_U - \alpha P] - R\}^2 > 0 \quad (5-30)$$

Formula (5-30) shows that when the government at higher levels increase financial allocations to the local government, it is more likely for the medical institution to improve their services. Therefore, such allocation is an effective means to mobilize the medical institution to upgrade their services.

5.1.3 Case study

5.1.3.1 Background of the case and parameters setting

Table 5-6 The collected data form empirical studies

Parameters	Values		
	Nanning	Liuzhou	Guilin
Q (item)	286	271	198
C0 (yuan/item)	27	24	22
CU (yuan/item)	2.5	2.2	1.9
P0 (yuan/item)	29	27	25
P (yuan/item)	34	22	32
CR (million yuan)		0.10	
F (million yuan)		0.30	
B (%)		0	
A (%)		0.25	
R (%)		1	

Source: Guangxi Statistical Yearbook (2017)

Taking the service improvement projects of three certain medical institutions located respectively in Nanning, Liuzhou, and Guilin as three cases, the author testifies the rationality of the game model and the implementation effect of the policy variables. Table 5-6 shows relevant parameters in the model.

In Table 5-6, statistics from these three medical institutions located in Nanning, Liuzhou, and Guilin are collected from the 2017 Guangxi Statistical Yearbook, while the statistics of supervision and law enforcement are collected from healthcare policies as well as laws and regulations.

5.1.3.2 Analysis of the influence of incentive policies

5.1.3.2.1 Influence of the fines

Figure 5-2 shows η^* , the probability of the local government's supervision, and μ^* , the probability of the medical institutions to upgrade their services are influenced by F , the fines in the mixed strategy equilibrium. Figure 5-2 (a), Figure 5-2 (b) and Figure 5-2 (c) show the statistics collected from cases of Nanning, Liuzhou, and Guilin respectively.

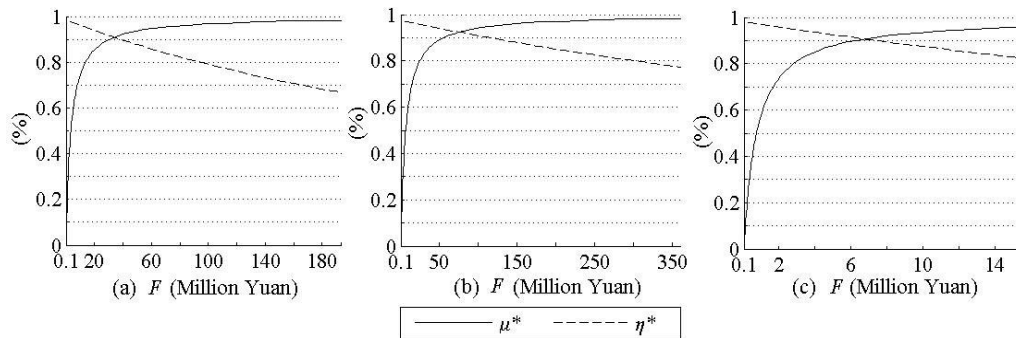


Figure 5-2 Impact of F on μ^* and η^*

The analysis results of formula (5-21) and (5-22) can be testified by Figure 5-2, which reveals that raising the limit of fines will decrease the probability of the local government's supervision (η^*) and increase the probability of the medical institution to upgrade their services (μ^*). Take the case of Nanning shown in Figure 5-2 (a) as an example. Within a certain range of fines which is from 100 thousand yuan to 20 million yuan, the probability of the medical institution to upgrade their services increases with higher fines. In this range, fines are effective and powerful to encourage the medical services to upgrade. However, if the limit of fines exceeds 20 million yuan, fines will decrease their influence on the probability of medical services to upgrade. Under the circumstances, even though fines are raised to an infinite volume, the medical institution will not further improve their services. Judging from the status quo, fines of 300 thousand yuan are not encouraging enough while the probability of services to upgrade will hit over 80% when the limit of fines is raised to 20 million yuan. Figure 5-2 (b) shows that the limit of 50 million yuan are the optimized volume of fines for the medical institution in Liuzhou while in the case of Guilin shown in Figure 5-2 (c), the optimized volume of fines is 4 million yuan. Therefore, we can conclude that the optimized volume of fines should be adjusted based on the profits and production scale of the medical institution if fines are required to be an incentive.

5.1.3.2.2 Influences of subsidies

$P \in [(1 - \beta) C_U, \beta (1 - \alpha) C_U / \alpha]$ is regarded as the mixed strategy equilibrium. In order to achieve this policy condition, the subsidy rates of unit cost β should be above 0.25. Figure 5-3 shows the influence of the subsidy rate of unit cost β on the game equilibrium of the medical institution and the local government. Figure 5-3 (b) and Figure 5-3 (c) show the case of Nanning, Liuzhou, and Guilin respectively.

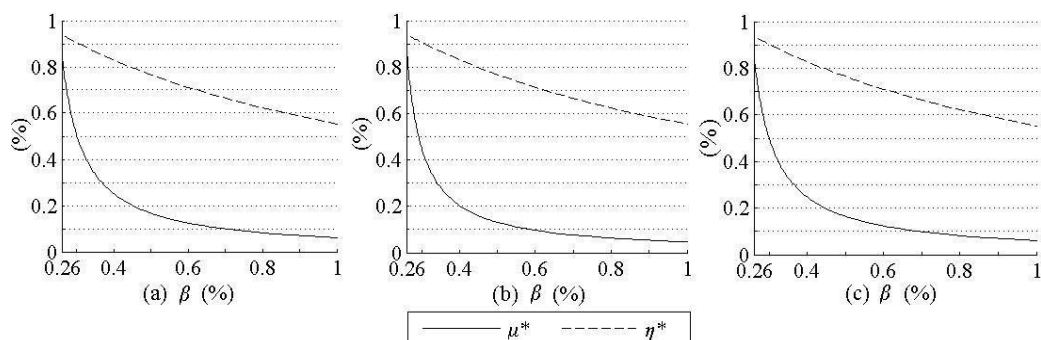


Figure 5-3 Impact of β on μ^* and η^*

The analysis results of formulas (5-23) and (5-24) are testified by Figure 5-3. With the increasing subsidy rates of costs, there will be a monotonic decrease in the probability μ^* of medical services to upgrade their services and the probability η^* of the local government’s supervision. Therefore, we can conclude that the subsidy policy is not an effective policy. Although the subsidy can release some pressure of rising prices brought by medical services upgrades, it cannot effectively encourage the medical institution to improve medical services. Figure 5-3 shows that the subsidy rates of costs should not exceed 30%. Meanwhile, if the subsidy rates exceed 50%, the probability of the medical institution to improve their services will be less than 10%.

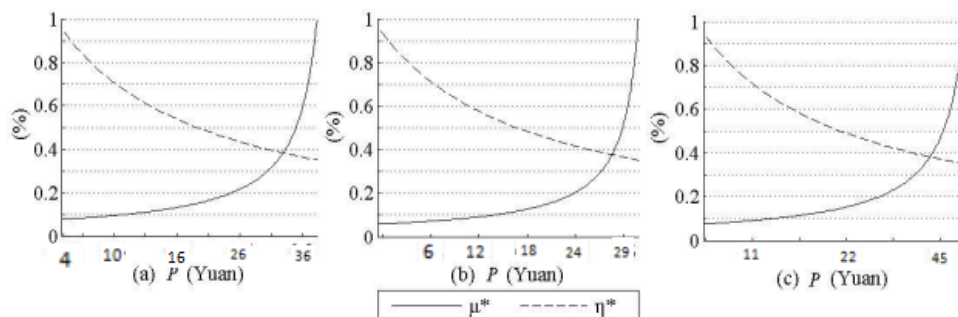


Figure 5-4 Impact of P on μ^* and η^*

5.1.3.2.3 Influence of price

Figure 5-5 shows the influence of P (range of rising prices) on the game equilibrium between the local government and the medical institution in the mixed strategy equilibrium. Figure 5-4 (a) shows the case in Nanning, Figure 5-4 (b) in Liuzhou, and Figure 5-4 (c) in Guilin.

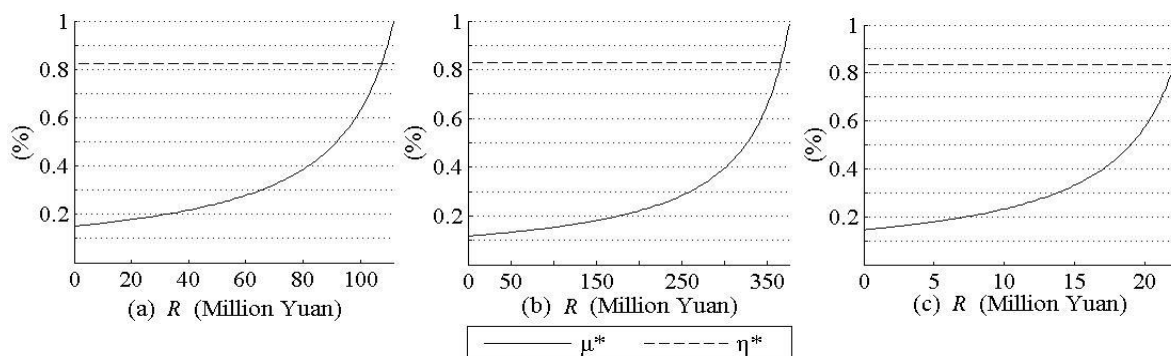


Figure 5-5 Impact of R and β on μ^* and η^*

The analysis results derived from formula (5-19) and (5-20) are testified by what is presented in Figure 5-4. μ^* (the probability of the medical institution improving services) increases monotonously with the rising prices, which can be seen from Figure 5-4(a), Figure 5-4 (b), and Figure 5-4 (c). With a higher price, there is a monotonic decrease in η^* (the probability of local government supervision). Therefore, we can conclude that rising prices can effectively improve services provided by the medical institution.

Take Figure 5-4 (a) as an example. We need to adjust P (the range of rising prices) and β (cost the subsidy rates) at the same time to determine the influences of different combinations of policy variables on μ^* . The volumes of the fines and the subsidies should be within $P \in [(1 - \beta) C_U, \beta (1 - \alpha) C_U / \alpha]$ to reach the mixed strategy equilibrium. In this case, F refers to 20 million yuan. If β is around 25%, i.e. a lower cost subsidy rate, a small range of rising price will increase significantly the probability of the medical institution improving their services to around 90%. The probability of the medical institution improving their services increases with the range of rising prices and decreases with the increasing rates of subsidy. This requires a further increase in prices. Therefore, we can conclude that rising prices can effectively improve medical services while subsidy will undermine the incentives of the price policy. Moreover, when the subsidy rate of cost is around 25%, the incentive role of the price policy can be leveraged.

5.1.3.2.4 Influence of financial funding

We can discuss how R (funding local government receives from the government at higher levels) influences the game equilibrium. Figure 5-5 (a), Figure 5-5 (b), and Figure 5-5 (c) respectively show the cases in Nanning, Liuzhou, and Guilin.

As is shown above, μ^* (the probability of the medical institution upgrading their services) increases monotonously with the increase of funding, while η^* (the probability of the local government's supervision) remains the same. Therefore, we can conclude that the funding provided by the government at higher levels to the local government can effectively incentivize medical service improvement, which will contribute to an ideal game equilibrium that the medical institution is improved comprehensively. In the case of Nanning shown in Figure 5-5 (a), the game equilibrium will be reached when the funding exceeds 112 million yuan, in which the medical institution will improve their services and the local government will actively supervise. The optimized volume of the funding approaches the limits of the funds, which should be in line with the profits and production scale of the medical institution. Therefore, we can conclude that Figure 5-5 testifies formula (5-29) and (5-30).

5.2 Patients' willingness to pay

5.2.1 Research design

In order to identify patients' willingness to pay (WTP) for medical service improvement and its influencing factors, Contingent Valuation Method (CVM) and Choice Experiment Method (CEM), which are used to adjust respondents' uncertainties, are adopted to compare the valuation.

5.2.1.1 Questionnaire design

Based on the features of regional and social economy, related research from home and abroad, and NOAA (National Oceanic and Atmospheric Administration) principle, the questionnaire is composed of 5 parts: (1) perception survey towards medical service; (2) CVM WTP; (3) CEM WTP; (4) attitude towards management in medical institutions; (5) socioeconomic features of respondents. Table 5-7 presents the perception towards medical service as well as the variables and definitions of attitude survey towards management in medical institutions. Appendix II is the questionnaire of consumers' WTP for medical service improvement.

Table 5-7 Variables of perception and attitude

Variables	Definition and assignment
Respondents' attitude towards management of medical institutions	
CONCERN	Concern about medical institutions, 1=the most concerned, 10=the least
ATTITUDE	Trust towards medical service improvement, 1=support, 10=other
Trust	Trust in medical institutions, 1=the least trusted, 10=the most trusted
INFOR	Knowledge of medical information, 1=the least, 10=the most
Respondents' perception towards medical service	
PQUA	Importance of meeting quality standards, 1=the least, 5=the most
PQUAN	Importance of meeting quantity standards, 1=the least, 5=the most
PCAP	Importance of stability of accommodation capacity, 1=the least, 5=the most
PPRI	Importance of reasonable price, 1=the least, 5=the most
PSER	Importance of medical service, 1=the least, 5=the most
Respondents' satisfaction with the current conditions of medical service	
SQUA	Satisfaction with meeting quality standards, 1=the least, 5=the most
SQUAN	Satisfaction with meeting quantity standards, 1=the least, 5=the most
SCAP	Satisfaction with stability of accommodation capacity, 1=the least, 5=the most
SPRI	Satisfaction with reasonable price, 1=the least, 5=the most
SSER	Satisfaction with medical service, 1=the least, 5=the most

5.2.1.1.1 CVM questionnaire design

In CVM survey, Payment Card-induced (PC-induced) technology will be used to gain the important valuation information. As respondents have a good understanding of the increased price (yuan/item), we choose payment methods in three steps: (1) conduct random survey, (2) examine the correct order of the questions, (3) ensure enough space for core questions. In pre-survey, 30 questionnaires have been distributed, and the result shows that positive WTP accounts for 76.67%, among which 23 accept the increased price, while 7 oppose.

In pre-survey, 10, 25, 30, 40, 50, and 60 yuan/item of CVM core questions are the bid values. According to the result, 100% of the non-negative WTP respondents choose those lower than 40 yuan/item, and 10, 25, and 30 yuan/item account for 82.61% of the total. Therefore, we narrow the range, increase the density of bid values, and adjust core valuation questions. It is determined that 10, 15, 20, 25, 30, 35, and 40 yuan/item of CVM core questions are the bid values. In addition, Numerical Certainty Scale (NCS) (ranging from 1 to

10) is attached to the key PC valuation questions, with 10 indicating “completely sure” while 1 “completely not sure”, so as to measure the certainty of respondents.

5.2.1.1.2 CEM questionnaire design

The design of proper attributes and levels is the first step of CEM survey. Through investigation to domestic and foreign research, and consultation with experts, 5 key factors in which patients show the greatest interest are defined as CEM attributes, including treatment frequency, accommodation capacity, service quality, medical service and price. Treatment frequency, accommodation capacity, service quality, and medical service are qualitative dummy variables, which are measured with “improve” or “remain”, so that respondents can better understand. Based on the pre-survey and the current prices, 0, 10, 20, 25, 35 yuan/item are set as the 5 levels on which prices can rise.

Table 5-8 Choice experiment attributes and levels

Attributes	Levels	Coding
Treatment frequency	Very frequent (>3 times /year)	0
	less frequent (<=3 times/ year)	1
Accommodation capacity	Not stable, not enough capacity during peaks hours	0
	Stable and enough capacity	1
Service quality	Sometimes failing to meet standards	0
	Always meeting standards	1
Medical service	Failing to deal with complaints in time and update medical information	0
	Dealing with complaints and updating medical information in time	1
Rise of price	0 yuan /item	Continuous variables
	10yuan/item	
	20yuan/item	
	25yuan/item	
	35yuan/item	

Note: * indicates current level.

Table 5-8 shows the levels and attributes of relevant variables. There are 6400 ($(2^4 * 5)^2$) types in total, which are gained through Full Factorial Design. Then, we design the questionnaire and conduct the research with Orthogonal Experimental Design (Louviere, 2000). As is presented in Table 5-9, there are 16 kinds of typical sets of combinations, which are derived from SPSS 19. Set 7, 8 and 13 are eliminated due to inconsistency with the reality;

set 1 represents the current level. Set 1 is the control group; a random combination of two sets constitutes 3 preference sets. The steps are as follows: (1) choose 66 preference sets, (2) eliminate inconsistent sets, and (3) decide 50 preference sets. Table 5-10 shows one of the examples of preference sets.

Table 5-9 Results of orthogonal experimental design

No	Treatment frequency	Accommodation capacity	Service quality	Medical service	Rise of price
1	0	0	0	0	0
2	1	1	1	0	15
3	0	0	1	1	25
4	1	1	0	0	25
5	1	0	0	0	15
6	1	0	1	1	20
7	1	1	1	1	0
8	1	0	0	1	0
9	0	0	1	0	10
10	1	0	1	0	10
11	1	1	0	1	10
12	0	1	0	0	20
13	0	1	1	0	0
14	0	1	0	1	10
15	0	0	0	1	15
16	0	1	1	1	15

5.2.2 Empirical model

5.2.2.1 CVM WTP valuation model

EWTP of CVM payment card is calculated through mathematical expectation of discrete variables:

$$EWTP = \sum_{i=1}^n M_i Pr_i \tag{5-31}$$

In formula (5-31), n refers to the choice set; M_i refers to bid value; Pr_i refers to the probability of choosing the bid value. SURE indicates the certain information of respondents, which is gained through NCS. Hence, two WTP valuation models for adjusting respondents' uncertainties are established.

Table 5-10 Example of choice set card presented to respondents

No	Plan 1	Plan 2	No improvement
Frequency of treatment	Very frequent (>3 times/year)	less frequent (<=3 times years)	Very frequent (>3times/year)
Accommodation capacity	Stable	Not enough during peak hour	Not enough during peak hours
Service quality	Guaranteed	guaranteed	Sometimes not guaranteed
Medical service	Not in time	Improved	Not in time
Rise of price	15 yuan/item	25 yuan/item	0
Your choice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

(1) CHAMP7 model. Champ (1997) suggested that definite answers are the main source of respondents' uncertainties. In order to minimize uncertainties, the critical value of SURE "yes" (value of certainty lower than C') will be recoded as "no". Based on the research by Ethier (2000), Moore (2010), and Donfouet (2013), we define "7" (in the NCS scale from 1 to 10) as the critical value C'. When the value equals or is higher than the critical value ($SURE \geq C' = 7$), and improvement of medical service is agreed, we will record it as "yes" ($Y=1$). When the value is lower than the critical value ($SURE < C' = 7$), "yes" will be recoded as "no" ($Y=0$).

(2) LM model. Respondents' uncertainties can be adjusted by weighting likelihood equation model (Li & Mattson, 1995). In order to adjust WTP valuation, NCS scale will be introduced to likelihood function as weight. This method has been practiced by Voltaire (2013) in payment card WTP valuation: respondents' certainty is calculated by WTP interval obtained by PC, and is used as weight to adjust WTP valuation. The coefficient weight falls between (0, 1], and will be introduced to PC-induced WTP valuation. The adjusted WTP valuation can be referred to as:

$$WTP_{Adj}^i = WTP_0^i \cdot (SURE_i / 10) \tag{5-32}$$

In formula (5-32), WTP_{Adj}^i , $SURE_i$ and WTP_0^i respectively represent: adjusted uncertain

WTP, certainty of respondents, and initial WTP.

5.2.2.2 Ordered probit regression model

WTP is ordered discrete data. PC-induced technology is adopted in CVM. Ordered probit regression is widely applied in discussing the influencing factors of WTP. The following formula are ordered Probit empirical models of influencing patients' WTP:

$$\begin{aligned}
 y_i^* = & \beta_1 \cdot CONCERN + \beta_2 \cdot ATTITUDE + \beta_3 \cdot TRUST + \beta_4 \cdot INOFR \\
 & + \beta_5 \cdot PQUA + \beta_6 \cdot PQUAN + \beta_7 \cdot PCAP + \beta_8 \cdot PPRI + \beta_9 \cdot PSER \\
 & + \beta_{10} \cdot SQUA + \beta_{11} \cdot SQUAN + \beta_{12} \cdot SCAP + \beta_{13} \cdot SPRI + \beta_{14} \cdot SSER \\
 & + \beta_{15} \cdot AGE + \beta_{16} \cdot GENDER + \beta_{17} \cdot INCOME + \beta_{18} \cdot EDU \\
 & + \beta_{19} \cdot CHILD + \varepsilon_i
 \end{aligned} \tag{5-33}$$

In formula (5-33), y_i^* is personal utility of respondent i , representing unobservable latent variable; CONCERN, ATTITUDE, TRUST, INOFR, PQUA, PQUAN, PCAP, PPRI, PSER, SQUA, SQUAN, SCAP, SPRI, SSER, AGE, GENDER, INCOME, EDU and *CHILD* are explanatory variables, which are related to the observable respondent i and choice; β is estimation coefficient; and ε_i is independently and identically distributed (IID) error.

5.2.2.3 Conditional logit model and random parameters logit model

U refers to the utility obtained by patient n 's selection of item i , which can be shown as:

$$\mathbf{U}_{in} (X_{in}, S_{in}) = \mathbf{V} (X_{in}, S_{in}) + \varepsilon (X_{in}) \tag{5-34}$$

$\mathbf{V}(\bullet)$ is the observable part of item i chosen by patient n ; in the utility function, the unobservable and random part is $\varepsilon(\bullet)$; X_{in} refers to the attributes of i chosen by patient n ; S_n refers to the socioeconomic features of patient n . Logit (Conditional Logit, or CL) model gives an estimation of the probability of patient n choosing i from choice set J .

$$\Pr(Y_i = n) = \exp \left[V(X_{in}) / \sum_{j=1}^J \exp \left[V(X_{jn}) \right] \right] \tag{5-35}$$

Suppose $\mathbf{V}(\bullet)$ obeys independent distribution and is a linear function, then CL model can be referred to as:

$$V_{jn} = ASC + \sum \beta_{jk} X_{jk} + \sum \phi_{jn} (S_n \cdot ASC) \tag{5-36}$$

Alternative Specific Constant (ASC) is a substitute constant term in formula (5-36); k , the attribute of choosing j , is referred to as X_{jk} ; socioeconomic features are described as S_n ; and coefficient vector of socioeconomic features is ϕ_{jn} . Independence of Irrelevant Alternative (IIA) of CL model will be invalid if there is preference heterogeneity. There will be deviation and

undermined observability for the valuation by CL model. Mixed Logit (MXL), or Random Parameter Logit (RPL), can overcome this drawback.

As the unobservable heterogeneity can be considered in RPL model, patients' utility function can be referred to as:

$$\mathbf{U}_{jn} = \mathbf{V}(X_n(\gamma + \delta_i)) + \varepsilon(X_n) \quad (5-37)$$

δ and γ in formula (6-7) are parameters that represent the correlation between options, random variation, and preference heterogeneity. The following formula is the probability function of patient n choosing item i from choice set J :

$$\Pr(\mathbf{Y}_i = n) = \exp[\mathbf{V}(X_n(\gamma + \delta_i))] / \sum_{j=1}^J \exp[\mathbf{V}(X_j(\gamma + \delta_i))] \quad (5-38)$$

Indirect utility equation considers the difference of respondents' preference on average, which can be referred to as:

$$\mathbf{V}_{jn} = \mathbf{ASC} + \sum \beta_{jk} X_{jk} + \sum t_{nk} X_{jk} + \sum \phi_{jn} (S_n \cdot \mathbf{ASC}) \quad (5-39)$$

Deviation parameter vector is referred to as t in formula (5-39). The two hypotheses are: β obeys normal distribution and t remains constant for all options.

The establishment of basic model and interactive model aims to analyze the factors that influence respondents' choice. Basic model only takes the influence of attributes into account while interactive model further examines the respondents' characteristics and attitude. In basic model, the utility of patient n choosing i can be referred to as:

$$\begin{aligned} \mathbf{V}_{in} = & \mathbf{ASC} + \beta_1 \mathit{FREQUENCY}_{in} + \beta_2 \mathit{CAPACITY}_{in} + \beta_3 \mathit{QUALITY}_{in} \\ & + \beta_4 \mathit{SERVICE}_{in} + \beta_5 \mathit{PRICE}_{in} \end{aligned} \quad (5-40)$$

ASC is a dummy variable in formula (5-40), representing current condition. ASC is 1 when the respondents choose plan 1 or 2; ASC is 0 when they choose "no improvement". The constant term of utility function is the same as ASC because of the following reasons: (1) orthogonal design is adopted in the experiment; (2) in terms of the form of utility function, plan 1 is the same as plan 2. The 5 attributes in the experiment are *FREQUENCY*, *CAPACITY*, *QUALITY*, *SERVICE* and *PRICE*. Indirect utility function involving attributes, other cognitive and attitude variables, as well as socioeconomic variables can be referred to as:

$$\begin{aligned}
V_{in} = & ASC + \beta_1 \cdot FREQUENCY_{in} + \beta_2 \cdot CAPACITY_{in} \\
& + \beta_3 \cdot QUALITY_{in} + \beta_4 \cdot SERVICE_{in} + \beta_5 \cdot PRICE_{in} \\
& + ASC \cdot CONCERN + ASC \cdot TRUST + ASC \cdot ATTITUDE \\
& + ASC \cdot INFOR + ASC \cdot GENDER + ASC \cdot CHILD \\
& + ASC \cdot AGE + ASC \cdot EDU + ASC \cdot INC
\end{aligned} \tag{5-41}$$

It is difficult to evaluate directly with formula (5-41), as any respondent is the same for every socioeconomic variable in each choice set. To measure the influence of socioeconomic variables on respondents' choice, an interactive approach involving ASC can be adopted.

5.2.3 Data collection and sample description

5.2.3.1 Data collection

On the premise of a pre-survey and an improved questionnaire sample in November 2018, the questionnaire survey was conducted from December 2018 to January 2019. Patients in Nanning were surveyed through a professional online survey platform (www.wjx.cn). 453 questionnaires were collected. Among them, 402 are considered as valid, accounting for 88.74% of the total, while 51 are invalid. CEM should be conducted with 200 to 400 questionnaires as samples (Ndunda, 2013) and CVM should be conducted with 300 to 400 (Sun & Kooten, 2009; Arouna & Dabbert, 2012). Hence, the quantity of our samples meets the above-mentioned requirements.

5.2.3.2 Sample description

In terms of gender structure, male and female respondents account for 46.02% and 55.98% respectively of the valid samples. In terms of age composition, those aged 20 or below account for 4.73%; from 21 to 30, 58.71%; from 31 to 40, 25.87%; from 41 to 50, 5.72%; from 51 to 60, 3.23%; 60 or above, 1.74%. In terms of education background, those who have received secondary school education or below account for 2.24%; high school or secondary vocational school education, 8.46%; advanced vocational school education, 21.89%; those who have a bachelor degree account for 46.27%; master degree, 17.16%; doctor degree, 3.98%. In terms of monthly income, those with 3000 yuan or below account for 20.40%; from 3001 to 6000, 33.33%; from 6001 to 10000 yuan, 30.85%; from 10001 to 20000 yuan, 13.68%; above 20000 yuan, 1.745%. In terms of family structure, 44.53% of the families have at least one child aged 13 or below, while 55.47% have no children.

Table 5-11 Summary statistics of variables

Variables	Mean	Std. deviation	Maximum	Minimum
SURE	8.216	2.060	1	10
CONCERN	4.052	2.46	1	10
ATTITUDE	0.779	0.416	0	1
TRUST	3.296	0.890	1	5
INFOR	2.833	1.040	1	5
PQUA	4.756	0.595	1	5
PQUAN	4.189	0.684	1	5
PCAP	4.040	0.753	1	5
PPRI	4.239	0.762	1	5
PSER	4.005	0.793	1	5
SQUA	3.313	0.874	1	5
SQUAN	3.751	0.687	1	5
SCAP	3.647	0.740	1	5
SPRI	3.278	0.875	1	5
SSER	3.341	0.774	1	5
N			402	

Table 5-11 presents the summary statistics of variables. The mean of SURE is 8.22, indicating that the respondents feel extremely certain about answering questionnaire. The mean of CONCERN is 4.05, indicating that most of the respondents are concerned about medical institutions. 77.9% of the respondents are in favor of the improvement of medical service. The mean of TRUST is 3.30, suggesting the respondents' lack of trust in medical institutions. Medical information is little accessed by patients, as indicated by the mean of INFOR 2.83. The most important attributes of medical service are quality and price, with the mean of 4.76 and 4.24 respectively. The mean of perception towards medical service is 4.01, which means that medical service is the least important to the respondents. The mean of SQUAN is 3.75, indicating that the respondents are most satisfied with the treatment frequency. However, the mean of SQUA is 3.31, indicating the respondents' dissatisfaction with the service quality. Patients are least satisfactory with price, with the mean of 3.28.

5.2.3.3 Analysis of CVM results of adjusted respondents' uncertainties

It can be observed from the sample analysis that 68.16% of the respondents are willing to accept certain rise in price for medical service improvement; 28.36% refuse the rise; and 3.48% choose "not sure". Then, we continue to ask the respondents who are not willing to pay

for special reasons. 13.16% choose “The current medical conditions are so good that they do not need further improvement”; 47.34% choose “Despite support for medical service improvement, I don’t have enough money to pay”; 31.58% choose “It’s only the responsibility of governments and medical institutions, not mine”; and 7.9% choose “Other reasons”.

5.2.3.4 Valuation analysis of average WTP

Figure 5-6 shows the distribution of WTP for medical service improvement, which is based on CVM survey. A rise of 10 yuan/item is accepted by 38.66% of the respondents. It is found that a rise of 10 to 25 yuan/item is mostly accepted.

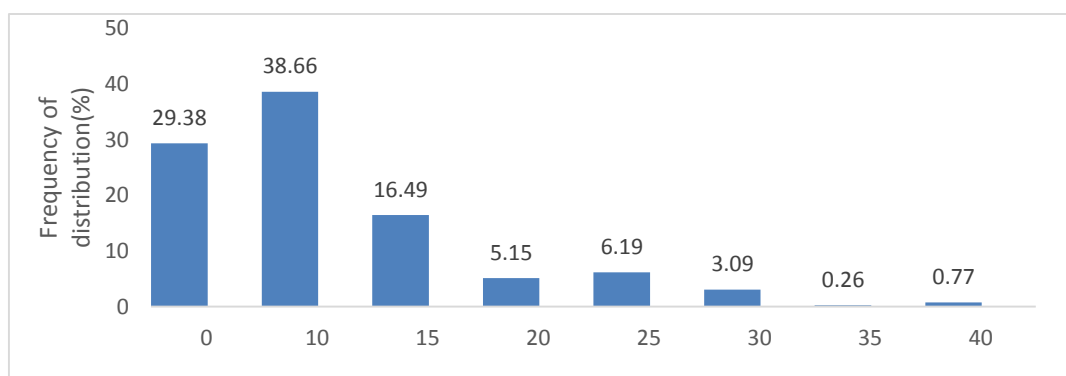


Figure 5-6 Probability distribution of respondents' WTP

The average WTP for medical service improvement is evaluated via the aforementioned methods. CHAMP7 model and LM model are adopted respectively to adjust respondents' uncertainties.

Table 5-12 Mean WTP with corresponding confidence intervals

	Basic model	CHAMP7 model	LM model
Mean WTP	13 yuan/ item	12 yuan/ item	11 yuan/ item
Std. deviation	0.0351	0.0367	0.0327
95% C.I.	12-14 yuan/ item	11-13 yuan/ item	10-12 yuan/ item
EFWTP	0.2066	0.2566	0.2335

Table 5-12 shows the valuation of the three models. Bootstrapping Method is widely adopted in current research (Krinsky & Robb, 1986). Dichotomous CVM Logit regression parameter estimation is the most frequently applied simulation technique by Krinsky & Robb (1986). To evaluate the confidence interval of respondents' WTP, the second method is applied and sampling with 1000-times replication is carried out. The mean WTP confidence

interval (95%) is calculated using these three methods, which is presented in Table 6-8. The evaluation of the valuation of the models is obtained from the calculation of WTP valuation efficiency ($EFWTP = (CI_U - CI_L) / \text{mean WTP}$).

According to Table 5-12, 13 yuan/item is the mean WTP for medical service improvement. This result is based on traditional CVM basic model. However, with the adjustment by CHAMP7 model and LM model, 12 yuan/item and 11 yuan/item are only accepted, indicating a low WTP level. The valuation efficiency of CHAMP7 model and of LM model, 0.2566 and 0.2335 respectively, are higher than that of basic model.

5.2.3.5 Analysis of factors influencing WTP

WTP basic regression mode, SUREcov model, CHAMP7 model and LM model are regression models used to valuate patients' WTP for medical service improvement. Probit regression is applied in WTP regression model, SUREcov model and CHAMP7 model, while OLS regression is applied in LM model. The valuation results are shown in Table 6-9. Appendix III is sum of STATA calculation command.

5.2.3.6 WTP regression model

Table 5-13 presents the following characteristics: four models exhibit good performance in degree of fitting, with the highest value of PseudoR² in LM model, which can be attributed to OLS regression. Among the three ordered Probit regression models, the degree of fitting increases with the introduction of explanatory variables. Patients' WTP is influenced by SURE. SUREcov model is the most explanatory one. Among patients' perception and attitude toward medical service, variables of CONCERN, ATTITUDE, PPRI, INFOR and SPRI show significant correlation, and are reflected in the four regression models. Variables of PQUAN, PPRE, PSER, SQUA, SQUAN, SCAP, and SSER do not show significant correlation, indicating that medical service, quantity, and accommodation capacity are not influential. The analysis is shown as follows.

(1) Patients' WTP value increases as more attention is paid to medical institutions, as can be seen from the significant positive correlation between CONCERN and WTP.

(2) Patients' WTP value increases as more support is provided for medical service improvement, as can be seen from the significant positive correlation between ATTITUDE and WTP.

(3) Patients' WTP value increases with more medical information, as can be seen from the significant positive correlation between INFOR and WTP.

Table 5-13 WTP regression model

Variables	Basic model		SUREcov model		CHAMP7 model		LM model	
	Coefficient	Std.deviation	Coefficient	Std.deviation	Coefficient	Std.deviation	Coefficient	Std.deviation
SURE			-0.1621***	-0.0068				
CONCER	-0.0690***	0.0258	-0.0751***	0.0258	0.1172	0.0254	-0.0222**	0.0115
ATTITUD	0.6665***	0.1730	0.7140***	0.1734	0.7035***	0.1839	0.2408***	0.0738
TRUST	0.2523**	0.0894	0.2193**	0.1017	0.1134	0.1000	0.0491	0.0541
INFOR	0.1013*	0.0693	0.1530**	0.0712	0.1757**	0.0707	0.0711**	0.0351
PQUA	0.2161*	0.1168	0.2575**	0.1167	0.2151*	0.1279	0.0577	0.0450
PQUAN	0.1580	0.1362	0.1411	0.1428	0.1213	0.1510	0.1164	0.0777
PCAP	-0.2288	0.1179	-0.2004	0.1194	-0.1432	0.1310	-0.0607	0.0606
PPRI	-0.3930***	0.0970	-0.3945***	0.0996	-0.4014***	0.1002	-0.1670***	0.0510
PESR	0.0513	0.0864	0.0406	0.0872	0.0350	0.0893	0.0030	0.0468
SQUA	0.0531	0.0865	0.0859	0.0870	0.1313	0.0889	0.0698	0.0405
SQUAN	-0.0421	0.1199	-0.0293	0.1239	-0.0611	0.1314	-0.0139	0.0618
SCAP	0.0949	0.1288	0.1112	0.1295	0.1379	0.1350	0.0808	0.0680
SPRI	0.1862**	0.0896	0.2148*	0.0906	0.1741*	0.0914	0.0795*	0.0408
SPER	-0.1511	0.1138	-0.1487	0.1172C	-0.1066	0.1210	-0.0807	0.1688
CENDER	-0.0766	0.1146	-0.0068	0.1172	0.0304	0.1199	0.0001	0.0580
CHILD	0.4813***	0.1363	0.4362***	0.1383	0.3055**	0.1423	0.1697***	0.0573
AGE1	-0.1858	0.1974	-0.1883	0.2169	-0.0687	0.2898	-0.1403	0.1466
AGE2	-0.6339**	0.2171	-0.6248**	0.0237	-0.4653	0.3126	-0.3085**	0.1499

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AGE3	-0.6703**	0.2783	-0.6543**	0.3188	-0.5254	0.3679	-0.3573**	0.1688
INC1	-0.7799**	0.2213	-0.9006**	0.2302	-0.9973***	0.2271	-0.4247**	0.1239
INC2	-0.8178**	0.1925	-0.9005*	0.1940	-0.9633***	0.1866	-0.4676**	0.1076
INC3	-0.5217**	0.1849	-0.5252**	0.1848	-0.6082***	0.1771	-0.3381**	0.1157
EDU1	-0.3271*	0.1676	-0.2812*	0.1663	-0.1655	0.1771	0.0899	0.0789
EDU2	-0.1777	0.1592	-0.1176	0.1622	0.0166	0.1626	0.0825	0.0826
Log-likelihood	500.4***		-485.62**		-478.266**			
Wald chi ²	202.02							
			215.85		202.14			
Pseudo R ²	0.1459		0.1711		0.1477		0.3236	
F-statistic							9.63	
Observation	388		388		388		388	

Note: *, ** and *** represent that statistical test reaches the significance level of 10%, 5%, and 1% respectively. GENDER: male=1, female=0; CHILD: child=1, childless=0; AGE1: 30 or below; AGE2: 31-40; AGE3: 41-50; AGE4: 50 or above; INC1: 3,000 yuan or below; INC2: 3,001-6,001 yuan; INC3: 6,001-10,000 yuan; INC4: 10,000 yuan or above; EDU1: advanced vocational school or below; EDU2: bachelor; EDU3: master and doctor.

(4) Patients' WTP value decreases as more emphasis is laid on price, as can be seen from the significant negative correlation between PPRI and WTP.

(5) Patients' WTP value increases with growing satisfaction with the price, as can be seen from the significant positive correlation between SPRI and WTP.

(6) SURE shows significant negative correlation, and the degree of fitting of SUREcov model is higher than that of basic model, indicating that WTP is influenced mostly by certainties (the more certain patients are, the lower WTP value is).

(7) Families with children have a significantly higher WTP for medical service improvement, as can be seen from the significant positive correlation of CHILD in the four models.

(8) Patients with a monthly income of less than 10,000 yuan show significantly less WTP than those with more than 10,000 yuan, as can be seen from the significant negative correlations between INC1, INC2, and INC3 and WTP.

(9) The AGE2 and AGE3 variables show significant negative correlation in the basic model, SUREcov model, and LM model, indicating that patients aged 31 to 40 and 41 to 50 have significantly less WTP than those over the age of 50; patients under the age of 30 show no significant difference.

(10) In basic model and SUREcov model, WTP value increases as more trust is placed in governments and medical institutions, as can be seen from the significant positive correlation of TRUST. The influence of TRUST is not significant in CHAMP7 model or LM model, which means that the respondents' certainties are closely related to their trust in medical institutions.

5.2.3.7 Marginal analysis of ordered probit model

Ordered probit model parameter estimation can identify WTP preference, but cannot give a comprehensive qualitative explanation. Marginal utility of each variable needs to be calculated after parameter estimation. Table 5-15 shows the marginal effect of the significant variables in SUREcov model. As Pseudo R^2 is the highest in SUREcov model, contributing to the best degree of fitting, this model is used as an example.

It can be seen from Table 5-14 that

(1) SURE indicates that the more certain the patients, the less willingness they will pay (WTP = 0 or 10 yuan/item).

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Table 5-14 Marginal effects from the variable on WTP

Variables	WTP=0	WTP=10	WTP=15	WTP=20	WTP=25	WTP=30	WTP=35	WTP=40
SURE	-0.0407	0.0017	-0.0135	-0.0067	-0.0107	-0.0069	-0.0007	-0.0040
CONCERN	0.0189	0.0008	-0.0063	-0.0031	-0.0049	-0.0002	-0.0003	-0.0019
ATTITUDE	-0.1795	-0.0075	0.0595	0.0296	0.0469	0.0302	0.0030	0.0178
TRUST	-0.0551	-0.0023	0.0183	0.0091	0.0144	0.0093	0.0009	0.0055
INFOR	-0.0385	-0.0016	0.0127	0.0063	0.0101	0.0005	0.0006	0.0038
PQUA	-0.0647	-0.0027	0.0215	0.0107	0.0169	0.0109	0.0011	0.0064
PPRI	0.0092	0.0042	-0.0329	-0.0163	-0.0259	-0.0167	-0.0017	-0.0098
SPRI	-0.0540	-0.0023	0.0179	0.0089	0.0141	0.0091	0.0009	0.0054
CHILD	-0.1096	-0.0046	0.0363	0.0181	0.0287	0.0185	0.0018	0.0109
AGE1	0.0473	0.0020	-0.0157	-0.0078	-0.0124	-0.0080	-0.0008	-0.0047
AGE2	0.1570	0.0066	-0.0520	-0.0259	-0.0411	-0.0264	-0.0026	-0.0156
AGE3	-0.1645	0.0069	-0.0545	-0.0271	-0.0430	-0.0277	0.0028	-0.0163
INC1	-0.2264	0.0095	-0.0750	-0.0373	-0.0592	-0.0381	-0.0038	-0.0225
INC2	-0.2263	0.0095	-0.0750	-0.0373	-0.0592	-0.0381	-0.0038	-0.0225
INC3	-0.1320	0.0056	-0.0437	-0.0217	-0.0345	-0.0222	-0.0022	-0.0131
EDUQ	-0.0707	0.0030	-0.0234	-0.0116	-0.0185	-0.0119	-0.0012	-0.0070
EDU2	-0.0296	0.0012	-0.0098	-0.0049	-0.0077	-0.0050	-0.0005	-0.0029

Note: *, ** and *** represent that statistical test reaches the significance level of 10%, 5%, and 1% respectively.

(2) When $WTP = 0$, or when patients are only willing to pay 10 yuan/item, the less concerned they are about medical institutions, the higher CONCERN value is; when the marginal effect is concerned, SURE is stronger than CONCERN.

(3) In the WTP range from 15 to 40 yuan/item, ATTITUDE shows a significant positive marginal effect, which is maximized when WTP is 15 yuan/item.

(4) In the WTP range from 15 to 40 yuan/item, TRUST, INFOR, PQUA and SPRI have significant positive marginal effects, which are maximum when WTP is 15 yuan/item.

(5) PPRI shows its marginal effect. Patients who are not willing or less willing to pay for medical service improvement care much about the price.

(6) For families with children, CHILD shows significant positive marginal effect, which is maximized when WTP is 15 yuan/item.

(7) When WTP is 10 yuan/item, INC1, INC2 and INC3 have a more significant positive effect on patients with a monthly income between 6,001 to 10,000, 3,001 to 6000, or lower than 3,000 yuan than those with 10,000 yuan.

(8) The marginal effect of AGE2 indicates that those aged 31 to 40 are less inclined to accept medical service improvement than those over 50; when WTP is 0, the effect is the maximum. The marginal effect on patient aged 41 to 50 is maximized when WTP is 10 yuan/item.

(9) EDU1 only has a more significant positive effect on patients who have received advanced vocational school education or below when WTP is 10 yuan/item, compared with those who have received postgraduate education.

5.2.3.8 Analysis of source of respondents' uncertainties

Ordered probit regression model of respondents' uncertainties and analysis of their main source indicate that BID and BID2 show significant positive and negative correlation respectively with respondents' certainty degree. This is shown in Table 5-15. The correlation between WTP and certainty is shown via a "U-shaped curve".

Table 5-15 presents the regression results:

(1) CONCERN shows significant negative correlation, which means that the more concerned the respondents are to medical institutions, the less certain they are.

(2) INFOR shows significant positive correlation, which means that the more certain the respondents are, the more they know about medical institutions.

Table 5-15 Ordered probit model results for respondents' uncertainty

Variables	SURE	
	Coefficient	Std. deviation
BID	-2.430***	0.2533
BID ²	0.8888***	0.1038
CONCERN	-0.0468**	0.0233
INFOR	0.1969***	0.0636
ATTITUDE	-1.6098***	0.5945
TRUST	0.3980**	0.1581
ATTITUDE*TRUST	0.5827***	0.1819
GEENDER	0.2511**	0.1218
AGE2	-0.0607	0.1471
AGE3	0.1725	0.3289
AGE4	0.0200	0.5578
INC2	0.0922	0.1720
INC3	0.3962**	0.1877
INC4	0.2341	0.2304
EDU2	0.0451	0.1440
EUD3	-0.0674	0.1729
Log likelihood		-603.92***
Wald Chi2		129.55
Pseudo R ²		0.0881

Note: *, ** and *** represent that statistical test reaches the significance level of 10%, 5%, and 1% respectively. GENDER: male=1, female=0; CHILD: child=1, childless=0; AGE1: 30 or below; AGE2: 31-40; AGE3: 41-50; AGE4: 50 or above; INC1: 3,000 yuan or below; INC2: 3,001-6,001 yuan; INC3: 6,001-10,000 yuan; INC4: 10,000 yuan or above; EDU1: advanced vocational school or below; EDU2: bachelor; EDU3: master and doctor.

(3) The more supportive the respondents are of medical service improvement, the less certain they are, as ATTITUDE shows significant negative correlation.

(4) TRUST shows significant positive correlation, which means that the more trust the respondents put in medical institutions, the more certain they are.

(5) The more supportive the respondents are of medical service improvement, the more trust they put in medical institutions and the more certain they are, as can be explained by the

significant positive correlation between ATTITUDE*TRUST and certainty.

(6) Male respondents are more certain than female, as can be explained by the significant positive correlation between GENDER and certainty.

(7) The respondents with a monthly income ranging from 6,001 to 10,000 yuan are more certain than those lower than 3,000 yuan; compared with those lower than 3,000 yuan, the patients who are in other income ranges do not show significant difference in certainty. This can be explained by the significant positive correlation between INC3 and certainty.

(8) The respondents' age and education background are significantly correlated to certainty.

5.2.4 Analysis results of CEM

Conditional Logit (CL) model and Random Parameter Logit (RPL) model are applied in this study to analyze the results of CEM. Data is processed by STATA11 software. 388 valid samples are selected from CVM analysis to compare the results of CEM and contingent valuation method. There are 50 selection sets in this experiment, with 3 options per selection set and an observation of 58200 ($388*50*3$) pieces. Relevant information is shown in Schedule III.

5.2.4.1 Valuation results of the Conditional Logit model

The valuation results calculated by Conditional Logit model are shown in Table 5-18. The model is significant at the 1% level, which can be observed in the χ^2 statistical distribution. The Pseudo- R^2 values are 0.2069 and 0.2440 in the basic model and the interactive model respectively. The scientific rationality of Hensher's (1981) questionnaire design and model setting is reflected in the statistical value of Pseudo- R^2 , which is reasonable between 0.2 and 0.4. According to the degree of fitting and likelihood ratio, the interpretation of interactive model is stronger than that of the basic model.

The regression results in Table 5-16 show:

(1) The following five attribute variables, namely treatment frequency, accommodation capacity, quality of service, medical service, and price increase, are statistically significant at the 1% level. There are four attributes with positive regression coefficient: treatment frequency, accommodation capacity, quality of service, and medical service. Price increase features negative regression coefficient. The results of CL model are consistent with the actual situation, that is, treatment frequency is lower, accommodation capacity is stable, quality of

service is acceptable, and the price increase is lower, which are all in the interests of patients.

Table 5-16 Parameter estimates of Conditional Logit model

Variables	Basic model		Interaction model	
	Coefficient	Std. Err	Coefficient	Std. Err
FREQUENCY	0.1844***	0.0234	0.1945***	0.0236
CAPACITY	0.6865***	0.0250	0.7085***	0.0252
QUALITY	1.6648***	0.0273	1.7090***	0.0279
SERVICE	0.2734***	0.0236	0.3201***	0.0239
PRICE	-0.7171***	0.0219	-0.7708***	0.0223
ASC	0.4010***	0.0390	-1.3267***	0.2133
ASC*CONCERN			-0.0515***	0.0092
ASC*ATTRITUDE			0.8130***	0.0533
ASC*TRUST			0.2746***	0.0304
ASC*INFOR			0.8133***	0.0274
ASC*GENDER			-0.3342***	0.0447
ASC*CHILD			-0.0872	0.0539
ASC*AGE1			-0.3814**	0.1922
ASC*AGE2			0.1828	0.1959
ASC*AGE3			-0.2493	0.203
ASC*EDU1			0.4449***	0.0643
ASC*EDU2			0.1944***	0.0612
ASC*INC1			0.0611	0.0967
ASC*INC2			-0.2837***	0.0859
ASC*INC3			-0.5724***	0.0818
Log-likelihood	-16903.36*		-16112.01***	
	**			
Wald chi ²	6685.78		7403.68	
Pesudo-R ²	0,2069		0.2440	
Observation	58022		58200	

Note: *, ** and *** represent the significant levels of 10%, 5% and 1% respectively; GENDER: Male = 1, Female = 0; CHILD: Yes = 1, No = 0; AGE1: ≤ 30 years old; AGE2: 31-40 years old; AGE3: 41-50 years old; AGE4: ≥ 50 years old; INC1: ≤ 3,000 yuan; INC2: 3,001-6,000 yuan; INC3: 6,001-10,000 yuan; INC4: ≥ 10,000 yuan; EDU1: junior college or lower; EDU2: bachelor degree; EDU3: master degree and PHD.

(2) The regression coefficient of the CONCERN and ASC interactive terms is negative in the interactive model, and the statistical test is significant at the 1% level. It can be observed that the more patients pay attention to medical institutions, the greater the probability of improvement in medical services. The statistical tests of the interactive terms of ASC and ATTITUDE, TRUST, INFOR are all significant at the 1% level, and the regression coefficient is also positive. It can be observed that when the patients show more support to medical service improvement, put more trust in medical institutions, and understand medical information better, the trend of improving medical services is clearer.

(3) From the perspective of social and economic variables, the regression coefficient of the GENDER and ASC interactive terms is negative, and the statistical test is significant at the 1% level, showing that women have a higher preference for improving medical services than men. The regression coefficient is negative, and the statistical test of the ASC and AGE1 interactive terms is significant at the 5% level. It can be observed that patients under the age of 30 are more reluctant to choose to improve medical services than patients over the age of 50. According to the interactive terms of ASC and income level, compared with the patients with monthly income of 10,000 yuan, the patients whose monthly income level is within the range of 3001 yuan to 6000 yuan and 6 001 yuan to 10,000 yuan have significantly lower probability in the choice of improving medical service items. From the perspective of education level, the probability of choosing to improve medical services among patients with bachelor degree, junior college or lower degrees is higher than that among patients with master degrees.

We need to perform IIA hypothesis testing on the CL model because the Logit model may result in invalid valuation results due to the constraint of IIA assumptions. The Hausman method and the Small-Hsiao method are more commonly used in IIA hypothesis testing. The approach of the testing is as follows. The condition that the IIA hypothesis satisfies is that after comparing the model of full option and excluding the constraint model of a certain option, the valuated parameter values of the two models are very close. The results tested by the Hausman are all Prob < 0.001. If one of the attribute variables is excluded, all four models reject previous assumptions. This shows that the IIA assumption holds the valuation results of the CL model, because there is no significant coefficient relationship between the attribute variables.

5.2.4.2 Valuation results of the Random Parameter Logit (RPL) model

The manifestation of the preferences' random variation and the overcoming of the IIA

hypothesis constraint are the advantages of RPL model. To analyze patients' demand preferences for improving medical services, we also use RPL model. We set the treatment frequency, accommodation capacity, quality of service, and medical services as random variables that follow normal distribution, and the price increase as a non-random fixed variable. Table 5-17 lists the basic RPL model, and an interactive RPL model that fuses other variables with ASC interactions. Since $P < 0.001$, the statistical test of the regression results is therefore very significant in both the basic RPL model and the interactive RPL model. Of course, the interpretation of the interaction model is stronger than that of the basic model, which can be observed from the comparison of Log-likelihood. Comparing the regression results of the four models in Table 5-17, we can observe that the interpretation of the RPL model is stronger than that of the CL model.

Table 5-17 Parameter estimates of RPL model

Variable	Basic model		Interaction model	
	Coefficient	Std. Err.	Coefficient	Std. Err.
Mean effect				
FERQUENCY	0.2691***	0.0640	0.2177***	0.0606
CAPACITY	1.1045***	0.0622	1.0515***	0.0586
QUALITY	2.8025***	0.1131	2.7697***	0.1058
SERVICE	0.2133***	0.0827	0.3360***	0.0468
PRICE	-1.2000***	0.0288	-1.1887***	0.0287
ASC	0.9726***	0.0498	-1.2693***	0.3559
ASC*CONCERN			-0.0340***	0.0172
ASC*ATTITUDE			0.4280***	0.0901
ASC*TRUST			0.2573***	0.0455
ASC*INFOR			0.1407***	0.0455
ASC*GENDER			-0.4441***	0.0842
ASC*CHILD			-0.2978	0.0993
ASC*AGE1			-0.9479***	0.2846
ASC*AGE2			-0.7506***	0.2876
ASC*AGE3			0.3558	0.3047
ASC*EDU1			0.6674***	0.1253
ASC*EDU2			0.7497***	0.1111
ASC*INC1			-0.2816***	0.1472
ASC*IINC2			-0.5897***	0.1332

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ASC*INC3			-0.9667***	0.1282
Standard deviation effects				
OUTAGE	1.1872***	0.0562	1.0083***	0.0444
PRESSURE	1.021***	0.0544	0.9478***	0.0560
QUALITY	2.8350***	0.1118	2.1622***	0.0654
SERVICE	1.5601***	0.0661	1.2186***	0.0449
Log-likelihood		-12432.68***		-12333.84***
LA Chi ²		8359.63		7556.33
Observations		58200		58200

Note: *, ** and *** represent the significant levels of 10%, 5% and 1% respectively; GENDER: Male = 1, Female = 0; CHILD: Yes = 1, No = 0; AGE1: ≤ 30 years old; AGE2: 31-40 years old; AGE3: 41-50 years old; AGE4: ≥ 50 years old; INC1: ≤ 3,000 yuan; INC2: 3,001-6,000 yuan; INC3: 6,001-10,000 yuan; INC4: ≥ 10,000 yuan; EDU1: junior college or lower; EDU2: bachelor degree; EDU3: master degree and PHD.

A regression analysis of the RPL model in Table 5-17:

(1) Accommodation capacity, treatment frequency, service quality and medical service are with positive regression coefficient and statistically significant at the 1% level; price increase is with negative regression coefficient and statistically significant at the 1% level. The valuation results are consistent in both the RPL model and the CL model. In addition, there is preference heterogeneity among respondents because the standard deviations of the four randomly distributed attribute variables are all significant at the 1% level.

(2) The regression analysis of the RPL interaction model are basically consistent with that of the C interaction model. The more patients are concerned about medical institutions, the more they support improving medical services. This can be inferred from the 1% level of significance between CONCERN and ASC interactive terms, and the negative regression coefficient. When the patients show more support to medical service improvement, put more trust in medical institutions, and understand medical information better, they are more likely to prefer improving medical services, which can be inferred from the results that the statistical tests of the interactive terms of ASC and TRUST, INFOR, ATTITUDE are all significant at the 1% level and the regression coefficients are positive.

Among the interactive items with social and economic characteristics, patients under the age of 40 are reluctant to improve medical services, but patients of 41-50 years old and above are more willing to improve medical services, which can be inferred from the fact that the interactive terms of ASC and AGE1, AGE2 are significant at the 1% level. In addition,

patients with monthly incomes below 10,000 yuan have a significantly lower probability of improving medical services than patients with monthly incomes above 10,000 yuan, which can be seen from the fact that the interactive terms of ASC and INC1, INC2, INC3 are significant at the 1% level and the coefficient is negative. In terms of education level, patients with bachelor degree, junior college or lower degrees have higher probability of improving medical service, but the probability among patients with master degrees is not high enough. This can be inferred from the fact that the interactive terms of ASC and EDU1, EDU2 are significant at the 1% level and the coefficient is positive.

5.2.4.3 Implicit value and compensating surplus

5.2.4.3.1 Implicit value

Table 5-18 Implicit price and confidence intervals (unit: RMB/U)

Attribute	CL Model		RPL Model	
	Average WTP	95% CI	Average WTP	95% CI
Treatment Frequency	5	3-7	4	2-5
Accommodation Capacity	13	11-17	12	11-13
Quality of Service	28	26-29	27	25-29
Medical Service	6	5-8	4	2-5

We use the interaction model of CL model and RPL model to evaluate the economic value, because the interpretation of interaction model is stronger than the basic model. The implicit value for the relevant attributes is estimated by equation (2-16), and the confidence interval (95% C.I.) for the implicit price can be analyzed by Bootstrapping. Table 5-18 lists the implicit prices for the four attributes:

Taking the RPL model as an example, 4 yuan/item is the willingness of the patient to reduce the treatment frequency, that is, in order to reduce the frequency of sudden illness, the unit price increase that the patient is willing to accept is 4 yuan/item. 12 yuan/item is the WTP for patients to improve the stability of accommodation capacity, that is, in order to achieve enough and stable accommodation capacity, patients accept a price increase of 12 yuan/item. 27 yuan/item is the WTP for patients to improve the quality of service, that is, in order to ensure the quality of medical care, patients are willing to accept the price increase of 27 yuan/item. 4 yuan/item is the WTP for patients to improve medical services, that is, in order

to obtain timely and comprehensive medical-related information and to improve the efficiency of complaint handling for medical services, patients are willing to accept a price increase of 4 yuan/item.

5.2.4.3.2 Compensating surplus

This study regards patient's WTP for different options relative to the current level of status as compensating surplus. The calculations are based on equation (2-17). The Delta method is used to estimate the average WTP and WTP 95% confidence intervals. In the case of large differences, Table 5-19 shows the application of the compensating surplus and confidence intervals in the CL interaction model and the RPL interaction model. During the experiment, the two levels, improvement and status quo, are set in four attribute variables. Therefore, after one of the attributes in 1-4 scenarios is improved, the implied value of the attribute change corresponds to the compensating surplus of 1-4 scenarios. Scenario 5 is the best plan, in which the treatment frequency, accommodation capacity, service quality and medical service are improved at the same time. 38 yuan/item is what patients are willing to pay for the best plan according to the RPL model.

Table 5-19 Compensating surplus for five possible scenarios in RMB/U

Possible Scenarios	Attribute				Compensating Surplus(95% C.I.)	
	Frequency	Capacity	Quality	Service	CL Model	RPL Model
Scenarios1	Improved	Status Quo	Status Quo	Status Quo	5 (3-7)	4 (2-5)
Scenarios2	Status Quo	Improved	Status Quo	Status Quo	13 (11-17)	12 (11-13)
Scenarios3	Status Quo	Status Quo	Improved	Status Quo	28 (26-29)	27 (25-29)
Scenarios4	Status Quo	Status Quo	Status Quo	Improved	6 (5-8)	4 (2-5)
Scenarios5	Improved	Improved	Improved	Improved	37 (35-41)	38 (36-43)

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Chapter 6: Conclusions and Suggestions

Based on the above analysis and research, this study proposes the design framework of incentive mechanism for medical service improvement. First, establish a stakeholder engagement mechanism for medical services; second, build a regulatory and incentive mechanism for supply-side stakeholders, including dynamic price adjustment mechanism (adapted to the cost of medical services), punishment mechanism (matching the size of medical institutions), reward mechanism (based on performance assessment of medical service); then, build the cost-sharing incentive mechanism of the demand side, including information communication mechanism (public medical information disclosure), public participation mechanism (path to participate in medical service supply) and demand subsidy mechanism (low-income groups).

First, based on the overall research of medical service stakeholders, the classification of different stakeholders and the analysis of contradiction between them, we build a stakeholder participation mechanism for medical services. The aim is to coordinate the relevant strategies of demand-side stakeholders, coordinate the relevant strategies of the suppliers and stimulate stakeholder participation in the supply of medical services, so as to build an incentive mechanism in which coordination of main stakeholders is the core and the secondary stakeholders' participation serves as the aid.

Second, based on empirical research on the supply-side stakeholders of medical services, the three methods of fines, financial allocations and prices should be considered to improve the effective use of incentive mechanisms for key stakeholders in the supply of medical services. By optimizing relevant policies, we should conciliate conflicts between local government authorities and medical institutions in the supply of medical services. When we consider the price adjustment, the patients' ability to pay should also be considered, and the proposal of incentive mechanism for local government departments should also be actively coordinated by medical institutions and scientific research institutions.

Third, previous studies show that patients are willing to bear certain costs to improve medical services. Therefore, a cost-sharing mechanism for demand-side stakeholders should be built according to the relevant factors affecting patient payment, which is conducive to pushing forward the formation of an incentive policy for patients to promote medical service

improvement. A public participation mechanism with media support and non-governmental organizations' (hereinafter referred to as NGO) cooperation and a subsidy mechanism for low-income groups should be built to increase the patient's WTP. In addition, it can also accelerate medical service upgrading by stimulating supply-side key stakeholders from the demand side.

6.1 Stakeholder engagement mechanism for medical services

The construction of the stakeholder engagement mechanism needs to follow the following principles:

First, the implementation of the incentive mechanism requires the active guidance of government departments; second, under the premise of supervising medical institutions, medical institutions are encouraged to proactively apply the incentive mechanism; third, push forward the establishment of a mechanism in which medical services are shared by patients; fourth, promote the active cooperation of scientific research institutions and media to improve medical services; fifth, give full play to the communication and coordination capabilities of NGOs and local communities.

6.1.1 Coordinate acting strategies among medical institutions, government departments and pharmaceutical companies

It is recommended that local governments take full responsibility for medical services within their respective administrative areas and build relatively independent medical institutions. The reform covers both vertical and horizontal measures: vertically, powers and responsibilities must be effectively distributed among central government and local governments; horizontally, functions should be clearly separated from other government departments to medical authorities. The medical service regulation system should also be reformed. China's economic regulation of medical institutions is not flexible enough, and the main supervisory means are administrative orders and approvals. Incentives should be updated according to the characteristics of medical industry, and government departments should focus on solving the problem of information asymmetry in medical service supervision and the cost-benefit problem of government departments when supervising law enforcement.

6.1.2 Continue to improve regulation over the entry, exit and service quality in the medical industry

Medical services are naturally monopolized. Due to its strong professionalism, there is also information asymmetry between hospitals and patients. Doctors who are medical providers generally have more information than patients on the demand side such as patients' disease condition. Since dispersed patients cannot fully supervise medical services, medical institutions' entry and exit into the medical industry and the behavior of medical institutions can only be regulated by government departments through strict approval and strengthening regulations over service quality. Because the government itself cannot obtain the information between doctors and patients, it cannot be expected to arrange all medical services. Therefore, the ultimate improvement in the efficiency and quality of medical services lies in the appropriate actions of the government.

6.1.3 Strengthen supervision and regulation over pharmaceutical companies

The government should strengthen punishment stated in Criminal Law, Law Against Unfair Competition, and Interim Provisions on Banning Commercial Bribery for pharmaceutical companies bribing public officials. In addition, the government should also further improve the industry norms that pharmaceutical companies need to comply with, including the Code of Practice on the Promotion of Pharmaceutical Products issued by R & D-based Pharmaceutical Association Committee and the Code of Practice on the Promotion of Pharmaceutical Products issued by China Pharmaceutical Industry Association, so as to form self-discipline in the pharmaceutical industry. It is necessary to improve the quality of supervision personnel while strengthening the supervision of pharmaceutical companies, so that the supervision personnel is more specialized and of higher competency. It is necessary to form a talent training mechanism to improve the professional quality of grassroots law enforcement personnel.

6.1.4 Pay attention to patients' interests and needs

The patient is a certain stakeholder in medical services and ranks third in importance. They have insufficient influence but high requirements on interests, therefore they are obedient stakeholders. Government departments and medical institutions should be particularly concerned about the needs of patients. The improvement of medical services for patients depends on clarifying the important influencing factors affecting the willingness of

patients to pay. On this basis, the design of medical service projects should be consistent with the patient's preferences. To obtain the support from patients while improving medical services, medical institutions must align themselves with patients.

6.1.5 Encourage active participation of research institutions and media

It is necessary to further enhance the role and influence of medical management and medical technology research funds in cultivating third-party scientific research institutions. Media should assume the main intermediary role in the information communication mechanism. Facing the problems in medical service industry such as shortage of supply and mismanagement, we need to liberalize the media and use the platform of the news media to strengthen discussion and supervision, so that we form a mechanism of mass supervision and benefit sharing. In addition, it is necessary to increase fund support and subsidies for research institutions, and promote the development of medical technology and relative researches on medical management theory.

6.1.6 Support the development of local communities and NGOs

Medical industry associations, other types of NGOs and local communities are all marginal stakeholders. Because of low grade of legitimacy, urgency, power and influence, they are mass participants and have little impact on the improvement of medical services. As China's local communities and NGOs are in the early stages of development, their future influence on the supply of medical services can be further explored. Therefore, both local communities and medical service associations should be given more attention for development. Legally, it is necessary to clarify the medical service-related responsibility of community property management companies for both community residents and minority groups, improve the standard and implementation regulations for medical service management, support the development of NGOs related to the medical services, and maintain the independence of industry associations.

6.2 Supervision and incentive mechanism for supply-side stakeholders

According to the game model research on supply-side stakeholders, it is necessary to fully consider the incentive effects of financial appropriation, price and fine, set reasonable prices of medical services and consider appropriate number of fines and the corresponding

financial appropriation. It is necessary to optimize the combination of these three incentive policies to promote the upgrading of medical services.

6.2.1 Establishment of dynamic price adjustment mechanism adapted to the cost of medical services

The establishment of a dynamic price adjustment mechanism suitable for the development of medical institutions will help improve service levels and efficiency, and encourage medical institutions to improve the quality and efficiency of medical services. The cost pressure of medical institutions is gradually increasing, which is related to the improvement of health standards, labor costs, water and electricity prices, and drug prices. Therefore, the level of local economic development and the input of medical institutions should be considered as key factors by the government while determining the price of medical services.

6.2.2 Punishment mechanism matching the size of medical institution

Fines are an effective means of motivating medical institutions to improve medical services. By increasing fines, medical institutions with substandard quality will be encouraged to improve their medical services, thus promoting the upgrading of medical services. To achieve that, it is necessary to match the fines with the sizes of medical institutions, and let fines play its important role in the incentive mechanism. In 2018, the China's National Healthcare Security Administration was officially listed as the last one among newly established institutions. One of the duties of the administration is to investigate and punish violations of laws and regulations with administrative penalties in the field of medical security.

6.2.3 Reward mechanism for performance assessment in medical institutions

It is recommended that provincial or central governments set up special funds of medical services for local governments, and offer financial incentives to local governments with better medical services. The premise of implementation is the performance assessment of medical services. Under the guidance of government, a performance committee composed of medical professionals, government departments and patient representatives will be established to formulate performance assessment standards and detailed rules and carry out performance assessment of medical services. The formulation of detailed rules relies on medical

reform-related documents of all levels of government, with the purpose of controlling the growth of medical costs, improving the treatment and mobilizing the enthusiasm of medical personnel, and adjusting the profit structure of hospitals.

6.3 Cost-sharing incentive mechanism for demand-side stakeholders

The cost-sharing mechanism of the demand-side stakeholders in this study is divided into information communication mechanism (improving patients' understanding of medical services), public participation mechanism (improving trust in government departments and medical institutions) and subsidy mechanism (increasing low-income group's ability to pay). The establishment of the cost-sharing mechanism will reduce the investment pressure of medical institutions and government departments in medical services. It can not only exert the incentive effect of price on medical services, but also maintain patients' rights and interests in medical service improvement, in which the supply of medical services will be more sustainable.

6.3.1 Information communication mechanism for medical services

The authenticity, timeliness and comprehensiveness of the information of medical services play an important role for the society to supervise medical institutions to improve medical services. The disclosure of information on medical services will help the public to understand relevant regulations and policies, price composition and adjustment of relevant information, so as to put forward their own opinions and suggestions. It will also help medical institutions to improve related services. Information disclosure of medical services can be considered from two aspects: one is to establish an information disclosure system for medical services, and the other is to establish an official information communication platform. According to the current situation in China, the way patients get medical service information is being changed by the new media platform and doctors' self-media. For example, the public accounts of medical institutions and doctors are becoming a convenient and fast way for patients to obtain medical service information.

6.3.2 Public participation mechanism for medical services

There are few ways for the Chinese public to participate in government's decision-making on medical services, and there is no legalized and standardized path and

method. In order to effectively share the supply and demand information of medical services, it is necessary to design a public participation and communication mechanism from the top level. Public participation in medical services must have relevant carriers and paths. Medical industry associations and other types of NGOs can be considered as the medium to attract other industry experts to participate in medical service decisions, so as to include the public's voice in the management, regulation, pricing and adjustment of medical services.

6.3.3 Establishment of subsidy mechanism for low-income groups

China's low-income groups are in a weak position and their demand for medical services is very strong. However, due to low income, their ability to pay is not strong and their WTP for improving medical services is not high. To this end, it is necessary to build a mechanism to subsidize low-income groups. Government departments should focus on the establishment of relevant laws and regulations, such as the authorities that issue subsidies, the standards, contents, funding sources, and operational procedures of subsidies. Its purpose is to avoid adverse incentives and negative effects brought about by financial subsidies to make financial subsidies more standardized and transparent. In order to strengthen public participation, the identification of beneficiaries and distribution of subsidies may include participation of NGOs and reporting of the media.

6.4 Conclusion

From the perspective of stakeholders, research is conducted on the design of incentive mechanism for improving medical services. Systematically analyzing the stakeholders of medical service, this thesis deeply expounds on the behavior strategies and interest demands of main stakeholders from two aspects, namely, supply and demand of medical service. Finally, the design framework of incentive mechanism for improving medical services is proposed. The main conclusions are as follows:

(1) Through the systematic analysis of stakeholders in medical services, eight main stakeholder groups were identified: government departments, patients, research institutions, pharmaceutical enterprises, community property sectors, media, NGOs, and medical institutions. Medical institutions and government departments, the main stakeholders of supply side in medical services, belong to definitive stakeholders and key players of medical services. Patients, the key players of demand side in medical services, belong to definitive

stakeholders and subject players. Furthermore, pharmaceutical enterprises belong to definitive stakeholders and key players. Owing power and urgency, media and research institutions are expectant stakeholders of medical services. Community property sectors are latent stakeholders of medical services, and NGOs are marginal stakeholders. And both community property sectors and NGOs are regarded as the crowd players in the medical service provision.

(2) By means of supervision game model of stakeholders on the supply side, it is proved that raising penalties, adjusting prices and providing fiscal appropriation to local governments are the effective measures for improving the medical services. However, the subsidy policy is not an effective motivating measure. These findings are based on empirical analysis of the data collection and research questionnaire in medical institutions of Nanning, Liuzhou and Guilin. In addition, it is found that the price and subsidy policy mutually influence and complement each other, and providing lower cost subsidies in a small range of rising price can encourage the local governments and medical institution to improve their medical services. The optimal cost subsidy rate is equal to the tax rate paid by medical institutions, and the optimal price increase is equal to the unit upgrade cost actually paid by medical institutions, which will contribute to an ideal game equilibrium that the medical institution is improved comprehensively.

(3) Through an investigation of the stakeholders of the demand side's (patients') WTP for medical service improvement, it's shown that patients are willing to pay more, to some extent, to improve the medical services. Patients' WTP are mainly influenced by their attention and trust to medical institutions, attitudes towards improving medical services as well as understandings of some information about medical services. Moreover, patients' WTP are closely related to their age, income and educational background. Moreover, patients with children tend to have strong willingness to pay for medical service improvement.

(4) Finally, according to the overall analysis of medical service stakeholders, the incentive mechanism for improving medical service is required to establish. Based on the stakeholder participation mechanism of medical service, different forms of participation are formulated according to the role of different stakeholders. The supervision incentive mechanism for the stakeholders of the supply side, such as government departments and medical institutions, shall be respectively established. And such mechanism includes the dynamic price adjustment mechanism corresponding to the cost, the punishment mechanism corresponding to the size of medical institutions and the reward mechanism for the

performance assessment of medical services. To stimulate patients' needs, the cost-sharing incentive mechanism for stakeholders of the demand side should be established, including the information communication mechanism, the public participation mechanism for medical services, and the demand subsidy mechanism for low-income groups.

Taking medical service as the research object, this thesis has introduced the stakeholder theory and its analysis method into the research of medical service management. In this way, it not only develops the analytical framework of medical service and even public utilities management, but also complements the stakeholder theory through quantitative model and empirical analysis in the Chinese context. Theoretically, this thesis helps to establish an incentive mechanism framework in line with the characteristics of the medical service industry from the unique perspective of stakeholders. Practically, it is conducive to the development of medical service reform in China, providing support for the policy design and implementation of decision-making departments. From the perspective of stakeholders, the attribute impact based on the traditional score-based approach proposed by Mitchell and Wood is introduced to the public characteristics of medical services, thus improving the stakeholder theory and its analysis method. In terms of the supply side, this thesis introduces the supervision game model between the government and medical institutions into the incentive mechanism researches to promote the upgrading and improvement of medical services. Meanwhile, it sheds light on the influence of price adjustment on the stakeholders' behavior and the realization of incentive goals. As to the demand side, the thesis introduces respondents' uncertainties into WTP for medical service improvement. Besides, it adopts contingent valuation method and selective experiment method to correct the uncertainties of respondents, thus improving the accuracy and reliability of the evaluation results.

6.5 Suggestions for future research

This study has achieved certain results. However, due to the complication of medical service supply, there is still room for further research. It is recommended that future researches focus on building models and exploring new methods because of differences in pricing mechanisms and resource allocation. In addition, considering that the supply of medical service is a global issue, it is necessary to explore advanced practices and incentive mechanisms in other countries and regions. The areas that can be further studied in the future are as follows.

First, regarding to the analysis of supply-side stakeholders, in order to simplify the model, local governments and medical authorities have been considered as government departments, and medical workers, shareholders, and managers are considered as medical institutions. However, there are also games and conflicts between government organizations, medical institutions and inside medical institutions, which also affect the supply of medical services. It is necessary to continue discussion in this regard in the future.

Second, in the game research of the supervision on supply-side stakeholders, the game model in this study is a static and two-person model, but in fact, the government department must simultaneously conduct long-term supervision on several medical institutions. Further research is needed to analyze how the incentive policy can achieve its goals in a dynamic model.

Third, in order to obtain the value of patients' WTP, this study only corrects the uncertainty of respondents in the contingent valuation method, but there is also uncertainty in the CEM, which belongs to stated preference method. The hypothetical error in the CEM is also a key area that needs to be further explored in the future.

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Appendix

Appendix I: Classified research of stakeholders of medical services

1. Background Information

1) How old are you?

A. < 20 years old

B. 20-30 years old

C. 31-40 years old

D. 41-50 years old

E. 51-60 years old

F. > 60 years old

2) How long have you been working in the medical industry?

A. Less than 1 year

B. 1-5 year(s)

C. 6-10 years

D. 11-20 years

E. More than 20 years

F. 0 year

3) Your current educational level

A. High school degree or technical secondary school degree or below

B. Higher vocational college degree

C. Bachelor degree

D. Master degree

E. Doctoral degree

4) You are currently working at__

A. Medical institutions

B. Government departments

- C. Colleges, universities, or relevant research institutes
- D. Community property sectors
- E. Media sectors
- F. Medical associations
- G. Pharmaceutical enterprises
- H. Others

5) Your monthly income is__

- A. ≤ 5000 yuan
- B. 5,001-10,000 yuan
- C. 10,001-15,000 yuan
- D. 15,001-20,000 yuan
- E. $> 20,000$ yuan

6) Are you familiar with the medical industry?

- A. Not at all
- B. Basically familiar
- C. Generally familiar
- D. Relatively familiar
- E. Highly familiar

2. Key terms and definitions

1) Stakeholders: individuals or groups that influence the realization of organizational goals or that are influenced by organizational activities

2) Stakeholders of medical services: individuals, groups, or organizations that have interest demands for medical services and that can adopt certain action strategies to influence medical services or that are influenced by medical services

3. Classified surveys on the stakeholders of medical services

Based on our surveys, we have defined eight types of major stakeholders of medical services, namely, medical institutions, government departments related to medical services, patients, community property sectors, experts and scholars, media, pharmaceutical enterprises, and non-governmental organizations (NGOs).

Please answer the following questions:

1) Generally, based on medical services, please grade the importance of the following stakeholders (“1” refers to the least important while “5” indicates the most important).

1.	Stakeholders	Most important	Relatively important	Generally important	Less important	Least important
	Medical institutions	5	4	3	2	1
	Government departments	5	4	3	2	1
	Patients	5	4	3	2	1
	Community property sectors	5	4	3	2	1
	Experts and Scholars	5	4	3	2	1
	Media	5	4	3	2	1
	Pharmaceutical enterprises	5	4	3	2	1
	NGOs	5	4	3	2	1

2) Please grade the following stakeholders from the perspective of legitimacy (“1” refers to the lowest legitimacy while “5” indicates the highest legitimacy).

Legitimacy refers to whether the stakeholders has been given the legal rights or obligations in medical services, i.e., whether the stakeholders’ interest demands for medical services are legitimate, correct and guaranteed by contracts.

2.	Stakeholders	Most important	Relatively important	Generally important	Less important	Least important
	Medical institutions	5	4	3	2	1
	Government departments	5	4	3	2	1
	Patients	5	4	3	2	1
	Community property sectors	5	4	3	2	1
	Experts and scholars	5	4	3	2	1
	Media	5	4	3	2	1
	Pharmaceutical enterprises	5	4	3	2	1
	NGOs	5	4	3	2	1

3) Please grade the stakeholders from the perspective of influence (“1” refers to the lowest influence while “5” indicates the highest influence). Influence refers to whether the

stakeholders have the competence and relevant methods that influence the medical services, which includes not only the influence on the operation and management of medical institutions but also the influence on the supervision and decision-making of government and administrative departments of medical services.

3.	Stakeholders	Most important	Relatively important	Generally important	Less important	Least important
	Medical institutions	5	4	3	2	1
	Government departments	5	4	3	2	1
	Patients	5	4	3	2	1
	Community property sectors	5	4	3	2	1
	Experts and scholars	5	4	3	2	1
	Media	5	4	3	2	1
	Pharmaceutical enterprises	5	4	3	2	1
	NGOs	5	4	3	2	1

4) Please grade the stakeholders from the perspective of urgency (“1” refers to the lowest urgency while “5” indicates the highest urgency). Urgency indicates that whether the requirements of certain stakeholders can receive the immediate attention from the government authorities or the administrative staff of medical institutions.

4.	Stakeholders	Most important	Relatively important	Generally important	Less important	Least important
	Medical institutions	5	4	3	2	1
	Government departments	5	4	3	2	1
	Patients	5	4	3	2	1
	Community property sectors	5	4	3	2	1
	Experts and scholars	5	4	3	2	1
	Media	5	4	3	2	1
	Pharmaceutical enterprises	5	4	3	2	1
	NGOs	5	4	3	2	1

5) Please grade the stakeholders from the perspective of impact (“1” refers to the lowest impact while “5” indicates the highest impact). Impact refers to the degree in which the stakeholders are affected by the medical services.

5. Stakeholders	Most important	Relatively important	Generally important	Less important	Least important
Medical institutions	5	4	3	2	1
Government departments	5	4	3	2	1
Patients	5	4	3	2	1
Community property sectors	5	4	3	2	1
Experts and scholars	5	4	3	2	1
Media	5	4	3	2	1
Pharmaceutical enterprises	5	4	3	2	1
NGOs	5	4	3	2	1

Appendix II: Questionnaire of patients' willingness to pay for medical services improvement

Dear friends!

We are carrying out a research of "patients' willingness to pay for medical services improvement" to understand patients' cognition of improving medical services and upgrading medical facilities and their willingness to pay for the medical services improvement so as to provide reference for the government to upgrade medical facilities and formulate pricing policies of medical services. This survey is anonymous and the answers affiliated to the questionnaires are neutral. The data collected are only used for the academic research of aggregate analysis. Your information will be kept secret. Thank you for your assistance and support.

1. Survey on patients' medical services (please mark "√" in relevant items)

(1) Please grade the importance of current Top 10 social issues

(1)	Most important	Relatively important	Generally important	Less important	Least important
Unemployment	5	4	3	2	1
Social insurance	5	4	3	2	1
Food safety	5	4	3	2	1
Drinking water safety	5	4	3	2	1
Housing	5	4	3	2	1
Traffic	5	4	3	2	1
Medical care	5	4	3	2	1
Education	5	4	3	2	1
Crime	5	4	3	2	1
Environmental pollution	5	4	3	2	1

(2) Regarding the medical services, the most important factors that attract your attention include:

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(2)	Most important	Relatively important	Generally important	Less important	Least important
Standard service quality	5	4	3	2	1
Strong accommodation capability	5	4	3	2	1
Proper frequency of treatment	5	4	3	2	1
Equitable price	5	4	3	2	1
Good medical services	5	4	3	2	1

(3) Your satisfaction of current medical services:

(3)	Very satisfied	Relatively satisfied	Generally satisfied	Relatively unsatisfied	Unsatisfied
Standard service quality	5	4	3	2	1
Strong accommodation capability	5	4	3	2	1
Proper frequency of treatment	5	4	3	2	1
Equitable price	5	4	3	2	1
Good medical services	5	4	3	2	1

(4) Frequency of your medical treatment:

(4)	Frequency of your medical treatment:
<input type="radio"/>	A. 0
<input type="radio"/>	B. Once a month
<input type="radio"/>	C. Twice a month
<input type="radio"/>	D. 3 times a month
<input type="radio"/>	E. 4 times a month
<input type="radio"/>	F. Over 4 times a month

(5) Average medical cost of your family:

(5)	Average medical cost of your family:
<input type="radio"/>	A. ≤50 yuan per month
<input type="radio"/>	B. 50-100 yuan per month
<input type="radio"/>	C. 100-200 yuan per month
<input type="radio"/>	D. 200-300 yuan per month
<input type="radio"/>	E. 300-500 yuan per month
<input type="radio"/>	F. Over 500 yuan per month

2. Survey on patients' willingness to pay

(1) Are you willing to bear some costs for improving medical services and upgrading medical facilities?

1.1	Are you willing to bear some costs for improving medical services and upgrading medical facilities?
<input type="radio"/>	A. Yes. Certain price rise is acceptable to me.
<input type="radio"/>	B. No.

If no, please explain:

1.2	Reasons for unwillingness to bear some costs for improving medical services and upgrading medical facilities	
	<input type="radio"/>	A. The status quo of medical services is sound and no improvement is needed.
	<input type="radio"/>	B. I support the improvement project of medical facilities but I have limited capability to pay.
	<input type="radio"/>	C. It is the responsibility of the government and medical institutions to improve medical facilities. It is none of my business.
	<input type="radio"/>	D. Others

If yes, the largest price rise acceptable to you is:

1.3	The largest price rise acceptable to you is:	
	<input type="radio"/>	A. 10 yuan per item
	<input type="radio"/>	B. 15 yuan per item
	<input type="radio"/>	C. 20 yuan per item
	<input type="radio"/>	D. 25 yuan per item
	<input type="radio"/>	E. 30 yuan per item
	<input type="radio"/>	F. 35 yuan per item
	<input type="radio"/>	H. 40 yuan per item

(2) Regarding the willingness to pay as mentioned in previous item, are you certain to bear the cost?

(2)	Definitely uncertain					Definitely certain				
	1	2	3	4	5	6	7	8	9	10

3. Preferred plans for improving medical services

It is assumed that the municipal government prepares to comprehensively improve the medical services. We select five attributes of medical services, namely, “reception frequency”, “reception capability”, “service quality”, “medical services”, and “price rise”, to know about patients’ demand preferences and concerns of medical services. “Plan 1” and “Plan 2” reflect the changes of the above-mentioned attributes after the improvement project is implemented.

Please choose your preferred plan.

Choice Set 1			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hour	Not enough during peak hour
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed not
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	30 yuan per item	0
Your choice	()	()	()

Choice Set 2			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hour	Not enough during peak hour
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed not
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	30 yuan per item	0
Your choice	()	()	()

Choice Set 3			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hour	Not enough during peak hour
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed not
Medical services	Not in time	Not in time	Not in time
Rise of price	25 yuan per item	10 yuan per item	0
Your choice	()	()	()

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Choice Set 4			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hour	Not enough during peak hour
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed not
Medical services	Not in time	Not in time	Not in time
Rise of price	25 yuan per item	10 yuan per item	0
Your choice	()	()	()

Choice Set 5			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hour
Service quality	Guaranteed	Sometimes guaranteed	Sometimes guaranteed not
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	10 yuan per item	0
Your choice	()	()	()

Choice Set 6			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hour
Service quality	Guaranteed	Sometimes guaranteed	Sometimes guaranteed not
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	10 yuan per item	0
Your choice	()	()	()

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 7			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hours	Not enough during peak hours
Service quality	Guaranteed	Sometimes not guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 8			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hours
Service quality	Guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 9			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Improved	Improved	Not in time
Rise of price	10 yuan per item	25 yuan per item	0
Your choice	()	()	()

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Choice Set 10						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	> 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Stable		Not enough during peak hours		Not enough during peak hours	
Service quality	Sometimes	not guaranteed	Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Not in time		Improved		Not in time	
Rise of price	20 yuan per item		25 yuan per item		0	
Your choice	()		()		()	

Choice Set 11						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	> 3 times a year		\leq 3 times a year		> 3 times a year	
Accommodation capability	Not enough during peak hours		Stable		Not enough during peak hours	
Service quality	Guaranteed		Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Improved		Not in time		Not in time	
Rise of price	30 yuan per item		30 yuan per item		0	
Your choice	()		()		()	

Choice Set 12						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	> 3 times a year		\leq 3 times a year		> 3 times a year	
Accommodation capability	Not enough during peak hours		Not enough during peak hours		Not enough during peak hours	
Service quality	Guaranteed		Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Improved		Not in time		Not in time	
Rise of price	30 yuan per item		25 yuan per item		0	
Your choice	()		()		()	

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Choice Set 13

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours	
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed	not
Medical services	Improved	Not in time	Not in time	
Rise of price	30 yuan per item	10 yuan per item	0	
Your choice	()	()	()	

Choice Set 14

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	> 3 times a year	≤ 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours	
Service quality	Guaranteed	Guaranteed	Sometimes guaranteed	not
Medical services	Improved	Not in time	Not in time	
Rise of price	30 yuan per item	10 yuan per item	0	
Your choice	()	()	()	

Choice Set 15

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	> 3 times a year	≤ 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours	
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes not guaranteed
Medical services	Improved	Improved	Not in time	
Rise of price	30 yuan per item	10 yuan per item	0	
Your choice	()	()	()	

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 16					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Improved	Not in time	Not in time		
Rise of price	30 yuan per item	20 yuan per item	0		
Your choice	()	()	()		

Choice Set 17					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Stable	Not enough during peak hours	Not enough during peak hours		
Service quality	Guaranteed	Guaranteed	Sometimes	not	not
Medical services	Not in time	Improved	Not in time		
Rise of price	25 yuan per item	30 yuan per item	0		
Your choice	()	()	()		

Choice Set 18					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes	not
Medical services	Improved	Improved	Not in time		
Rise of price	30 yuan per item	25 yuan per item	0		
Your choice	()	()	()		

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 19			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Improved	Improved	Not in time
Rise of price	10 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 20			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	20 yuan per item	0
Your choice	()	()	()

Choice Set 21			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Not in time	Not in time
Rise of price	25 yuan per item	10 yuan per item	0
Your choice	()	()	()

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 22						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Not enough during peak hours		Stable		Not enough during peak hours	
Service quality	Sometimes	not guaranteed	Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Not in time		Not in time		Not in time	
Rise of price	25 yuan per item		20 yuan per item		0	
Your choice	()		()		()	

Choice Set 23						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Not enough during peak hours		Stable		Not enough during peak hours	
Service quality	Sometimes	not guaranteed	Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Not in time		Improved		Not in time	
Rise of price	25 yuan per item		10 yuan per item		0	
Your choice	()		()		()	

Choice Set 24						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Not enough during peak hours		Not enough during peak hours		Not enough during peak hours	
Service quality	Sometimes	not guaranteed	Sometimes	not guaranteed	Sometimes	not guaranteed
Medical services	Not in time		Improved		Not in time	
Rise of price	25 yuan per item		25 yuan per item		0	
Your choice	()		()		()	

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 25

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	25 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 26

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Guaranteed	Sometimes not guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	10 yuan per item	10 yuan per item	0
Your choice	()	()	()

Choice Set 27

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Guaranteed	Sometimes not guaranteed	Sometimes not guaranteed
Medical services	Not in time	Not in time	Not in time
Rise of price	10 yuan per item	20 yuan per item	0
Your choice	()	()	()

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 28

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours	
Service quality	Guaranteed	Guaranteed	Sometimes	not guaranteed
Medical services	Not in time	Improved	Not in time	
Rise of price	10 yuan per item	10 yuan per item	0	
Your choice	()	()	()	

Choice Set 29

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours	
Service quality	Guaranteed	Sometimes	not	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time	
Rise of price	10 yuan per item	25 yuan per item	0	
Your choice	()	()	()	

Choice Set 30

Attributes	Plan 1	Plan 2	No improvement	
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year	
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours	
Service quality	Guaranteed	Guaranteed	Sometimes	not guaranteed
Medical services	Not in time	Improved	Not in time	
Rise of price	10 yuan per item	25 yuan per item	0	
Your choice	()	()	()	

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 31					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	> 3 times a year	≤ 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Not in time	Improved	Not in time		
Rise of price	10 yuan per item	10 yuan per item	0		
Your choice	()	()	()		

Choice Set 31					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	> 3 times a year	≤ 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Not in time	Improved	Not in time		
Rise of price	10 yuan per item	10 yuan per item	0		
Your choice	()	()	()		

Choice Set 32					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Not in time	Not in time	Not in time		
Rise of price	10 yuan per item	10 yuan per item	0		
Your choice	()	()	()		

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 33			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Guaranteed	Sometimes guaranteed	not Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	10 yuan per item	10 yuan per item	0
Your choice	()	()	()

Choice Set 34			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours
Service quality	Guaranteed	Sometimes guaranteed	not Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	10 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 35			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	> 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	10 yuan per item	25 yuan per item	0
Your choice	()	()	()

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 36					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Improved	Improved	Not in time		
Rise of price	20 yuan per item	10 yuan per item	0		
Your choice	()	()	()		

Choice Set 37					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Improved	Not in time	Not in time		
Rise of price	20 yuan per item	25 yuan per item	0		
Your choice	()	()	()		

Choice Set 38					
Attributes	Plan 1	Plan 2	No improvement		
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year		
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours		
Service quality	Guaranteed	Sometimes guaranteed	not	Sometimes guaranteed	not
Medical services	Improved	Improved	Not in time		
Rise of price	20 yuan per item	10 yuan per item	0		
Your choice	()	()	()		

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 39

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Not enough during peak hours	Not enough during peak hours
Service quality	Guaranteed	Sometimes guaranteed	not guaranteed
Medical services	Improved	Improved	Not in time
Rise of price	20 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 40

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Not enough during peak hours	Stable	Not enough during peak hours
Service quality	Guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Improved	Improved	Not in time
Rise of price	20 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 41

Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hours	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Not in time	Not in time
Rise of price	30 yuan per item	10 yuan per item	0
Your choice	()	()	()

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 42						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Stable		Stable		Not enough during peak hours	
Service quality	Sometimes	not	Sometimes	not	Sometimes	not
	guaranteed		guaranteed		guaranteed	
Medical services	Not in time		Not in time		Not in time	
Rise of price	30 yuan per item		20 yuan per item		0	
Your choice	()		()		()	

Choice Set 43						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Stable		Stable		Not enough during peak hours	
Service quality	Sometimes	not	Sometimes	not	Sometimes	not
	guaranteed		guaranteed		guaranteed	
Medical services	Not in time		Improved		Not in time	
Rise of price	30 yuan per item		10 yuan per item		0	
Your choice	()		()		()	

Choice Set 44						
Attributes	Plan 1		Plan 2		No improvement	
Accommodation frequency	≤ 3 times a year		> 3 times a year		> 3 times a year	
Accommodation capability	Stable		Not enough during peak hours		Not enough during peak hours	
Service quality	Sometimes	not	Sometimes	not	Sometimes	not
	guaranteed		guaranteed		guaranteed	
Medical services	Not in time		Improved		Not in time	
Rise of price	30 yuan per item		25 yuan per item		0	
Your choice	()		()		()	

Improvement of Incentive Mechanisms for Medical Service Supply

Choice Set 45			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	> 3 times a year	> 3 times a year
Accommodation capability	Stable	Stable	Not enough during peak hours
Service quality	Guaranteed	Sometimes guaranteed	not Sometimes guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	30 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 46			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hours	Not enough during peak hours
Service quality	Sometimes not guaranteed	Sometimes guaranteed	not Sometimes guaranteed
Medical services	Not in time	Not in time	Not in time
Rise of price	30 yuan per item	25 yuan per item	0
Your choice	()	()	()

Choice Set 47			
Attributes	Plan 1	Plan 2	No improvement
Accommodation frequency	≤ 3 times a year	≤ 3 times a year	> 3 times a year
Accommodation capability	Stable	Not enough during peak hours	Not enough during peak hours
Service quality	Sometimes not guaranteed	Guaranteed	Sometimes not guaranteed
Medical services	Not in time	Improved	Not in time
Rise of price	30 yuan per item	20 yuan per item	0
Your choice	()	()	()