Research on Mode Selection of Government Purchase Public Service Based on Contract Theory

Li Jian

School of Management, Minzu University of China, Beijing, P.R. China 100081
lijian@muc.edu.cn

Abstract

As an important initiative of comprehensively deepening reform in China, how to promote government purchase public service actively and steadily is the common focus of academic and practical departments. Two typical modes of government purchase public service which are purchase service from producer and purchase service from integrator are analyzed. According to the contract theory, the two optimal models are set up through adding heterogeneity of public service variables to the classical incentive model. The rent of the two modes paid by government is compared and analyzed. The conclusion indicates that the heterogeneity of public service can influence mode selection of government purchase public service. It should choose multi-agent when the heterogeneity of public service is low; otherwise, it should select service integrator to undertake public service.

Keywords: governemnt purchase serice, model selection, heterogeneity

1. Introduction

Due to the complexity of public services, it is difficult to provide scale and fine public service by government alone. Government regards the public service as a system to decompose and purchases is becoming a trend around the world. The implication for government to purchase service is to transform part of public services delivered by government directly and necessary service for government to perform duties to qualified organizations through specific methods and procedures relying on the market mechanism, and government pay for the fees according to the contract. As a significant approach, government purchase service can increase the creativity for public service delivery, accelerate the development of service industry and guide the effective demand in society. It also contributes to the transferring of government functions, integrate and utilize social resources, enhance the citizen's participation awareness and the quality of public service. Government purchase service has been first introduced in Shanghai Since 1996, and then spread to more and more cities in China. On September 26th 2013, General office of the state council brought out "The guidance of government purchase service to social forces", which aims at forming the normal development in the process of government purchase and the system of public service delivery. On January 4th 2015, National ministry of finance, the ministry of civil affairs and state administration for industry and commerce jointly published "Interim measures for government purchase service", which further cleared the subjects, objects, contents and forms of purchase service. It means the unified platform for purchase service and mechanism were formed initiatorily, as well as relative laws and regulations. Nevertheless, there are multifarious models of government purchase service including single purchase or group purchase, how to design a scientifically and reasonable mechanism of purchasing service will determine whether the purchase service can achieve desired result. Therefore, this paper starts from the heterogeneity of public service, focuses on the design of mechanism for government purchase service based on contract theory, with the purpose of put forward useful suggestions to government.

2. Literature Review

In the 1970s, based on the civil society theory of Weisbrod and Burton (1974) [1], White (1994) combined "government failure theory" and "market failure theory" to explain the necessity for nonprofit organization as a subject to delivery public service [2]. After distinguished the multiple spectrum from private goods to public goods, Ostrom (1978) took the case of police service of 80 cities in American to declare the traditional and hierarchy bureaucracy organizations, couldn't govern complex public affairs, complicated public service needs polycentric governance and diversification of the public service delivery. Then, she puts forward to six different institutional arrangements for public service: (1) government produces by itself; (2) government outsources to one private enterprise; (3) government outsources to another government; (4) government produces part of service and gets the other part from the other organizations; (5) government authorizes different producers and sets the standard, it is up to the consumer to decide which one to choose; (6) ticket [3]. Savvas (2002) spent three decades to survey the public service of 30 countries and proposed ten institutional arrangements for public service delivery (see Table 1) [4].

Table 1. The Systematic Arrangement of Public Service Delivery

producer	designer	
	public department	private department
Public department	government service	government sell
	intergovernmental agreement	
Private department	contract	free market
	franchise	voluntary service
	allowance	self-service
		ticket

He distinguishes "designer" and "producer" which is the key point to institutional arrangement of public service delivery. The designer makes public policy and supports funds, while the producer can be government-affiliated institutions, enterprise or nonprofit organizations or another government institution. Specifically, government has a different hierarchy inside which has a division of responsibilities. The higher homogeneity of public service, the higher tier government takes in hand, which can create economies of scale. On the other hand, the lower homogeneity of public service, the lower tier government takes in hand, which can contribute to improve the pertinence and effectiveness of public service.

Yu (2009) designed a composite model of public service delivery in response to the contradiction between the decentralized, heterogeneous demand for public service and non-scale public service delivery [5]. There are twice divisions of work among the participants in government purchase. The first division is to separate designers and producers, called "the primary division of government purchase services". Designers generally refer to the government, which no longer serve as the role of producer in the primary division, but separate the function of production, the scope of government activities turns to allocate funding, make policy and supervision. Producers produce public service directly, and what's more, they still need to supervise and integrate resource. The public services which producers cannot produce effectively by themselves will be integrated to other resources to product indirectly. This process is called "the secondary division of government purchase services". During the twice division, producers can be nonprofit organizations, enterprises, citizens or government agency. The existence of twice divisions of public service delivery adapts miscibility and complexity in reality. The institutional innovation originated from growth demand for public service, and the motivation which government pursues the social welfare maximization. The

second division expands a positive externality on the social effects which goes beyond the first division. Through twice divisions, various social resources can be integrated, while multi-producers can exert their respective advantages, improve the efficiency and quality of services and increase the total social welfare.

Ma and Zhang (2013) proposed the third division of government purchase service based on Yu (2009). They believed that the production link becomes far away from demand as the public service delivery system becoming specialized, which makes it difficult to respond to the changes in demand for heterogeneous public services [6]. Therefore, we need to establish a public service development center between producers and designers as links with the demand and agile supply capacity of public service.

All above studies show that government purchase public service is an important form of co-governance for public service delivery, the roles and functions of participants involved in government purchase public service will generate corresponding change according to the degree of divisions. However, the current studies have not considered how government should choose and switch in a multi-level mode of government purchase service deeply, namely, how to design the mechanism of government purchase service based on the complexity of public service.

3. Analysis of Typical Modes for Government Purchase Service

3.1 The Main Participants of the Government Purchase Service

According to the system economics, government purchase service is an organic economic system which composed of the government, enterprises, nonprofit organizations, government-affiliated institutions and other social forces. It can be expressed by formula: the network of social value= ({government, enterprises, nonprofit organizations and government-affiliated institutions...}, {the relationship among the government, enterprises, nonprofit organizations, government-affiliated institutions...}). The participants which undertake the government purchase service work on the premise of system design rules, in some cases, it can even cause the government to formulate and modify the rules of system design [7]. Therefore, in the framework of government purchase service, the relationship among the participants and government is no longer as simple as a contract, but a partnership which benefit to each other in order to achieve the optimal interests of the whole social value network.

Due to the hierarchy of public service delivery chain, the simple distinguish of designer and producer cannot cover the multi-hierarchy of the government purchasing service. We define the main participants in the government purchase service as service planner, service producer and service integrator. Service planner refers to the government, which have plenty of resources to meet the requirements of the public combined with different projects. Service producer refers to specific enterprises, nonprofit organizations, government-affiliated institutions and other social forces. They deliver public service independently according to the requirements of the government by its core expertise. Service integrator refers to "public service development center" which mentioned above and usually takes the forms of hub or joint organizations. It integrated the public service before deliver to government. Service integrator usually plays the role of designer, which involved in designing the rules of purchasing service, decomposing complex public services and determining the architecture, interface and standards of public service system to make sure the decomposed public services combine into a whole organic according to the setting.

3.2 Typical Model of Government Purchase Service

Government purchase service is to split complex public service into certain blocks to produce. Service planners decompose public service, and authorize different service producers to design the sub-modules, which can meet the needs of increasingly sophisticated demand of technology through taking advantage of integration and rapid innovation resources. Service producer plays a core expertise to service production; while service integrator enjoys integrated advantages to combine resources innovatively. There are two basic modes in the process of government purchase service: government purchases service from producer directly and government purchase service from integrator indirectly.

In the first mode of government purchasing service, generally, service planners set the purchased rules and determine the interfaces and standards between various public services. Service planners also need to decompose the public service system, then outsource to different service producers, then integrate and test public service delivery by service producers (see Figure 1). There are three main steps for service planners to integrate service: define the service, set the rules, and coordinate service. Now many service planners decompose public service system into several categories, each service producer is responsible for each category, while service planner is mainly responsible for supply funds and setting the rules which are on the top of the social value chain.
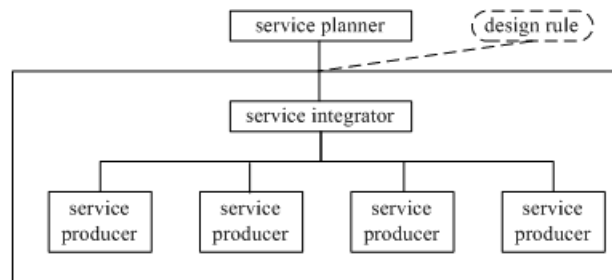

Figure 1. Government Purchase Public Service from Service Integrator Indirectly

In the second mode of government purchasing service, service integrator should have strong ability to integrate service producers effectively. This mode not only can decrease the cost of government purchasing service, but also can spread the risk effectively (see Figure 2). At present, service integrator has developed as a full service provider, which can use supply chain to integrate R&D and public service delivery through assembling or integrating general or special service producers to public service delivery and submit to the service planners eventually.
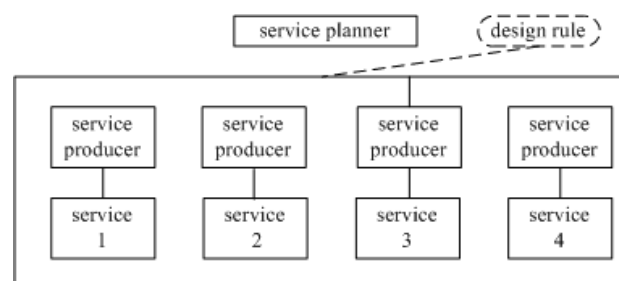

Figure 2. Government Purchase Public Service from Service Producer Indirectly

3.3 Analysis about the Effect between Two Modes of Government Purchase

In the mode of government purchase service from integrator indirectly, service planners provide a stable demand and close collaboration to service integrators and set up an external supply network which has a few producers and high stability. The model especially emphasis on the stability of the existing network of public service delivery, once certain service producer has problems, service integrators will help the service producer to improve the quality of supply through various ways instead of knock it out easily. In this mode, it is not a single service producer but multiple activities repeatedly at the same time and each service producer is responsible for handling individual information and limited information systems. So the visible information provided by different service producers is not necessarily the same, which is explained by service integrators from the angle of system environment, then feedback to the whole system in a simple form. It is obvious that each service producer handles the feedback information by comparison, explanation, choice and so on. Through disposing, communicating and exchanging the distributed information, the rule of connection among single service producer will be filtered continually which contribute to evolve the system. The service integrators develop the public service delivery system through integration of overall planning and finding the most appropriate service portfolio. On this point, the service integration acts as a role of path finder. In the development of interface standard and an optimal combination of the module, service integrators play an intermediary role. Although the service of government purchase is the services of integrator, but in fact, the public service is carried by all kinds of service producers respectively [8].

Under the mode of government purchase service producers directly, service planners utilize the market mechanism to achieve more effective through the competition of service producers in the external supply network. Under this mode, the status among existing and potential service producers is equal roughly, once existing service producers have problem with price, service and timeliness, they will soon be knocked out of the public service delivery network. And new service producers won't be discriminated because of the short cooperation history. In this mode, service planners are responsible for dealing with professional and exclusive system information and decide the connected rule of service beforehand.

In the process of government purchase service, only service planner has the right to change the rules even if great changes have taken place in the system environment. In a word, government acts as a designer. Because system information is invisible to others, government can provide contact information and rules, so the service producer is responsible for handling individual information what their own activities need under "visible" information. In these projects, the government prescribes designed rules in advance, including which service producers can participate; how to arrange and connect service producers; which standards are used to measure performance. Under the visible rules, service producers are encouraged to design public service freely.

Because of different effect of the two modes, this article will introduce the divisibility of public service to test which one is more effective based on contract theory.

4. Mode Selection for Government Purchasing Public Service under the Heterogeneity

Current popular theoretical tools to analyze the characteristics of public goods or public services are as follows: Savas (2002) analyzed the public goods or public services delivery by public-private partnership based on the "competitive - exclusive" frame of Samuelson (1954) [9]. Laking (1996) brought forth a "specificity – competitive" framework when he analyzed the the participants and methods to public services delivery [10]. Gidron (1992) proposed an "Fund raising-service delivery" framework when he analyzed the relationship of government and NPO [11]. Based on the research finding of Buchanan (1968) and Hansmann (1996), we proposed the heterogeneity of public service

can be divided into two dimensions: divisibility and Information asymmetry [12, 13]. Divisibility depends on the relationship between the total consumption X and consumers' personal consumption x_i. In which, totally divisibility can be expressed as $X = x_1 + x_2 + ... + x_n$, while totally indivisibility: $X = x_1 = x_2 ... = x_n$.

The degree of information asymmetry is related to how difficulty to evaluate the effect and benefit of services [14]. Table 2 Shows that a more detailed classification for public service.

Table 2. Initial Classification Framework of Public Service

		The degree of asymmetric information services		
		Low asymmetry	Moderate asymmetry	High asymmetry
Whether it is divisible for service revenue in the crowd	Divisibility	[divisibility, Low asymmetry] Example: TOEFL exam training	[divisibility, Moderate asymmetry] Example: vocational education	[divisibility, High asymmetry] example: the treatment of non-communicable diseases
	Partly divisibility	[Partly divisibility, Low asymmetry] Example: re-employment training	[Partly divisibility, Moderate asymmetry] Example: elderly care; childcare; delivery of student services donations	[Partly divisibility, High asymmetry] Example: general education; propaganda and treatment the knowledge of infectious diseases
	indivisibility	[indivisibility, Low asymmetry] Example: maintain the operation of forest ecosystems under the business model	[indivisibility, Moderate asymmetry] Example: advocacy of environmental protect	[indivisibility, High asymmetry] Example: basic cases research; policy research

Due to the existence of heterogeneity, it requires the government pay attention to the mode selection of government purchase public service. On the one hand, the government can purchase public service from service integrator indirectly, service integrator engages in a number of public service design and R&D and response to the conflict of public service. On the other hand, government can purchase public service from producer directly, government re-integrated the task module. From the cost perspective, the rent varies with the different mode.

5. Comparative Analysis of the Model of Government Purchase Service

5.1 The Mode of Purchasing Service Producers Directly

We introduce Peng's model (2011) to analyze [15]. We hypothesis service producers deliver public service 1 and public service 2, for simplicity, we assume that the degree of completion of the service i is $q_i \hat{1} \{0,1\}$, q_i is independent of each other and has the following distribution: $\mathrm{P_r}(q_i = 1) = a + ra_i - ra_j, i = 1, 2, j = 2, 1$

The Efforts to finish the service i is indicated by $a_i \hat{1} \{0,1\}$. Per effort for a given service generates cost $y^3 0$. Trying to improve the quality of public service to r, but the cost is reducing the quality of other service r (r indicates the degree of

heterogeneity for public service). Assuming the effort to finish two services is efficient, we have $\rho - \gamma > \psi$.

Assuming that the marginal cost of effort α_i is independent to α_j, there is no efforts replacement emphasized by Holmstrom and Milgrom (1991) [16]. The heterogeneity of public service may cause the single service producers costly. In fact, assuming the service producers are neutral risk, but resources are limited, that is, their profit is equal to funds by government (w) minus the cost of their efforts, and remuneration can't be negative. If the two services are integrated by service producers, then the government can provide a benefit both dependent on q_i, which is compensation plans w_{ij}. In a symmetric problem, $w_{01} = w_{10}$ we label as w_1. In addition, the government apparently intend to set $w_{00} = 0$. Defining $j = a + r - g$, the problem for government to settle is $\min\limits_{w_1, w_{11}} j^2 w_{11} + 2j(1-j)w_1$, so

$$j^2 w_{11} + 2j(1-)w_1 - 2y^3(j+g)(j-r)w_{11} + [(j+g) + (j-r) - 2(j+g)(j-r)]w_1$$
$$- yj^2 w_{11} + 2j(1-j)w_1 - 2y^3 a^2 w_{11} + 2a(1-a)w_1$$

Both incentive constraint indicates that service producers would rather put two times effort on the two services, not pay effort or effortless on a simple service. As a result, the optimal incentive scheme is $w_1 = 0$, and the second incentive constraint is tight which can be simplified to $j^2 w_{11} + 2y^3 a^2 w_{11}$.

Therefore, the optimal point is $w_{11} = \dfrac{2y}{j^2 - a^2}$, the rent leaving to service producers is $a^2 w_{11}$, that is $\dfrac{2a^2}{(a + r - g)^2 - a^2} y$.

5.2. The Model of Government Purchase Service from Integrator Indirectly

We assume that government purchases two items of public service from service producers. Government provides an incentive scheme to each service producer, if they all accept the scheme, the efforts of two service producers will satisfy Nash Equilibrium. Similarly, we assume that incentive scheme for each service producer may depend on two q_i at the same time. We discuss individual service producer here, according to symmetry, another service producer has the same incentive scheme. Obviously, in order to obtain a positive reward, service producer need to complete its task with high quality. If w_{11} and w_{10} are determined, the minimization cost of the incentive plan which satisfies $a_1 = a_2 = 1$ is:

$$\min\limits_{w_{10}, w_{11}} j^2 w_{11} + j(1-j)w_{10}$$

And $j^2 w_{11} + j(1-j)w_{10} - y^3(j-r)[(j+g)w_{11} + (1-j-g)w_{10}]$

Because each service producer only finish one service, so there is only one incentive restraint, given the second service producer's will reduce the quality of the first service producer from j to $\varphi - \rho$, at the same time, the second service producer's effort will increase from j to $j + g$. The best incentive scheme is $w_{10} > 0$, but $w_{11} = 0$. In intuitively, the other service producer's failure was encouraged, because it is an indicator

of high level of effort paid by service producers. Therefore, the optimal results
is: $W_{10} = \dfrac{y}{j(1-j)-(j-r)(1-j-g)}$, and the rent leaving for each service producer is

$\dfrac{(j-r)(1-j-g)}{j(1-j)-(j-r)(1-j-g)} j$.

5.3. Rent Comparison

We can decide whether to authorize a service integrator to deliver public service or authorize two service producers to deliver public service through the comparison of total rents. Obviously, it is better for the government to pay less rent.

Rent function of authorize a service integrator to deliver public service is:

$$f_1(g) = \frac{2a^2}{(a+r-g)^2 - a^2} y$$

Rent function of authorize two service producers to deliver public service is:

$$f_2(g) = \frac{2(a-g)(1-a-r)}{(a+r-g)(1-a-r+g)-(a-g)(1-a-r)} y$$

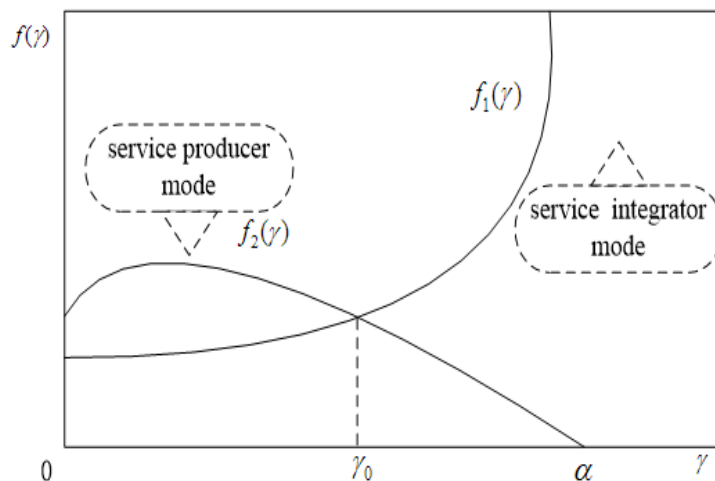Figure 3. Shows the rent function diagram of the two modes

Figure 3. Rent Funvtion of the Two Modes

The lateral axis g represents the degree of heterogeneity of two services; the vertical axis $f(g)$ represents the rent payable by government under the two modes. As Figure 3 shows, when the heterogeneity of public service is high, government will generally choose service integrator to deliver public service, when the heterogeneity of public service is low, the modules should be integrated by service planner.

We assume when $f_1(g) = f_2(g)$, result for g is g_0 (the critical value equal to two equations), simple analysis as follows:

(1) When $g < g_0$, $f_1(g) < f_2(r)$ the government pays less rent to the service producers, it is efficient for government to authorize more service producers to finish several task modules.

(2) When $g > g_0$, $f_1(g) > f_2(r)$ the government pays less rent to the service

integrators, it is efficient for government to authorize a service integrator to finish task modules.

(3) When $g = g_0$, the fees paid by government are equivalent in both modes, either mode can be selected.

6. Conclusion

According to this paper, there are two typical modes of government purchase public service including purchase service from service producers directly and purchase service from integrator indirectly. According to the study of Holmstrom and Milgrom (1991), in the absence of heterogeneity of service, multi-tasking is helpful to the government, which is more willing to authorize a single agent to implement two tasks instead of hiring two agents to implement one task. But as for government purchase service, the heterogeneity of public services exist exactly, the outcome will change with the introduction of heterogeneity variables of public service. The paper shows that during the process of government procurement of service, the degree of heterogeneity of public service influences the government's mode selection directly. When the heterogeneity of public service is high, government will generally choose service integrator to deliver public service, when the heterogeneity of public service is low, the modules should be integrated by government. However, the third division of government purchase service provides us an alternative mechanism design, but the number of qualified service integrator is limited at present. And what is more, with the stretched value chain of public service, integration or design from the top-level for public service leads to error accumulation due to the overlap of forecast, which makes the service producers have to face greater service deviations and resource depletion, and bring the risk by "push" supply.

Acknowledgements

References

[1] B. Weisbrod, "Toward a Theory of the Voluntary Nonprofit Sector in Three-Sector Economy", Phelps, E. Altruism Morality and Economic Theory. New York: Russel Sage, **(1974)**.
[2] G. White, "Civil Society", Decmocratization and Development, Democratization, vol. 1, no. 2, **(1994)**.
[3] E. Ostrom, R. B. Parks and G. P. Whitaker, "Patterns of Metropolitan Policing", Cambridge, MA: Ballinger, **(1978)**.
[4] E. S. Savas, "Privatization and Public-Private Partnerships", New York: Chatham House, **(2002)**.
[5] J. X. Yu and Y. X. Wu, "Innovations of Public Service Supply Mechanism: A New Analysis Framework", Academic Monthly, vol. 12, no. 41, **(2009)**.
[6] L. L. Ma and Y. B. Zhang, "Modular Supply Mechanism of Public Services in Networking Times", China Industrial Economics, vol. 9, **(2013)**.
[7] Y. Ke and S. Y. Wang, "Research of a New Form of Industry Organization: Modular Production Network", China Industrial Economics, vol. 8, **(2007)**.
[8] M. Aoki and H. Ando, "Modularity-The Essence of New Industrial Architecture", Toyo: Keizai Inc., **(2002)**.
[9] P. A. Samuelson, "The Pure Theory of Public Expenditure", The Review of Economics and Statistics, vol. 4, no. 36, **(1954)**.
[10] R. G. Laking, "Good practice in public sector management", issues for the World Bank. World Bank Working Paper, Washington, D. C, **(1996)**.
[11] B. Gidron, K. Ralph and L. M. Salamon, "Government and the Third Sector", San Francisco: Jossey-Bass Publishers, **(1992)**.

[12] H. Hansmann, "The Ownership of Enterprise", Cambridge, Mass: Belknap Press of Harvard University Press, **(1996)**.

[13] J. Buchanan, "The Demand and Supply of Public Goods", Indianapolis, IN: Liberty Fund, Inc., **(1968)**.

[14] H. Hansmann, "The Role of Nonprofit Enterprise", The Yale Law Journal, vol. 5, no. 89, **(1980)**.

[15] B. H. Peng, "Analysis on the Governance Pattern Selection of Modular Production Network", Industrial Economic Research, vol. 2, **(2011)**.

[16] H. B. Milgrom, "Multitask Principle Agent Analysis: Incentive Contracts, Asset Ownership, and Job Design", Journal of Law Economics and Organization, vol. 7, **(1997)**.