THE USE OF ECONOMIC PRICING MODELS IN GOVERNMENT PROCUREMENT

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ABSTRACT. The price mechanism has long been noted for its usefulness in allocating resource in a free market as market prices serve to signal consumers' interest and producers are able to use prices as a gauge for profitable investments. Public sector procurement relies mostly on long term contracts and negotiation, with goods and services being secured in non-market transactions. Although these mechanisms can ensure uninterrupted supply of high quality goods at a fair and reasonable price, (not necessarily the best price) they can result in a waste of government's resources. We review the usual process of securing goods and services in public sector and apply economic pricing models to public sector procurement.

INTRODUCTION

Microeconomic analysis is the foundation for the design and evaluation of policies as most public policy involves resource allocation. The objective of all economic activities (public sector as well as private sector) is the allocation of scarce resources among alternative uses to maximize individual welfare and in the end the community's satisfaction. To maximize utility there are often trade-offs as activities that yield greater levels of satisfaction are selected in exchange for those yielding

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less satisfaction. In the private sector, the price mechanism is used to allocate resources and generally, a greater level of demand leads to higher prices and more supply. For example, if more consumers decide to buy cars, the demand for cars increases and with unchanged supply, so will the price. With the higher price, car manufacturers will increase the quantity of cars supplied. Price has a signaling function; it provides information and incentives and helps with efficient the allocation of resources. When price increases because of stronger demand, it is a signal to producers to increase output.

As far back as the eighteenth century, the father of modern economics, Adam Smith (1776) had extolled the virtues of the price mechanism. In *An Inquiry into the Nature and Causes of the Wealth of Nations*, Smith concluded that economies using the price mechanism in which agents (consumers and producers) act in a decentralized and uncoordinated to maximize their own welfare, achieve maximum societal benefits. Consumers will signal their wishes through prices and investment will flow into the most profitable industries. With the price mechanism distributional and allocational efficiency is achieved as resources flow to the most profitable ventures.

Prices and output levels are affected by the structure of the market that ranges from perfect competition with large numbers of buyers and sellers of a homogeneous good to monopoly in which there is a single seller. In between the two extremes there are many variations of imperfectly competitive markets some with homogeneous goods and others with differentiated goods. Whereas in the perfect market neither one buyer nor one seller is not able to influence the price in the market (price taker), in the imperfectly competitive and monopolistic markets, producers are prices setters.

Research on procurement issues is fairly recent when compared to other areas of economics and public policy. A recent paper by Bajari and Tadelis (2001) indicates that the discussion surrounding procurement tends to model the procurement problem as one of ex ante asymmetric information problem coupled with moral hazard [See also Laffont & Triole (1993) and McAfee & McMillan (1987)]. In this situation the seller or agent supplying the goods or service has more information about the production and cost than the buyer or principal who is a public sector administrator. The interaction between buyer and seller culminates with the buyer and seller settling on a particular contract, in which case it

is said that the seller reveals his private information. This paper reviews the issues surrounding public procurement when the transactions are not conducted in a market. It first reviews the non-market procurement methods of the public sector and then makes the case for the use of the market as a better approach to public procurement policy.

WHY NON-MARKET PROCUREMENT?

In professional purchasing circles procurement is generally defined as covering the purchase of goods and services including for example, transport and stockholding. Although the market can help to determine whether or not socio-economic objectives of procurement are accomplished, and whether or not a government entity can fulfill its needs, still yet a very large fraction of goods and services are obtained through contracts and not through the market.

Non-market procurement occurs because "a government may wish to exercise caution by not immediately extending open competitive procurement methods to all of the services, before it has the necessary structures and personnel in place" (Warrillow, 1995: 24). For example, certain special skills needed by the public sector may not be readily found in the competitive market, and the nature of certain purchases (ex. National security purchases and the secrecy that surrounds them) cause government agencies to depend less on the competitive market.

Although state-owned enterprises often use the competitive market to procure their initial capital goods from a selected supplier, when it is time to extend or renew that equipment it is not always economical to go back to the competitive open market. This is so because of the probability that a second (different) supplier could provide capital goods that are not compatible with those that were purchased initially. There could be problems of technical incompatibility between the two sets of equipment. To reduce this possibility, limited tender action or negotiated settlement with the previous supplier seems to be the better option, provided that the supplier's past performance record is satisfactory. Some have even said that open competition procedures for public procurement "are time-consuming and that consequently busy buyers generally prefer to engage in selective tendering with qualified bidders" (Warrillow, 1995: 28).

Public procurement is discussed as a part of public financial management that deals with managing debt, cash, investments, and purchasing. Generally, public sector procurement is analyzed in terms of transaction cost, (the cost of making the transaction), for which master contracts, economies of scope, the use of information technology, and compliance monitoring play a major role. The transaction cost approach that is credited to Ronald Coase (1988), grew out of the theory of the firm and assumes that decision-makers behave in a way that is consistent with *bounded rationality*, in that they consider a restricted range of alternatives but in a rational way, as they seek to reduce the transaction cost of procurement. The idea presented by Coase (1988) is that transactions are not costless; they involve the cost of searching for trading partners and negotiating relevant prices. The use of other ways to secure goods and services could reduce transaction costs.

The transaction cost approach has been applied to some areas in public administration. For example, it has been applied to macro questions of budgeting by looking at both the emergence of and the effect of constitutional provisions and institutional rules on budgetary outcomes, to the budgetary process and policy issues such as legislative grants of discretion (Horn 1995). Although it seems relatively easy to apply transaction cost as the unit of account to public administration, research in this area is lacking. In fact Thompson and Jones (1986) and Thompson (1993) are two of the few who have applied transaction cost to public financial management issues like administrative grants and contracts to subordinate agencies.

Non-market procurement in the public sector using *cooperative purchasing* can minimize transaction cost. Information obtained from NASPO (1997) noted that "in 46 states there was statutory authorization for cooperative procurement with different units of government (such as local governments and state universities)" (Bartle 2002, 3). Cooperative purchasing government agencies come together and negotiate the price of the good needed with a seller. This is expected to provide the advantages of more buying power, more accurate and comprehensive specifications, and better vendor service [Aronson and Schwartz (1996)]. Furthermore, with cooperative purchasing, firms (especially those firms that are low volume purchasers) benefit from economies of scale and this reduces transaction cost that translates into lower prices for goods purchased by the public sector.

The use of *master contracts* in public procurement is another way to reduce transaction cost and is also preferred to market transactions. A master contract is an optional-use contract, established and administered by the Department of Information Services (DIS) for state and local government entities and qualifying non-profit organizations to purchase products and services directly from contractors. Master Contracts are used extensively by a large number of public sector agencies in the United States with many states having over 100 and some as much as 1,000 of these agreements (Bartle 2002, 3). Master contracts are used mostly for goods that are purchased repetitively by public sector agencies, items such as office supplies, vehicles and parts, food, computers, and software. In some states, for example, Massachusetts and Utah, over 80% of the goods are purchased through master contracts (Bartle, 2002, 4). Master contracts reduce transaction cost due to volume and low contract management costs.

Information technology (IT) and the establishment of e-procurement initiatives are also reasons why the public sector has opted for non-market transactions, as they have also helped to reduce transaction cost. Perlman (2001) reports that whereas it costs an average of about $125 to process a paper transaction, it only cost between $5 and $15 by doing so electronically. The use of IT allows for verification of approved funding, compliance of order to budgetary restrictions, and the encumbrance of funds. Information technology reduces paperwork, lessens the approval time, and improves the supply chain management process, all of which reduces transactions cost. Public sector officials see the use of IT and e-procurement as generating a saving and cause them to pay less attention to market transaction and securing goods and services at the lowest possible price.

The public sector also requires specific assets (defense) that are produced by very few firms and with some markets there is always the possibility of shortages. If supplies are not forthcoming in a timely way, there could be serious national consequences. In instances like these it is best for the public sector to use non-market transaction in the form of long term contracts in which delivery time and quality are specified. Long term contracts could also ensure compliance with the terms of a bid and reduce transaction cost. There is more interaction with the contractor/seller through the life of the contract and performance clauses, and compliance audits can be used to ensure on-time delivery.

From the discussion above in which market forces are not important in the procurement process, this does not guarantee that the purchase price is minimized. In the United States, public procurement accounts for around 10% of GDP (Bajari & Tadelis, 2001), and with this level of spending it is imperative that benefits are maximized. Also, the focus on transaction cost gives no indication as to whether the deal itself is good or bad. Joseph Petrillo (2002) also notes that focusing on transaction cost has a corrosive effect, as it streamlines the buying process and justifies reducing acquisition personnel. This could lead to the staff being stretched too thin to carry out their roles efficiently.

WHY THE PRICE MECHANISM?

Traditionally, public procurement has been based on contracts to a range of providers for goods and services. These contracts specify explicitly the service and performance criteria, and in some cases the contracts include penalties for non compliance. Budgetary restrictions, population growth, and more insistence on accountability have led to the demand for new practices in public service provision. Among the demands is the need to secure the lowest price for goods and service, this implying the use of a more market oriented approach.

The demand for a more market oriented approach is part of the *new public management,* an expanded view of reinventing government that began in the 1980s. Shortly after President Clinton was sworn into office in 1993, he created the National Performance Review with the goal of making the entire federal government less expensive and more efficient. The new public management is based on the following (Henry, 2004: 179)

1. Government should be entrepreneurial and improve the quality of service.
2. Government should collaborate and work with other governments and nonprofit and private sector to achieve social goals.
3. Government should judge its performance with measurable results.
4. Government should increase its accountability to the public interest, which should be understood in terms of law, community and shared values.

5. Government should empower its citizens and public alike.
6. Government should anticipate and solve problems.

Implied in the above is the need to procure goods and services at the minimum cost and this is usually done in a competitive market and not necessarily by negotiated contracts with a few select sellers.

In the traditional procurement model, obtaining goods and services by contracts could be described as adversarial: the public sector (principal) tries to find ways of procuring services from providers (agent) on beneficial terms. This relationship means the contract is used to "curb any opportunistic behavior on the part of the agent and reduce the agent's inherent advantage that could stem from asymmetric access to information" (Bovaird, 2006: 83). With the market mechanism, there is more emphasis on independent, utility maximizing, and less adversarial behavior. In the market, the process is seen as collaborative behavior in which each party is hoping to reap benefits from helping to make the transaction more successful (Bovaird, 2006; Lorange & Roos, 1992; Dror & Hamel, 1998).

Even when the contractual relationship is not adversarial, the objective of procurement officers is to obtain goods and services at a "fair and reasonable price". This unfortunately is not necessarily the lowest price as public sector agents tend to buy goods and services without regard for the profit, and does not seek to reduce expenditure because they get no direct benefit from this. If public procurement is done in a competitive market in which buyers and sellers determine the market price, there is a greater possibility of buying at an efficient market price. Furthermore, with procurement not based on market price, the agent may be overcharged with retaliation to overcharging unlikely to occur because failure to spend the allocated budget could be a cause to reduce future budget allocations. For the public sector administrator, a lower budget allocation means less manpower and prestige.

Niskanen (1971) research explains decision-making in the public sector by assuming that upper level bureaucrats are only interested in maximizing their salaries and prestige and this is done by maximizing their budgets. Niskanen (1971) model further assumes that bureaucrats have the power of perfect price discrimination, and along with the legislature (using the "public demand curve") they are able to determine the "maximum willingness to pay". However, only the bureaucrats are

assumed to know the least cost of production. Seeking to maximize their budget, public sector administrators tend to persuade politicians to accept the budget that maximizes their prestige and power. The budget that is chosen may not represent the best allocation of resources.

A market-oriented process is also needed because of "the growth in the number of interfaces between service commissioners (public sector agencies) and service providers in the procurement process" (Bovaird, 2006: 83) and the unbundling of services (Drucker, 1992; Hagel & Singer, 1999). The number of interfaces between public sector agencies and service providers has grown because of the rapid fragmentation of public sector agencies and providers into a larger number of organizations. Using the internet is ideal to find the lowest price for goods and services needed by the public sector and with a large number of providers, the competition that it generates could lead to large savings for the public sector. Furthermore, when a competitive market is not present, those who tender bids have no particular interest to disclose relevant information. Where bidders know there is no or limited competition, they are likely to ask for whatever price they think the buyer will accept. Also, when price is not the only factor, goods may be purchased on the basis of quality which could be difficult to determine.

We extend the analysis by including the international sector in which research on public procurement is also relatively new and scant and is limited mostly to research by Baldwin (1984), Miyagiwa (1991), and Brulhart and Trionfetti (2000). The law of comparative advantage specifies that international specialization and trade reduce the price of tradable goods and increase world output and economic welfare. This conclusion is given more emphasis when the Heckscher-Ohlin model of factor endowment is applied, and nations specialize in the goods for which they have abundance resources. The end result is that public sector procurement on the world market will lead to increased public sector savings as lower priced goods are often available on the world market.

Based on the reasons above, we recommend the use of the price mechanism in public sector procurement because it could cause a more efficient allocation of resources within the public sector. Even if the government was to insist on competitive bidding, contracting for specific quality of goods requires firms to have separate productions runs that increase production time and cost. The end result is that bid prices are generally high as they reflect supply conditions and complying with

government specifications and regulations. Government therefore ends up paying more for the item than for a similar product in a competitive market.

APPLYING THE MARKET MECHANISM TO GOVERNMENT PROCUREMENT

Microeconomic theory can be applied to the procurement decision in the public sector. Microeconomic theory postulates that provision of a good should be undertaken up to the point where the marginal social benefit equals the marginal social cost. The marginal social benefit of a good is the extra benefit obtained by making one more unit of the good available per period, and the marginal social cost is the minimum sum of money or price (P) that is required to purchase an extra unit of the good. For the public good that is provided freely to the population (defense), if we denote the marginal benefit per individual for public goods as MB_i, the sum of individual marginal benefits is ΣMB_i. The efficiency condition requires that the government should purchase this good to distribute to the population or inputs to make this good quantity as long as the cost of purchasing this good or the inputs to make this good is less than or equal to the sum of benefits to be derived from this good (Equation 1).

$$\Sigma MB_i \geq P \qquad [1]$$

If the public good is sold for a user fee and externalities are included in the analysis, the efficiency condition changes. In this case, benefit for the individuals paying the user fee is separated from those receiving the externality. The efficiency condition is given by equation [2] in which MB_i represents the benefit derived by the ith individual who pays the user fee and MB_j the jth individual receiving the externality. As with equation [1], P is the cost of the good to the government and U_i is the user fee paid by the ith individual. User fees are included in equation [2] on the right side of as helping to reduce the cost to the government. The right side of equation [2] represents the net cost of securing goods by the government. The efficiency condition with user fees and externalities as indicated by equation [2] requires the total benefits to be greater than or equal to the net cost to the government.

$$\sum_{i=1}^{n} MBi + \sum_{j=1}^{k} MB_j \geq \left[\mathrm{P} - \sum_{i=1}^{n} Ui \right] \qquad [2]$$

Most goods and services by the government are not distributed using the price mechanism and this makes it difficult to determine benefits received from the use of public goods. The standard way to determine benefits is to use individual's *willingness to pay* for a good. This is not a completely hypothetical situation when applied to the public sector because as expenditure on public goods increases, taxes also increase. If members of the public favor having a building for after school care rather than a four-lane highway, we can reasonably conclude that they are willing to pay more for the building than the highway. If we now ask each person in the community what he or she is willing to pay to have this 'additional' building and then sum the amounts, we obtain the marginal utility or benefit for the building for after school care. Based either on equation [1] or [2], the building should be procured if the sum of marginal benefits exceeds the cost to the government of purchasing this building in the market.

Marginal analysis is also applicable in decisions where the market price of the good is not constant. In this situation, the cost of obtaining additional resources is referred to as the marginal cost (MC). Adjusting equations [1] and [2] to include the marginal cost, efficiency requires that procurement should be driven by equating the sum of benefits (based on willingness to pay) to marginal cost. This means that the project should be undertaken up to the point where the benefit from the last unit purchased is equal to the cost of the last unit purchased.

$$\mathrm{MB} = \mathrm{MC} \qquad [3]$$

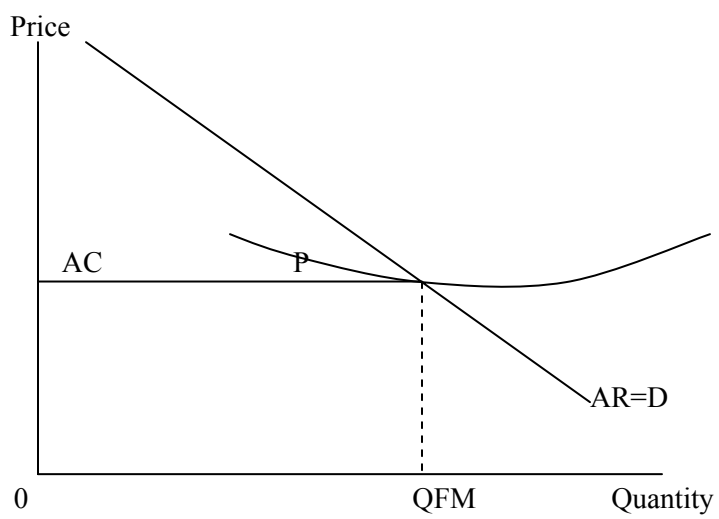
By changing the quantities and asking the same question (willingness to pay), the approach above can be used to trace out the collective demand curve or *the marginal willingness to pay curve*. This approach is similar to benefit cost analysis that can also provide meaningful answers regarding an individual's willingness to pay. Summing the individuals' willingness to pay results in the social benefits to society and the difference between social benefits and the cost to procure the good represents the net efficiency of the project. The government should procure a public good as long as the net efficiency is positive.

One of the earliest models of the behavior of public sector agencies was developed by Joseph Newhouse (1970) regarding the behavior of

hospital administrators who are assumed to maximize output and quality because it increases their sphere of responsibility and importance. This however does not mean maximizing profit and little attention is paid to minimizing cost. With the average cost curve indicating a certain level of quality, Newhouse (1970) model defined equilibrium where the average cost curve intersected the demand curve or average revenue curve.

In Diagram 1, Newhouse (1970) analysis is applied to the public sector's choice of obtaining inputs in the over-the-counter free market versus contractual arrangement. In Diagram 1, the AC represents the average cost of production when inputs are obtained in the over-the-counter free market. We assume that demand for public sector output (D) is the usual downward sloping curve, and due to the zero-profit assumption and no excess demand, the public agency will operate where the demand or average revenue curve intersects the AC curve at its minimum point. With the average cost lower in the free market due to competition, the economy is expected to gains more in terms of economic welfare.

DIAGRAM 1
Over-The-Counter Free Market Versus Contractual Arrangement

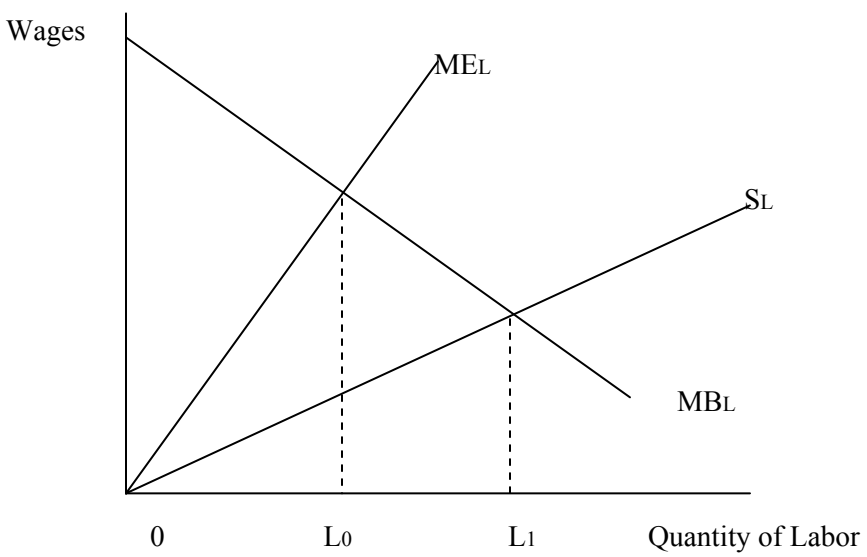


Public sector procurement can also be applied to the case where the government is one of many buyers in the labor market. Because the government competes with the privates sector for labor it must offer a comparable wage/fringe benefit package if it wants to attract qualified skilled labor. Also, because the quantity of labor supplied in the market varies directly with wages as labor generally work more at higher wages, the government faces a positively sloped labor supply curve. Facing an upward sloping labor market supply curve has significant implications for the public sector's marginal expenditures on labor.

Generally, as the government seeks to hire an additional worker it will have to offer a higher wage, and at the same time increase the wage rates of those already employed in order to keep them. This means that the *marginal expenditure* (ME_L) of additional employees is greater than the wage rate paid to the additional employee.

Diagram 2 illustrates the situation faced by the government. The wage-setting public sector faces an upward sloping labor supply curve

DIAGRAM 2
Public Sector's Marginal Expenditures On Labor



(S_L) and a marginal expenditure curve (ME_L) that is also upward sloping, but which is steeper than the supply curve.

If the government applies marginal analysis, and assuming that it is able to quantify benefits provided by labor, the market mechanism dictates that labor should be hired until the marginal benefit of the last worker equals the marginal expenditure (L_0). At this level of employment the government maximizes the net gains from labor or the benefit-cost ratio of labor exceeds one. However, if we accept the notion that the government is not a "net benefit maximizer" but simply seeks to provide the greatest amount of service by hiring the largest supply of labor that the budget affords, employment will now be at L_1 where the wage rate in the market equals marginal benefit, that is where net benefit from labor is zero or the benefit cost ratio is one.

Even if the public sector uses transactions cost to determine the amount of goods and services to contract, there is still a role for the market, and the process should take into account the structure of the market. Research by Sashi and Kudpi (2001: 195) notes that "the use of transaction cost and market structure analysis allows decision makers to appreciate how market selection and procurement decisions are related to an organization's strategic decision." Without the use of some form of market mechanism, even though the United States procurement system is a model of transparency, competition, and integrity, the procurement process is grossly inefficient (Schooner, 2002).

Although we have shown how the market mechanism could be applied to public procurement, there could be difficulties in its application. First, if goods are purchased by the public sector to be given away, benefits to the recipients are not easily identified. Even if direct benefits are identified, there could be the presences of positive externalities indicating that some goods are under supplied and negative externalities for oversupplied goods. In both cases, externalities make it difficult to asses the true benefit and cost from market transactions. Furthermore, the presence of externalities means that the market fails, and this failure means that the signaling and incentive function of the price mechanism is not operating efficiently, leading to a loss of economic and social welfare

The second challenge to Adam Smith's invisible hands idea is "Arrow's Impossibility Theorem" that shows that "there is no voting rule that always satisfies the desirable properties of a social choice

mechanism" (Stiglitz, 2000; 166). This means that sometimes the voting mechanism does not ensure a consistent group preference. Under the price mechanism, individuals vote by their purchasing power, and there could be instances where it is impossible to use information about individual preferences for goods to decide "the will of the people." As indicated by Hallgren and McAdams (1995), "even a competitive market is not a panacea for allocation of goods and services of all economic characteristics, and, in fact, it is not the economically-efficient solution for large classes of goods". This could help to explain why historical artwork is expensive as supply does not increase with demand.

The "Prisoner's Dilemma", a very famous "paradox" in Game Theory represents the third challenge to the market mechanism. In this paradox, there are two people acting in an informed manner that are seeking to maximize their welfare. However, in the end the choices that they make lead to a less than profit maximizing outcome for both. Apply this to Adam Smith's invisible hand idea leads to the options faced by the procurement agent and the seller. The choices they make to help determine benefits are similar to those made in an economic society: comply with the terms of the contract (remain silent) or default (confess). Although compliance with the terms of the contract will result in more gain for each party, the fact that each party is seeking to get more than that which was specified by the contract could result in less gain for both.

CONCLUSION

Even if government agencies decide to rely more on the price mechanism and buys goods and services over the counter, the unique aspects of the procurement system could make selling to the government unattractive. There are various procurement requirements, from laws, regulations, policies, and practices), and these could drive away potential sellers. Schooner (2001; 6) points out that private firms "fear the requirements related to tracking and disclosing cost data and other financial information, in conjunction with the government's broad audit rights, can lead to costly missteps …..and they are intimidated by scores of government unique terms and conditions and daunted by the prospects of granting unlimited rights to the government in their technical and proprietary data". And it is not the fear of the laws and requirements as it is the consequence of not adhering to the complex requirements. Businesses could be subject to criminal and civil sanctions for

incomplete or inaccurate disclosure, and there is a fear of the punishment that is endorsed by for example, the Civil False Claims Act (FCA). However, even with the unique aspects of the public procurement system the benefits that are generated by competition and price mechanism are large, and will makes public procurement on the free market most beneficial to the society.

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