

Research Paper

A Study on Reforming the Korean Public Procurement System

December 2018

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I

Introduction

The public procurement market (PPM) refers to the market upon which the government and the public sector purchase the goods, construction works, and services they need. The PPM in South Korea amounted to KRW 117 trillion in value as of 2016, making up a significant part of the Korean economy. It continues to grow steadily, with government and public sector spending of increasing amounts of tax revenue to purchase goods and services. Efficiency—obtaining the best value possible for the lowest price—is therefore the first and foremost principle of purchasing on this market. This efficiency varies widely depending on the parties with whom the government and the public sector enter into purchase agreements and the prices agreed.

The bidding contract system (BCS) is critical in the process by which the government and the public sector select their transaction partners and decide the prices to be paid. In many cases, bidding contracts refer to public tenders. As such, the BCS is a decisive factor in government performance in public procurements. The BCS directly shapes the ways in which bidders plan their tenders as well as the incentives that encourage them to participate. An efficient BCS should therefore be designed to encourage qualified bidders to submit the tenders that properly cater to government and public sector demands and also allow the government and the public sector to choose, in an open and fair manner, the bidder that makes the best offer.

The main subject matter of this study is the effect of the BCS on Korea's PPM on the efficiency of the public procurement contracts into which the Korean government has entered. Specifically, we survey and assess the characteristics and performance

of the BCS used in contracts on the supply of goods and construction services.

As with governments of other developed countries, the Korean government, too, considers not only the price of offers, but also the quality of goods and services potential suppliers are capable of providing, in granting bids on public procurement deals. The BCS in Korea therefore features not only a lowest price program, but also a qualification review, a general review, a dual-stage competition, and negotiation-based contract programs. In Chapter II, we analyze how each of these programs affects the efficiency of public procurement contracts, and which of these programs can have serious implications for competition among small and medium-sized enterprises (SMEs). Accordingly, we perform empirical analysis on how the contract performance capability review program and the limited lowest price program differ in their effect on the final prices at which SMEs supply their goods to the government and the public sector. As for cases where the targeted goods do not affect competition among SMEs, we empirically analyze how the qualification review program (considering both price and non-price factors), the dual-stage competition program, and the negotiation-based contract program influence the final prices of bids.

In Chapter III, we analyze the characteristics and performance of the BCS used in public procurement of construction services. In the past, the Korean government insisted on keeping architectural design and construction separate in public construction works. In February 2016, however, the Korean government replaced the lowest price program with the general review program, requiring consideration of both price and quality, concerning public construction projects valued at KRW 30 billion or more each. We analyze how the introduction of this new bidding program has affected the bid prices in construction, and whether the program is causing the Korean government to consider both price and quality as intended. Then we survey the characteristics of the qualification review program that the Korean government applies to construction projects under KRW 30 billion in value in which architectural design and construction remain separate. While the qualification review program, too, requires that the government consider both prices and quality, it has been criticized for being unable to adequately sort truly qualified bidders from less qualified ones. We assess the empirical characteristics of the qualification review program and in what specific types of construction projects the program fails to work.

II

Bidding Contract System for the Supply of Goods

1 Major Programs of the Bidding Contract System on the Korean Public Procurement Market

Our introduction of the programs of the BCS in Korea is based on the Act on Contracts to Which the State Is a Party (hereinafter “the ACS”). Before we proceed, however, we need first to understand the concepts of estimated price and projected price.

A. Estimated and Projected Prices

According to the Article 2 of the Enforcement Decree to the ACS, an estimated price refers to the price calculated, pursuant to the Act, for use as a criterion in international tender for public procurement contracts. Estimated prices also form an important foundation for decision-making in various programs of the BCS analyzed herein. For instance, goods whose estimated price, for the required quantity, falls below KRW 50 million can be procured from a supplier chosen as a partner for a private contract. The qualification review program (QRP) applies different qualification criteria depending on the levels of estimated price. Estimated prices are announced as part of notifications on an upcoming tender and may be used by potential bidders to estimate the scale of the public procurement project in which they are to participate.

A projected price, according to the same article of the Enforcement Decree

to the ACS, refers to the price that is determined prior to the completion of tender or conclusion of a contract so that the final contract price can be determined accordingly. Pursuant to Article 7.2 of the Enforcement Decree to the ACS, project prices are not to be disclosed before bids are held. In general, bidders who call prices higher than the given projected price are not chosen as winning bidders. Where there is a bid floor ratio to the projected price, bidders who offer prices below that ratio are also excluded from winning the bid.¹⁾

Because they form an important component of selecting winning bids in public procurement, the Korean government maintains multiple projected prices for each given contract to ensure that potential bidders remain unaware of the real projected price. Under the multiple projected price system, projected prices are determined randomly. The ordering party first announces a “basic price” as part of its bidding notification and selects 15 different projected prices that are within a two-percent range of the basic price, both higher and lower, and numbers these prices from one to 15. Each participating bidder randomly chooses two of these 15 projected prices by drawing lots. The four projected prices that are most frequently drawn are added up and divided by four to determine the final projected price. Under this system, neither the bidders nor the ordering party can know the final projected price to be used in the contract until the bid process is officially open. While this system prevents pre-bidding collusion, it also allows bidders who predict the final project price most accurately to win bids irrespective of their capability to perform the terms and conditions of their contracts most successfully.

B. Modes of Competition

The modes of competition for public procurement include general competition, limited competition, competition among nominated parties, and private contracts.

General competition involves allowing all participants meeting the minimum

1) The bid floor ratio refers to the minimum price that is a proportion of the projected price that bidders must offer. The bid price ratio refers to the ratio of a bidder's offer to a given projected price.

qualification to participate in competitive bidding, with the one making the best offer to the state winning the bid. Limited competition involves allowing only a selected few participants who meet quite strict qualifications to participate. Competition among nominated parties occurs among bidders who are designated by the state, instead of being selected according to predefined criteria. Articles 21 and 23 of the Enforcement Decree to the ACS defines the conditions under which the Korean government may call for limited and nominated competition. Major reasons for organizing these types of bidding include the need for specific technologies, processes, levels of performance and/or quality and also the need to increase public procurement from SMEs.

Private contracts allow the Korean state to enter procurement contracts with certain parties without resorting to competitive bidding and pursuant to the terms and conditions stipulated by law. Article 26 of the Enforcement Decree to the ACS defines the conditions under which these contracts may be used, which include situations of national emergency that leave no room for organizing competitive bidding, the need for goods or services that are exclusively produced by a single producer, the need to procure goods or services from SMEs with certain government certificates, the need to procure goods or services from businesses that provide jobs and social services for those with disabilities and other groups in need, and where the quantity of goods or services needed is so small that competitive bidding is inefficient.

While general competition is required, in principle, for public procurement of all types in Korea, the Korean government may resort to limited competition, competition among nominated parties, or private contracts, depending on the nature of goods or services concerned and policy purposes involved.

C. Programs of the BCS

The main programs of the Korean BCS include the qualification review program (QRP), the lowest price program (LPP), the limited lowest price program (LLPP), the negotiation-base contract program (NBCP), the dual-stage competition program (DSCP), and the desired quantity competition program (DQCP).

Pursuant to Article 42.1 of the Enforcement Decree to the ACS, the QRP is required, in principle, for all forms of bidding on public procurement. Under this program, the government must start the process of reviewing contract performance capabilities with the bidder that has made the lowest-price offer and other bidders in ascending order of the offered prices. The bidder who gains a score above a certain threshold in this review process then wins the bid. The government is to consider both price and non-price factors in this review of contract performance capabilities. Non-price factors include the bidder's prior record of performing government contracts, technological capabilities, financial status, conduct with past government contracts, quality of past services provided, ability to mobilize the resources and manpower needed, and plans for managing subcontractors. As for the price factor, the bidder who satisfies the given bid price ratio in comparison to the given projected price is given a perfect score. The specific criteria for review vary according to estimated prices and the nature of goods or services involved.

The LPP requires that the government grant a bid to the bidder making the lowest-price offer, even should all participating bidders offer prices below the given projected price. Although the QRP is required for all procurement contracts in principle, pursuant to the ACS, the LPP may be used instead with respect to the procurement of goods whose estimated prices fall below the announced prices.²⁾

The LLPP is similar to the LPP, but requires that the government announce the bid floor ratio first so that all participating bidders can offer prices higher than that ratio, with the bidder offering the lowest price winning the bid. According to Article 10.2 of the Government Bidding and Contract Execution Rules of the Ministry of Strategy and Finance (MOSF), in private contracts based on quotes submitted by two or more bidders, bidders must offer prices that are at least 88 percent of the bid floor ratio in order to qualify for consideration, with the bidder offering the lowest price required to win the bid. In effect, the LLPP induces bidders to offer prices that are 88 percent of the bid floor ratio.

2) Even if the estimated price falls below the announced price, the government may invoke the QRP where it deems this necessary to assess bidders' contract performance capabilities.

The NBCP requires the government to receive bid proposals from multiple bidders in matters of contracts for goods and services. The government should evaluate these bidders according to their proposals and hold negotiations with them before deciding who will win the bid. Under Article 43 of the Enforcement Decree to the ACS, the NBCP may be used instead of the QRP “in view of the special nature, technical nature and urgency of the execution of contract, the safety of public installations and other national security purposes.”

The DSCP may be used where it is difficult to create appropriate specifications for the goods or services required prior to entering a procurement contract, or where it is otherwise required by the nature of the contract involved. The government here calls for tender on specifications or technologies needed first, and then organizes a price bid among the bidders that have passed the first bidding stage, and from whom the winning bidder will be selected. In the second stage of competition, the government applies the LPP to award the contract to the bidder offering the lowest price. The DSCP can help prevent excessive competition among bidders over price, which may compromise the quality of the resulting product.

The DQCP is used, pursuant to Article 17.2 of the Enforcement Decree to the ACS, when the government needs a large quantity of goods or services, but it is impossible to procure the needed quantity from a single supplier. Under this program, each bidder is required to propose the portion of the desired quantity of goods or services it is capable of supplying, along with the unit price at which the goods/services are to be provided. The government then begins its selection by starting with the bidder that has offered the lowest price below the projected price, and continues selecting others until the desired quantity is satisfied.

2 Goods Procurement Contract Process

Now that we have outlined the programs of the BCS in Korea, we will summarize the process by which contracts for the procurement of goods are entered. Each agency of the Korean state identifies the type and quantity of

goods they need, sets aside funds for their purchase, and estimates the price they are willing to pay, based on the available funds. Where private contracts are possible, in light of the given estimated prices or other conditions recognized by law, the agency may enter them. Where private contracts are not an option, the agency must check whether the goods it seeks are subject to competition among SMEs. These goods are designated by the Administrator of the Small and Medium Business Administration, pursuant to Articles 6 and 7 of the Act on Facilitation of the Purchase of SME-Manufactured Products and Support for Development of Their Markets, as those in need of policy support for market development and expansion. If the goods the state agency needs fall into this category, the agency must organize limited competition or nominate qualifying SMEs. The agency also needs to organize a review of the contract performance capabilities of the participating SMEs, in a process similar to the QRP.³⁾ If, on the other hand, the goods to be purchased are not subject to competition among SMEs, the agency can resort to an appropriate bidding program pursuant to the ACS or the Local Contracts Act and announce the upcoming tender.

While estimated prices must be displayed in tender announcements, it is strictly forbidden to disclose projected prices before bidding takes place. In many cases, state agencies use the multiple projected price system to announce basic prices instead so that projected prices are determined on the basis of the preliminary prices selected by participating bidders. State agencies must determine the projected price upon the start of bidding and choose the winning bidder according to the rules of the chosen bidding program. The agencies then enter procurement contracts with the selected bidder(s). Once the contracts are performed, the bidders are paid the prices stipulated within them.

3 Data

The Open Public Procurement Portal (OPPP) is a web platform that publishes detailed information on government and public-sector bids announced via the

3) Other bidding programs may be used to ensure the efficiency of procurement or to support SMEs.

Korea Online e-Procurement System (KONEPS, www.g2b.go.kr), including details on bids organized and contracts signed. KONEPS is an official electronic platform of public procurement administered by the Public Procurement Service (PPS) and serves as the single channel through which the entire process of public procurement is digitally handled.⁴⁾ As of 2016, contracts worth a total of KRW 78 trillion had been entered on KONEPS, accounting for 67 percent of all public procurement deals.⁵⁾

In this study, we analyze the effects of the various programs of the Korean BCS with the data, published by the OPPP, on the public procurement contracts handled via KONEPS. The OPPP data includes both the national government contracts handled by the PPS without commission from any state agencies and the direct contracts entered into by individual state agencies. For this study, only the data on the former type of contracts was analyzed because it is difficult to control the endogeneity of the direct contracts as the data on these contracts lacks information on the legal grounds (variable “legal grounds”) on which the modes of competition and bidding programs were selected.

The Korean PPM encompasses over 6,000 goods and services. Analyzing the effects of different bidding programs on the entire PPM can complicate the interpretation of analysis findings due to the heterogeneity of the goods, services, and industries involved. As a result, we confined our focus to four major types of goods on the PPM: ready-mixed concrete (“remicon,” Sorting No. 30111505), asphalt concrete (“ascon,” Sorting No. 30111597), computer servers (Sorting No. 43211501), and concrete blocks (Sorting No. 30131502). <Table II-1> shows the years in which these goods were subject to competition among SMEs.

4) KONEPS introduction, http://www.g2b.go.kr/gov/koneps/pt/intro/intro_01.html (accessed October 26, 2017).

5) KONEPS Performance, http://www.index.go.kr/potal/main/EachDtlPageDetail.do?idx_cd=1374 (accessed October 26, 2017).

<Table II-1> **Analyzed Goods Subject to Competition Among SMEs**

Good	Year designated as subject						Remarks
	2011	2012	2013	2014	2015	2016	
Remicon	○	○	○	○	○	○	Exception applies to a maximum 20% of annual predicted quantities in Seoul, Gyeonggi, and Incheon (starting in 2013).
Ascon	○	○	○	○	○	○	
Computer servers	X	X	X	X	X	○	Limited to all x86 architecture-based CPU clock E3 and E5 products at 2.1 GHz or below.
Concrete blocks	○	○	○	○	○	○	

Source: "General Information on Public Procurements" (<http://www.smpp.go.kr/prd/prdinfo/smlpzbtwncmptprd/SelectSmlpzBtwnCmptprListVw.do>, accessed October 26, 2017).

A. Bidding Programs in Use

<Table II-2> summarizes, by frequency, the distribution of different bidding programs used in public procurement from 2011 to 2016. Limited competition and private contracts were the two most popular programs used with respect to the four analyzed goods, while the nominated competition program was not used on any occasion. Remicon, ascon and concrete blocks were also frequently submitted to reviews of SME contract performance capabilities as these goods were subject to competition among SMEs. The LLPP and the LPP were also frequently used with respect to these three goods as a result. As for computer servers, all bidding programs, including the DSCP, the QRP, the LLPP, the LPP, and the NBCP, were used.

<Table II-2> Distribution of Bidding Programs by Good & Frequency

	Category of goods				Total
	Remicon	Ascon	Computer servers	Concrete blocks	
Mode of competition					
Private contracts	1,585 (40.18%)	1,773 (53.26%)	449 (22.26%)	356 (72.65%)	4,163 (42.56%)
General competition	66 (1.67%)	32 (0.96%)	790 (39.17%)	1 (0.20%)	889 (9.09%)
Limited competition	2,294 (58.15%)	1,524 (45.78%)	778 (38.57%)	133 (27.14%)	4,729 (48.35%)
Nominated competition	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
Bidding program					
DSCP	0 (0.00%)	0 (0.00%)	150 (7.44%)	0 (0.00%)	150 (1.53%)
Other (on-site bidding)	39 (0.99%)	27 (0.81%)	0 (0.00%)	1 (0.20%)	67 (0.69%)
QRP	49 (1.24%)	13 (0.39%)	589 (29.20%)	1 (0.20%)	652 (6.67%)
LLPP	626 (15.87%)	210 (6.31%)	327 (16.21%)	64 (13.06%)	1,227 (12.54%)
SME capability review	2,073 (52.55%)	1,411 (42.39%)	1 (0.05%)	130 (26.53%)	3,615 (36.96%)
LPP	986 (24.99%)	1,536 (46.14%)	418 (20.72%)	294 (60.00%)	3,234 (33.06%)
NBCP	0 (0.00%)	0 (0.00%)	532 (26.38%)	0 (0.00%)	532 (5.44%)
DQCP	172 (4.36%)	132 (3.97%)	0 (0.00%)	0 (0.00%)	304 (3.11%)
Total	3,945 (100.00%)	3,329 (100.00%)	2,017 (100.00%)	490 (100.00%)	9,781 (100.00%)

Note: Figures in parentheses indicate the proportion to the total number of competitions or bids held for each category of goods.

<Table II-3> summarizes the correlation between the modes of competition and the bidding programs used. Private contracts were mostly chosen on the basis of the LPP or the LLPP, while the review of SME contract performance capabilities was used only in limited competition situations.

〈Table II-3〉 Modes of Competition & Bidding Program Used

Bidding program	Mode of competition			Total
	Private contracts	General competition	Limited competition	
DSCP	0	87	63	150
Other (on-site bidding)	59	0	8	67
QRP	0	200	452	652
LLPP	1,227	0	0	1,227
SME capability review	3	0	3,612	3,615
LPP	2,874	171	189	3,234
NBCP	0	383	149	532
DQCP	0	48	256	304
Other	4,163	889	4,729	9,781

The cause of these regular patterns between the modes of competition and the bidding programs used can be found in the legal grounds upon which state agencies choose the bidding programs to be used. For example, the review of SME contract performance capabilities always coincides with limited competition because Article 7 of the Act on Facilitation of the Purchase of SME-Manufactured Products requires that the government and its agencies resort to limited or nominated competition for SMEs when they procure goods subject to competition among SMEs.

As a matter of fact, the variable of “legal grounds” is a strong indicator of which bidding programs are used under each given mode of competition. We therefore used this variable to control, at least partially, the problem of endogeneity in our analysis of the effects of bidding programs. The correlation between the legal grounds and the modes of competition can be summarized as follows. First, the Korean government and its agencies mainly use private contracts in cases where there are only single producers of the goods to be procured, where the procurement bidding has been announced at least twice, where the estimated price of the goods to be procured falls below KRW 50 million, and where goods invented by SMEs are to be procured. Second, limited competition is used mainly in the procurement of goods subject to competition among SMEs, where SMEs are to be given special preferences as suppliers of

goods, and where there are only limited locations at which the goods to be procured—falling under the prices announced—are produced. Third, the LLPP is mostly used in relation to private contracts involving estimated prices of less than KRW 50 million. Fourth, the review of SME contract performance capabilities occurs in most situations in which goods subject to competition among SMEs are to be procured. Finally, the LPP is used mostly for private contracts involving estimated prices equivalent to, or greater than, KRW 50 million and other legally recognized causes calling for private contracts.

〈Table II-4〉 Distribution of the Modes of Competition Used, by Legal Grounds

Legal grounds	Mode of competition			Total
	Private contracts	General competition	Limited competition	
Unknown	2	0	19	21
Single producer	1,048	0	0	1,048
Dual-stage competition	0	85	0	85
Limited manufacturing locations (below announced prices)	0	0	366	366
Benefitting those with disabilities, etc.	10	0	0	10
Liquid assets sold	0	2	0	2
Certification under Industrial Standardization Act	0	0	62	62
Construction requiring proven record of capability	0	0	2	2
General competition	0	333	0	333
Re-announced bidding	1,428	0	8	1,436
QRP	0	64	0	64
Goods subject to SME competition	0	0	3,723	3,723
Goods invented by SMEs	376	0	0	376
SMEs to be preferred	0	0	531	531
National emergencies, etc.	32	0	0	32
Estimated prices below KRW 50 million	1,266	0	0	1,266
Special technology/equipment	0	0	18	18
Special supplier	1	0	0	1
NBCP	0	365	0	365
DQCP	0	40	0	40
Total	4,163	889	4,729	9,781

〈Table II-5〉 Distribution of Bidding Programs Used, by Legal Grounds

Legal grounds	Bidding program								Total
	DSCP	Other (on-site bidding)	QRP	LLPP	SME capability review	LPP	NBCP	DQCP	
Unknown	0	0	0	2	19	0	0	0	21
Single producer	0	10	0	0	0	1,038	0	0	1,048
Dual-stage competition	85	0	0	0	0	0	0	0	85
Limited manufacturing locations (below announced prices)	0	0	145	0	52	154	15	0	366
Benefitting those with disabilities, etc.	0	0	0	0	0	10	0	0	10
Liquid assets sold	0	0	0	0	0	2	0	0	2
Certification under Industrial Standardization Act	0	0	25	0	5	2	0	30	62
Construction requiring proven record of capability	0	0	0	0	2	0	0	0	2
General competition	2	0	136	0	0	169	18	8	333
Re-announced bidding	0	56	0	0	0	1,380	0	0	1,436
QRP	0	0	64	0	0	0	0	0	64
Goods subject to SME competition	1	0	2	0	3,462	26	7	225	3,723
Goods invented by SMEs	0	0	0	0	0	376	0	0	376
SMEs to be preferred	62	0	269	0	72	3	124	1	531
National emergencies, etc.	0	1	0	0	0	31	0	0	32
Estimated prices below KRW 50 million	0	0	0	1,225	3	38	0	0	1,266
Special technology/ equipment	0	0	11	0	0	4	3	0	18
Special supplier	0	0	0	0	0	1	0	0	1
NBCP	0	0	0	0	0	0	365	0	365
DQCP	0	0	0	0	0	0	0	40	40
Total	150	67	652	1,227	3,615	3,234	532	304	9,781

4 Bidding on Goods Subject to Competition Among SMEs: Review of SME Contract Performance Capability vs. the LLPP

In principle, goods subject to competition among SMEs must be procured in a process closed to the participation of large corporations. Either limited competition or competition of nominated SMEs should be used with respect to these goods. In the preceding section, we confirmed that, of the four analyzed categories of goods, remicon, ascon, and concrete blocks were goods subject to competition among SMEs and therefore procured via limited competition and on the basis of the review of SME contract performance capabilities.

An interesting topic of analysis is whether replacing the SME capability review with another bidding program would make any difference to successful bid rates concerning goods subject to competition among SMEs. The data available to us, however, shows that the Korean government and its agencies did not use all the various bidding programs when they procured goods subject to competition among SMEs. We therefore limit our empirical analysis on this topic to only a limited range of the bidding programs that have actually been used.

In this study, we compare the effects of the review of SME contract performance capabilities and the LLPP. Pursuant to Article 7.1 of the Enforcement Decree to the Act on Facilitation of the Purchase of SME-Manufactured Products, state agencies seeking to procure goods subject to competition among SMEs may resort to private contracts if other applicable laws permit them to do so for public procurement of such goods. Article 26.1.5 of the Enforcement Decree to the ACS, for example, allows state agencies to procure goods with estimated prices below KRW 50 million through private contracts. We confirmed earlier that the LLPP was the bidding program of choice where private contracts on goods with estimated prices below KRW 50 million were concerned. We therefore analyzed the effects of the SME capability review and the LLPP on contracts involving goods priced around KRW 50 million to examine how the use of these two different programs affected the successful bid rates differently.

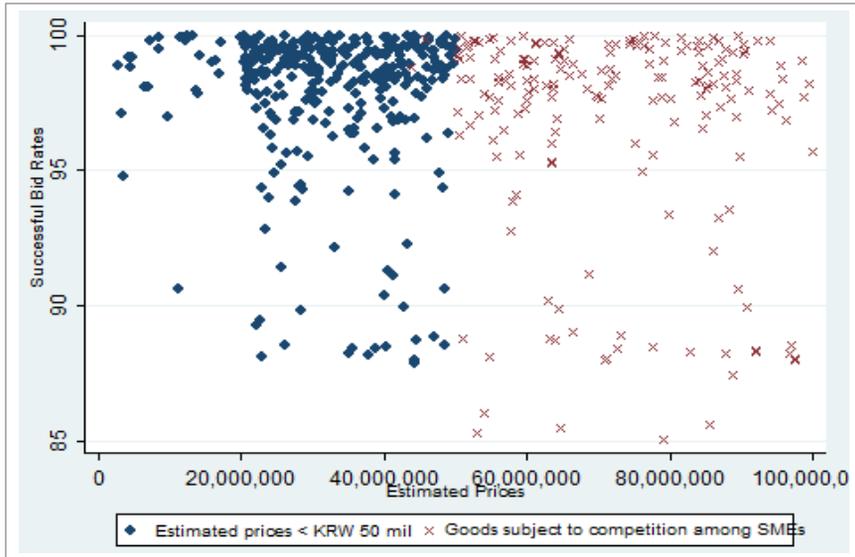
There are other grounds recognized by law upon which state agencies may

resort to private contracts (e.g., where the needed goods are produced exclusively by a single producer, where the bidding announcement has been repeated, and where goods invented by SMEs are involved). In these situations, state agencies resort to the LPP and not the LLPP. Contrary to expectations, it is realistically impossible to compare the effects of the SME capability review and the LPP, as the latter is used with private contracts in special circumstances, such as when there are no other producers producing similar goods and when the goods to be procured are those invented by SMEs. Making a comparison between the SME capability review and the LPP in a simplistic manner would therefore give rise to the problem of endogeneity by leading the researcher to neglect unobservable factors.

In this study, henceforth, we limit our comparative analysis to the SME capability review and the LLPP only, with a view to determining whether the current limit on the use of private contracts for goods with estimated prices of KRW 50 million or below is conducive to the efficiency of public procurement contracts.

Directly comparing the two programs may give rise to endogeneity due to the estimated prices involved. The estimated prices of goods procured on the basis of the SME capability review tend to be larger than those of goods procured under the LLPP. This difference may be the cause of variation in successful bid rates. We therefore limited our analysis to goods with estimated prices below KRW 100 million. [Figure II-1] shows the distributions of estimated prices and successful bid rates by legal grounds. As expected, state agency use of bidding programs most markedly differs around the estimated price line of KRW 50 million.

[Figure II-1] Estimated Prices & Successful Bid Rates for Remicon, Ascon & Concrete Blocks, by Legal Grounds (Estimated Prices Below KRW 100 Million)



For ease of analysis, let us assume there is no difference in quality between remicon, ascon, and concrete blocks provided via procurement contracts with estimated prices less than KRW 100 million. The main determinant of the estimated prices of these goods is the quantity to be procured, so this assumption is not too far-fetched.

The descriptive statistics show significant differences in the number of bidders and the successful bid rates even when the same bidding program was used. We therefore calculated the average number of bidders and the average successful bid rates for the two programs. Then we analyzed the main variables involved in public procurement deals with estimated prices less than KRW 100 million and based on two legal grounds, i.e., estimated prices below KRW 50 million and goods subject to competition among SMEs.⁶⁾

6) Whereas the majority of remicon, ascon and concrete block procurement contracts based on the SME capability review cite goods subject to competition among SMEs as the legal grounds for choosing private

The first fact we notice is that the average successful bid rate tends to be the highest and the average number of bidders tends to be the smallest in the case of remicon. Furthermore, while the use of different bidding programs made little difference to the average successful bid rate for remicon, the average successful bid rates differed significantly according to the bidding programs used for ascon and concrete blocks. This suggests that the nature of the given industry is another major variable of the successful bid rate. Overall, the average successful bid rate based on the SME capability review was not significantly larger than the rate based on the LLPP.

〈Table II-6〉 **Descriptive Statistics: Remicon, Ascon, & Concrete Block Contracts with Estimated Prices Below KRW 100 Million**

Category	Bidding program	Statistics	Estimated price	Number of bidders	First-order bidding price rate	Successful bid rate
Remicon	LLPP	Mean	33	1.67	98.2	98.2
		S.D.	10	0.555	2.25	2.17
		Obs.	625	347	223	216
	SME capability review	Mean	71	2.08	98.1	98
		S.D.	15	0.35	1.96	1.95
		Obs.	475	118	106	101
Ascon	LLPP	Mean	33	2.98	96.8	97.2
		S.D.	9	6.06	3.95	3.54
		Obs.	209	132	88	82
	SME capability review	Mean	72	2.29	96.3	96.2
		S.D.	16	0.981	4.26	4.3
		Obs.	291	86	79	76
Concrete blocks	LLPP	Mean	31	2.31	95.9	95.9
		S.D.	9	1.26	3.9	3.9
		Obs.	64	26	17	17
	SME capability review	Mean	69	5	90.4	90.4
		S.D.	12	3.24	5.2	5.2
		Obs.	46	17	15	15

Note: The legal grounds cited are limited to "goods subject to competition among SMEs" and "estimated prices below KRW 50 million."

contracts, there are small numbers of private contracts involving other legal grounds as well. Similarly, the most cited legal grounds for private contracts based on the LLPP is an estimated price below KRW 50 million. For a more rigorous analysis, we compared the effects of these two bidding programs on the basis of the legal grounds cited as well. Omitting the legal grounds variable, however, would have made little difference to the conclusion of our analysis.

We can think of mainly two ways in which the bidding program affects the successful bid rate. On the one hand, it may make a difference to the number of participating bidders and therefore decide the intensity of competition. On the other hand, the same number of bidders may participate, but the difference in the way the winning bidder is chosen may affect the successful bid rate. Earlier we confirmed that bidding program influence on successful bid rates varied by the type of goods concerned. To determine the exact path(s) by which this influence arose, we performed a regression analysis, with the dependent variable the successful bid rates expressed as percentages, and the basic variables the SME capability review and concrete block dummy variables. We also sought to identify differences in the level of intensity resulting from differences in the

〈Table II-7〉 Effects of the LLPP & SME Capability Review on Successful Bid Rates

Successful bid rate	(1)	(2)
LLPP dummy	2.097 (1.451)	4.488*** (1.621)
Remicon dummy	0.804 (0.942)	1.937** (0.929)
Ascon dummy	0.501 (0.974)	1.124 (0.990)
SME capability review* remicon	3.073** (1.449)	5.985*** (1.545)
SME capability review* ascon	1.933 (1.535)	5.024*** (1.630)
Estimated prices	-0.020** (0.010)	-0.035*** (0.011)
Number of bidders	-1.250*** (0.264)	n/a
Constant	97.910*** (1.597)	92.251*** (1.521)
Year dummy	Y	Y
R ²	0.3557	0.2520
Obs.	507	507

Notes: 1. Of contracts with estimated prices below KRW 100 million, only the contracts whose cited legal grounds were either "goods subject to competition among SMEs" or "estimated prices below KRW 50 million" were analyzed.

2. The unit for the estimated price variable is KRW 1 million.

3. The asterisks, *, **, and ***, respectively indicate significance levels of 10, five, and one percent.

4. Figures in parentheses indicate standard errors.

number of bidders by including the number of bidders as a variable in one model and excluding it from the other. We also included a term of interaction between bidding programs and categories of goods to see whether the effects of bidding programs varied by the type of goods concerned.

Our analysis revealed that, with the number of bidders held the same, bidding programs did make a difference to the successful bid rates. Specifically, the LLPP applied to remicon contracts had the effect of lowering the successful bid rate by 3.07 percentage points, when the number of bidders was held the same, while the same program did not exert a statistically significant influence on the successful bid rates concerning the other two types of goods. When we allowed the bidding programs to determine the number of participating bidders, however, the LLPP increased the successful bid rates on concrete blocks by 4.49 percentage points in comparison to the SME capability review. Conversely, the LLPP brought the successful bid rate 1.5 percentage points lower than was the case under the SME capability review. Similarly, in procuring ascon worth less than KRW 100 million in estimated price, the LLPP ensured greater efficiency (lower successful bid rates) than the SME capability review.

These results of our analysis suggest that the effects of bidding programs measured, with the number of bidders controlled, reflected the very designs of the programs, which failed to make significant differences to successful bid rates on ascon and concrete blocks. The results of our analysis, without the number of bidders controlled, reflected the effects of both program designs and given level of competition. In this case, the LLPP did lower the successful bid rate on ascon, albeit marginally, while raising the successful bid rate on concrete blocks by 4.49 percentage points. The two models of regression analysis we used therefore indicate that the differences in successful bid rates observed with respect to ascon and concrete blocks were solely the effect of the given level of competition. As the LLPP applied to ascon contracts increased the number of participating bidders on average, the successful bid rate dropped. In contrast, the LLPP applied to concrete blocks decreased the number of participating bidders, thereby raising the successful bid rate. When the number of bidders was not controlled, the LLPP applied to remicon brought the successful bid rate 3.07 percentage points lower than was the case with the SME capability review. When the number of investors was controlled, the bid rate dropped by

1.5 percentage points. This suggests that, by design, the LLPP is capable of bringing the successful bid rate 3.07 percentage points lower than does the SME Capability review, but the reduced number of bidders participating under the LLPP reduced the margin of decrease to 1.5 percentage points.

The findings of our analysis convince us of the importance of designing bidding programs so as to maximize bidder participation. Even if bidding programs were to be designed with built-in mechanisms for deciding the winning bidder and the winning bid price, it is still important to increase the number of participating bidders, by changing the channels of participation if necessary, in order to enhance the efficiency of public procurement. For instance, the custom of letting only cooperatives participate in bidding is what keeps the level of competition over remicon and ascon procurement contracts relatively low.⁷⁾ The government may therefore increase participation by either banning cooperatives from submitting tenders or by limiting the quantity of goods that each single cooperative may supply. As the level of participation under different bidding programs varies significantly according to the structures of the given industries, it is also important to devise legal and policy means to apply different bidding programs to different types of goods or industries.⁸⁾

5 Consideration of Price & Non-Price Factors: DSCP vs. NBCP vs. QRP

Computer servers are open to a relatively wider range of bidding programs than remicon, ascon, and concrete blocks. All goods in this category were exempt from competition among SMEs until 2015, so analysis of the contracts involving computer servers can shed light on implications for the procurement of goods not subject to competition. Here we analyze computer server contracts to examine

7) "Public Procurement Service to Increase Competition for Remicon and Ascon Procurement," May 20, 2017, <http://www.yonhapnews.co.kr/bulletin/2017/05/30/0200000000AKR20170530038000063.HTML> (accessed December 1, 2017).

8) Park and Kim (2005), suggested applying different bidding programs to different types of construction processes or works in public construction contracts.

the effects of bidding programs that take non-price factors into account, i.e., the QRP, the DSCP, and the NBCP.

Article 42.1 of the Enforcement Decree to the ACS requires, in principle, that the QRP be the first bidding program of choice for public procurement contracts. The QRP requires the state and its agencies to start the process of reviewing the price and non-price factors and qualifications of bidders with the bidder that has submitted the lowest price below the projected price so that the bidder that is the first to obtain a certain general score wins the bid. The state, however, may resort to the DSCP instead of the QRP with respect to contracts for which it is impossible to prepare appropriate specifications in advance or where it is necessary in light of the technology or contract involved. For the expertise, technological requirements, or urgency of given contracts and/or other reasons relating to national security, the state may also resort to the NBCP instead of the QRP.

By law, these three bidding programs are used in cases where not only prices, but also non-price factors, matter. In this section, our goal is to determine which of these three programs is the most efficient way of granting government contract bids. Because we had no access to information on the quality of computer servers supplied, we tried, once again, to control indirectly for the differences in the quality of computer servers by limiting the price range.

As with the analysis of remicon, ascon, and concrete blocks, we first sought to control endogeneity by limiting the scope of computer server contracts under analysis to those citing certain legal grounds. See <Table II-8> for a summary of the legal grounds cited and the bidding programs used.

<Table II-8> Legal Grounds & Bidding Programs in Computer Server Contracts

Legal grounds	Bidding program				Total
	DSCP	QRP	LPP	NBCP	
DSCP	85	0	0	0	85
General competition	2	112	149	18	281
QRP	0	59	0	0	59
NBCP	0	0	0	365	365
Total	150	589	418	532	2,017

Contracts citing the QRP, the NBCP, and the DSCP as legal grounds applied both the mentioned bidding programs and the general mode of competition to select winning bidders. Contracts citing general competition as their legal grounds, too, used general competition to select winning bidders. The LPP, however, was especially frequently used in the case of contracts citing general competition, most likely in compliance with Article 42.2 of the Enforcement Decree to the ACS. The Decree requires contracts on goods whose estimated prices fall below the announced prices be decided according to the LPP, with the QRP used only in exceptions where a review of supplier contract performance capabilities is required. We therefore limited our analysis to computer server contracts that announced the DSCP, general competition, the QRP and the NBCP as the official modes of bidding and excluded contracts that announced the LPP as the official mode. By limiting the contracts subject to our analysis, we sought to control for the effects of differences in both the prices and quality of computer servers.

〈Table II-9〉 **Descriptive Statistics: Computer Server Contracts with Estimated Prices Below KRW 600 Million (DSCP, QRP, NBCP)**

(Units: KRW million, number of contracts, number of persons, percentage)

Bidding program	Statistics	Estimated price	Number of bidders	First-order bidding price rate	Successful bid rate
DSCP	Mean	221	2,33	94,4	94,4
	S.D.	148	0,569	6,46	6,46
	Obs.	80	61	57	57
QRP	Mean	340	15,8	87,2	88,7
	S.D.	109	31,9	6,83	7,01
	Obs.	145	143	143	130
NBCP	Mean	306	2,45	96,3	96,4
	S.D.	147	0,819	7,56	7,37
	Obs.	212	148	140	139

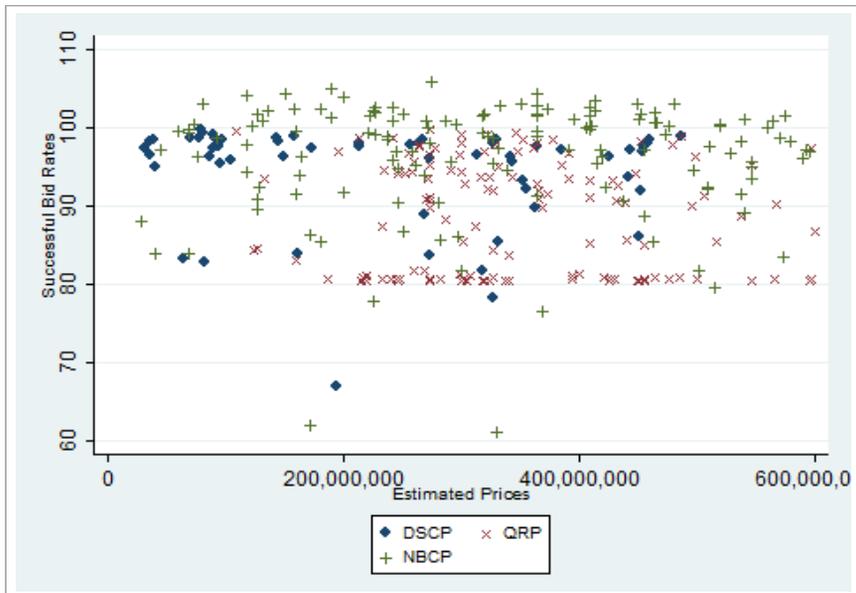
Note: The legal grounds cited were limited to "goods subject to competition among SMEs" and "estimated prices below KRW 50 million."

Because the mean estimated price of contracts under the NBCP departed significantly from the mean prices of other bidding programs, we set the ceiling on estimated prices at KRW 600 million in our analysis. [Figure II-2] illustrates the distribution of computer server contracts we analyzed, by estimated price

and successful bid rate. The descriptive statistics of major variables suggest that the estimated prices of different bidding programs have been controlled somewhat. Based on this finding, let us assume that no differences in quality tied to bidding programs exist. The descriptive statistics show that the successful bid rate is lowest under the QRP and highest under the NBCP.

As in the case of remicon, ascon, and concrete blocks, the differences in successful bid rates may stem from the differences in the levels of competition (i.e., the number of bidders) as much as from differences in the bidding programs. We thus performed a regression analysis to determine the path(s) by which these differences in the effect were generated. As our analysis this time concerned computer servers only, we did not include a term of interaction between the category of goods and the bidding programs. The basic variables of reference were those of the QRP.

[Figure II-2] Distribution of Computer Server Contracts with Estimated Prices Below KRW 600 Million by Estimated Price & Successful Bid Rate (DSCP, QRP, NBCP)



〈Table II-10〉 Effects of the DSCP, QRP, & NBCP on Successful Bid Rates

Successful bid rate	(1)	(2)
DSCP dummy	4.368*** (1.098)	5.438*** (1.097)
NBCP dummy	6.545*** (0.889)	7.717*** (0.866)
Estimated price	-0.001 (0.710)	-0.001 (0.003)
Number of bidders	-0.085*** (0.019)	-
Constant	91.477*** (1.257)	87.890*** (1.471)
Year dummy	Y	Y
R ²	0.2618	0.2145
Obs.	326	326

Notes: 1. Of contracts with estimated prices below KRW 600 million, only those whose cited legal grounds in official announcements were "DSCP," "general competition," "QRP," and "NBCP" and not "LPP" were analyzed.

2. The unit for the estimated price variable is KRW 1 million.

3. The asterisks, *, **, and ***, respectively indicate significance levels of 10, five, and one percent.

4. Figures in parentheses indicate standard errors.

Our analysis shows that, when the number of investors was controlled, the DSCP increased the successful bid rate by 4.37 percentage points on average over the QRP, while the NBCP raised the rate further, by 6.55 percentage points. When the number of investors was not controlled, the margins of increase rose further by one percentage point in both cases. The successful bid rates are higher under the DSCP and the NBCP than the QRP, suggesting that program designs and not the level of competition were the determinants of successful bid rates. For computer servers of the same quality, therefore, it would be most efficient for the government to apply the QRP. However, we should not over-generalize this conclusion and apply it to the procurement contracts on other types of goods.

6 Conclusion

This chapter provides analysis on how bidding programs affect the efficiency of public procurement contracts. First, we analyzed the difference in successful bid rates created by applying the SME capability review and the LLPP to the procurement of goods subject to competition among SMEs. Our analysis based on remicon, ascon, and concrete blocks—well-known examples of goods subject to competition—showed that the effects of the bidding programs varied by the type of goods concerned. This finding may seem natural, but it suggests the need for state agencies to analyze information on the goods subject to competition among SMEs and with estimated prices below KRW 100 million with a view to determining the most efficient bidding program to be used. Our analysis showed that the LLPP is the more efficient for use with respect to remicon and ascon when their estimated prices are below KRW 100 million. On the other hand, the SME capability review, by subjecting candidate SMEs to limited competition, is the more efficient form of bidding for concrete blocks. Much of the effect of the bidding programs on successful bid rates also stemmed from the difference in the number of investors. To increase the efficiency of public procurement contracts on goods subject to competition among SMEs, it is also important to redesign bidding programs so as to maximize participation by potential bidders.

Next, we analyzed the efficiency of bidding programs applied to goods not subject to competition among SMEs. Specifically, we analyzed information on computer server contracts under the QRP, the DSCP, and the NBCP. Assuming that the quality of computer servers remains the same, the QRP was the bidding program with the lowest successful bid rate in general. Contrary to the case of goods subject to competition among SMEs, it was the very design of the bidding program that exerted greater effect on the successful bid rates of computer servers than did the number of investors. This conclusion, however, may be particular to computer servers only, and the QRP may not be the most efficient bidding program with respect to other goods. Nevertheless, our analysis is significant as it affirms the possibility of finding the most efficient bidding program for procuring certain types of goods.

Our analysis carries a number of shortcomings. The heterogeneity of the types of goods analyzed could well limit the applicability of the findings of our analysis. Although we sought to avoid this problem by narrowing down the scope of our analysis to only a few categories of goods, it may not be possible to generalize the findings of our analysis for application to all types of goods and bidding programs. Yet the methods we employed to compare and analyze the efficiency of bidding programs may still be fruitfully applied to other types of goods. In addition, our analysis does not consider the cost of bidding failure. Certain bidding programs may seem to be the most efficient as they have the effect of lowering successful bid rates, but this is true only when there are winning bidders. If it is necessary for the state to organize repeated bidding, using a certain bidding program, because of the difficulty of finding a winning bidder, it will be crucial to analyze, additionally, whether the chosen bidding program is still the most efficient even after the cost of bidding failure is taken into account.



III

Tender & Bidding on Construction Contracts

The construction industry is a significant part of the Korean economy, responsible for a large portion of the gross domestic product (GDP) and also for creating jobs. The Korean public sector is also quite deeply involved in the industry. Construction output accounted for 4.5 percent of Korean GDP while construction investment accounted for 14.7 percent, as of 2015.⁹⁾ Of nationwide construction projects, worth KRW 100 trillion or so a year, the public sector accounts for KRW 35 to 40 trillion.¹⁰⁾ Designing effective bidding programs on construction works is therefore of paramount importance.

In ordering construction works, the public sector ought to attempt to obtain the highest quality for the lowest possible cost, as with the procurement of other goods and services. It is, however, also necessary to consider that the buildings and facilities that are the outcomes of public construction works involve high maintenance costs unlike other goods and services publicly procured. The poor quality of results of public construction works would not only threaten the wellbeing and lives of people, but also generate immense costs of maintenance in the future. Given the significant position of construction in the Korean economy and the dramatic ripple effects of construction works and subcontracting, it is also impossible to ignore the profit concerns of the construction industry. Excess competition over prices may significantly reduce profits for participating bidders and even lead them to pass the burden of cost-saving onto subcontractors

9) Kang and Shim, 2016, p. 1.

10) Jang, 2015, p. 709.

and workers.

The bidding system on public construction works should therefore be designed by taking into account a wide range of factors, including the need to minimize budgetary waste, the importance of obtaining quality results, and ensuring financial sustainability of the construction industry, all of which may come into conflict.

In this study, we examine the bidding system on public construction works and how the choice of different bidding programs affects the costs and outcomes of construction works. In particular, we analyze how the successful bid rates (ratio of price offered by the winning bidder to projected price), the characteristics of participating bidders, and bidder behavior changes according to different bidding programs and identify how effectively each bidding program supports the accurate assessment of non-price factors. Before we proceed with our analysis, we also introduce the historical evolution and major features of the public construction bidding system in Korea, and compare the general review program (GRP), which has been applied to large-scale projects valued at KRW 30 billion or more since 2016, with the LPP. Next, we subject the QRP, applied to smaller-scale projects valued under KRW 30 billion, to an empirical analysis with a view to finding policy implications.

1 Public Construction Bidding Systems¹¹⁾

In this section, we introduce the public construction bidding systems of Korea and other developed countries around the world. We first survey the evolution of the construction bidding system in Korea, and compare the LPP, the GRP (for large projects worth KRW 30 billion or greater), and the QRP (for smaller projects worth less than KRW 30 billion). We also introduce the full turnkey, alternative, and technological proposal construction projects open to bidding. Finally, we discuss the public construction bidding systems in other developed countries worldwide.

11) This section is largely based on Kim, 2017.

A. Public Construction Bidding System in Korea

1) Evolution of the Bidding System

The LPP, introduced in 1962, was the only bidding program used in public contracting of construction works in Korea for decades, before the QRP was introduced in 1995, followed by the GRP in 2016. The construction bidding system has evolved and diversified over the decades in light of changes in the economic situation, the construction industry, and policy objectives. <Table III-1> summarizes major milestones in the historic evolution of the public construction bidding system in Korea. This evolution reflects changes in the respective weights of the price and non-price factors under review.

<Table III-1> Evolution of the Public Construction Bidding System in Korea

Date	Major development	Remarks
Jan. 1962 – Dec. 1971	LPP	LPP used as sole bidding program.
Jan. 1972 – Dec. 1975	Nearest bid program: Bidder offering price closest to the average of bids submitted by bidders was awarded contract (counting only bids hovering above 80% of projected price).	Introduced to revitalize construction industry hit hard by first oil shock.
Jan. 1976 – Feb. 1981	Return of LPP	LPP returned as sole bidding program after construction industry revitalized.
Mar. 1981 – Mar. 1983	Return of nearest bid program: Bid floor raised to 85% of projected price.	Temporarily revived to promote construction industry amid second oil shock.
Apr. 1983 – Mar. 1990	LPP + low-price review: Bidders offering prices below direct construction costs were put to further review. Nearest bid program applied to smaller projects. – Jul. 1983 – Mar. 1984: Below KRW 3 billion. – Apr. 1984 – Mar. 1985: Below KRW 2 billion. – Apr. 1985 – Mar. 1990: Below KRW 1 billion.	Low-price review introduced to prevent dumping bids. Nearest bid program applied to smaller projects, with eligible amounts reduced gradually over time.
Mar. 1990 – Feb. 1993	LLP + low-price review	Nearest bid program abolished.
Feb. 1993 – Sep. 1993	LPP: applied to projects worth KRW 2 billion or more. PQ introduced in Jul. 1993. LLPP: applied to projects worth less than KRW 2 billion. Lowest price above 85% of projected price granted bid.	Low-price review abolished (for lacking objectivity). LLPP applied to smaller projects to support SMEs.

〈Table III-1〉 Continued

Date	Major development	Remarks
Sep. 1993 – Jul. 1995	LPP: applied to projects worth KRW 10 billion or more. LLPP: applied to projects worth less than KRW 10 billion.	Scope of LLPP application expanded.
Jul. 1995 – Dec. 1996	QRP: applied to projects worth KRW 10 billion or more. LLPP: applied to projects worth less than KRW 10 billion. Bid floor raised to 88% of projected price.	QRP introduced in response to public outcry of collapse of poorly built structures, including Seongsu Bridge (Oct. 1994).
Jan. 1997 – Sep. 1999	QRP – Jan. 1997 – Feb. 1999: applied to projects above announced price. – Feb. 1999 – Sep. 1999: applied to projects worth KRW 3 billion or more. LLPP: – Jan. 1997 – Feb. 1999: applied to projects below announced price. – Feb. 1999 – Sep. 1999: applied to projects worth less than KRW 3 billion.	Scope of QRP application expanded.
Sep. 1999 – Dec. 2000	QRP	QRP applied to all projects (LPP abolished).
Jan. 2001 – Dec. 2003	LPP: applied to PQ-eligible projects worth KRW 100 billion or more. QRP: applied to all projects other than LPP-eligible ones.	LPP revived due to criticisms of QRP over inability to select most efficient bids and also the need to facilitate restructuring of construction industry.
Dec. 2003 – May 2006	LPP + low-price review: applied to PQ-eligible projects worth KRW 50 billion or more. QRP: applied to all projects other than LPP-eligible ones.	Scope of LPP application expanded and low-price review revived.
May 2006 – Jan. 2016	LPP + low-price review: applied to projects worth KRW 30 billion or more. QRP: applied to all projects other than LPP-eligible ones.	Scope of LPP application expanded and low-price review improved (with two-stage review).
Feb. 2016 – Present	GRP: applied to all projects worth KRW 30 billion or more. QRP: applied to all projects other than GRP-eligible ones.	GRP introduced for projects worth KRW 30 billion or more; LPP abolished.

Source: 〈Table II-1〉, Lee et al., 2013, pp. 9~10.

2) Main Bidding Programs

a) LPP

The LPP awards a contract to the bidder offering the lowest price. Korea was the first to introduce this bidding program into public construction contracting. Since its introduction in the 1960s, the LPP has been reduced and expanded in scope, abolished, and revived repeatedly, before ultimately being replaced by the GRP in 2016.

In the early years, the Korean government selected construction bidders according to a single-dimensional auction process, considering price offers as the sole grounds for awarding contracts. As excess competition over prices began to generate a host of problems, including poor quality of built structures, the Korean government additionally introduced a low-price review to prevent bidders from offering excessively low prices.

b) QRP

The QRP was introduced in 1995 in response to the various defects of the LPP, including its tendency to encourage excessive price competition, resulting in poor construction outcomes and pressure to reduce costs being passed on to subcontractors. Contrary to the LPP, under which price is the sole factor in deciding winning bids, the QRP requires that the government review a comprehensive range of price and non-price factors, including bidder contract performance capabilities. However, as this program requires the government to start the review process with the bidder that has offered the lowest price, price still takes precedence over non-price factors, as under this program, the bidder who is first to obtain the threshold score in the given order of review wins the contract. The QRP is therefore a form of multi-dimensional auction, and is now applied only to projects with estimated prices below KRW 30 billion.

The respective weights of price and non-price factors vary according to the estimated prices of construction projects (<Table III-2>), with the weight of non-price factors increasing in proportion to project prices.

〈Table III-2〉 Respective Weights of Factors & Minimum Scores for Winning Bids

Project scale (in terms of estimated prices)	Factor weight (%)		Minimum score
	Performance capability	Price	
KRW 10 to 30 billion	70	30	92
KRW 5 to 10 billion	50	50	95
KRW 1 to 5 billion	30	70	95
KRW 0.3 to 1 billion	20	80	95
Less than KRW 0.3 billion	10	90	95

Source: Park, 2016, p. 348.

As for the review of bidder capability to perform contracts, capability to execute construction, appropriateness of material prices and manpower submitted, appropriateness of the subcontractor management plans, technological capabilities, financial status, and records on past contracts are considered. The allocation of scores and the list of criteria considered vary by project scale.¹²⁾

The price review is designed so that bidders submitting prices that most closely approximate the given ratios of projected prices receive high scores, and the successful bid rates rise in inverse relation to the scale of construction project. The Korean government also implements a multiple-projected price system, presenting participating bidders with 15 randomly chosen projected prices within two-percent ranges of basic prices so that the final project price is decided and disclosed on the site of bidding. This is meant to prevent the corrupt and unauthorized disclosure of projected prices in advance.

c) GRP

The GRP was also introduced in February 2016 as an effort to overcome the shortcomings of the LPP. All construction projects with estimated prices of KRW 30 billion or more, formerly decided according to the LPP, were made subject to the GRP instead as of February 2016. The Korean government hopes

12) For detailed criteria and rubrics of capability review for projects of different sizes, see "Chapter III. Quality Review Program for Government Construction Works" by Jang (2015).

that the GRP will improve the ecosystem for the construction industry and the general quality of resulting structures by fostering technological competition, and reduce the overall costs of maintenance throughout structure lifecycles.¹³⁾ In other words, the objective of the program is enhance the overall fiscal efficiency of public construction works by preventing dumping bids and ensuring fair prices for the works, improving the quality through greater technological competition, and reducing lifecycle costs even if it means increasing initial costs. Accordingly, the Korean government takes into account a comprehensive range of factors, including bidders' price offers, their capabilities to perform the contracts, their commitment to the public interest, and their past record with contracts, in reviewing bidders and choosing a winner.

While the evaluation of price factors is designed so that bidder scores will rise conversely with their price offers, the GRP also lowers scores for bidders that fail to offer prices on a par with, or higher than, the average offer prices so that bidders will avoid offering extremely low prices. The average bidder-offered price is determined by eliminating outliers and taking the arithmetic mean of the remaining prices. This result, forming the basis of price evaluation, is known as the equilibrium price. The government also reviews unit prices and subcontractor management plans submitted by bidders to prevent excessive competition over prices (concerning general construction projects).

d) Winning Bidders of Turnkey, Alternative, & Technological Proposal Bids¹⁴⁾

Some large-scale public construction projects valued at KRW 30 billion or more and requiring sophisticated technologies are managed as turnkey projects in which the given contractor undertakes both design and construction. This section provides brief overviews of the turnkey, alternative, and technological proposal bids used in the Korean public sector.

13) MOSF, "LPP to be Replaced by GRP Beginning in 2016: Projects Worth KRW 30 Billion and More to Undergo Comprehensive Review of Contractor Prices, Contract Performance Capabilities, and Commitment to Public Interest," December 29, 2015 (press release).

14) See "Chapter 16. Bidding and Contracting on Large-Scale Construction Projects" in Jang (2015).

① Turnkey Bids

Turnkey bidding refers to a style of bidding in which bidders submit their tender on public construction projects, along with the plans, drawings and documents prepared according to the Master Plan on Turnkey Construction Project Bidding and other related guidelines.¹⁵⁾ This style of bidding was first introduced into public construction works in Korea in 1975.¹⁶⁾ Because a single bidder undertakes the entire process of a given project, from design to construction, turnkey projects can prevent the waste of time in construction works and also keeps the chain of responsibility clear. However, this style of bidding may also discourage the ordering party's engagement in the project.¹⁷⁾

② Alternative Bids

Article 79.3 of the Enforcement Decree to the ACS provides for this style of bidding. Each participating bidder may submit, in addition to an original plan for the given project, another plan or design laying down alternative methods, technologies, or processes capable of serving the same functions and effects demanded by the government's executive design. In order to win the bid on such an alternative plan, the bidder must submit one that is capable of achieving the desired construction outcomes for a lower price and in a shorter span of time than envisioned by the government's design. The winning bidder is then selected from two or more bidders according to the same process as that applied to selecting a winning turnkey bidder.

③ Technological Proposal Bids

In this style of bidding, each bidder reviews the design, plans, etc. for the given construction project distributed by the ordering party, and prepares a technological proposal suggesting ways to achieve the desired result at lower

15) Article 79, ACS, National Law Information Center (www.law.go.kr, accessed October 19, 2017).

16) Jang, 2015, p. 1425, "Special Exemptions from the Enforcement Decree to the Budget Accounting Act on Large-Scale Construction Contracts," April 17, 1975; now subsumed under the Enforcement Decree to the ACS.

17) Jang, 2015, p. 1427.

cost, in shorter spans of time, and/or with more efficient control over the construction process, and submits it along with the tender. Technological proposal bids can be divided between those on executive designs and those on basic designs. This type of bid was first introduced in 2007, and mainly concerns public construction projects involving the creation of structures with high symbolic, commemorative or artistic value and/or requiring quite sophisticated technologies. Technological proposal bids were sought in the development of Sejong and other innovation cities across Korea.¹⁸⁾

B. Public Construction Bidding Systems Outside Korea

1) United States

The rules of public procurement in the United States are outlined in the “Federal Acquisition Regulation” (FAR) that makes up the first part of the Federal Acquisition Regulation System.

Since the 1980s, the U.S. federal government has mostly relied on lowest-price bids in public construction works with a view to preventing corruption and fostering competition. Enactment of the Federal Acquisition Streamlining Act in 1994, however, has shifted the orientation of federal acquisition to the best value.¹⁹⁾ Since 1994, the U.S. government has been applying both the tradeoff-based best-value rule and the lowest price technically acceptable (LPTA) rule. Both rules explicitly require consideration of technological and other non-price factors in selecting winning bidders to undertake federal construction projects.

The tradeoff-based best-value rule allows for some tradeoff between price factors and non-price factors in consideration of bidders so that the bidder who receives the highest overall score, under the given tradeoff ratio, is awarded the contract. The federal agency ordering the construction project is required

18) See the ACS, National Law Information Center (www.law.go.kr, accessed October 19, 2017).

19) Ji, S. et al., “Suggestions for Improvement of the Public Construction Contracting and Bidding System in Korea: Comparison to the United States, the United Kingdom, and Japan,” Collection of Academic Conference Contributions 2006–11, Korea Institute for Construction Engineering and Management, 2006, pp. 367~372.

to announce the criteria for evaluation, the respective weights of those criteria, and the tradeoff ratios between price and non-price criteria in advance so that the bidder who offers an optimal mix of technology and price under the given tradeoff ratio can win the bid.

The LPTA rule allows the bidder who satisfies the pre-announced technological requirements at the lowest possible price to win the bid. Under this rule, there are no monolithic or universal criteria for evaluating technological requirements and qualifications. Rather, internal technological experts from federal agencies evaluate bidder proposals, thus ensuring greater flexibility in technical standards applied to different construction projects.²⁰⁾

Under the LPTA rule, technological experts judge whether each bidder satisfies the given technological requirements without specifically scoring each one.²¹⁾ The fact that the bidder who satisfies technological requirements at the lowest price wins the bid under this rule suggests that it is akin to the combination of LPP and low-price review in Korea.

2) United Kingdom

The Public Contracts Regulations lay down the rules of public procurement in the United Kingdom. The U.K. government, too, mainly uses bidding programs or processes that ensure the wide-ranging consideration of both price and non-price factors.

Open competition and the lowest-price bidding rule were the core features of the public procurement policy in the United Kingdom until the 1990s. The release of the “Achieving Excellence” guidelines in 1999, however, has shifted the policy focus onto finding the optimal combination of quality and price that satisfies public needs.²²⁾ While there are officially two rules governing the public construction contracting and bidding system in the United Kingdom, i.e., the most economically advantageous tender (MEAT) rule and the lowest price rule,

20) Kim et al., 2016, p. 139.

21) FAR 15.101-2 “Lowest price technically acceptable source selection process”(<http://acqnotes.com/acqnote/careerfields/lowest-price-technically-acceptable-lpta>, accessed November 9, 2017).

22) Song et al., 2012, p. 141.

the use of the latter is disappearing.²³⁾

The internal cost experts of public agencies undertaking construction projects or private-sector experts participate in the determination of projected prices, which, in principle, are to remain concealed from bidders. The projected prices so determined reflect the prices of various resources involved as well as the market situation and are known to be reliable.²⁴⁾

3) Japan

The Japanese government uses a lowest-price program that automatically selects the bidder offering the lowest price as the winner and a comprehensive evaluation program. As with the United States and the United Kingdom, non-price factors play increasingly important roles in Japan.²⁵⁾

The lowest-price program automatically grants the contract to the bidder who offers the lowest price within the range of projected prices. The general evaluation program was introduced to avoid the excess competition over prices and dumping contracts that the lowest-price program tends to foster. The general evaluation program requires the state to consider the prices, technological capabilities, and performances of all bidders offering prices within the given projected price range so that the bidder that offers the greatest advantage to the state is chosen. While the general evaluation program is used in most public construction projects today, the lowest-price program still applies to some of the small-scale works commissioned by local governments.²⁶⁾

The Japanese state, too, keeps projected prices undisclosed to prevent collusion and other corrupt practices and ensure genuine competition over prices.

23) Kim et al., 2016, p. 139.

24) Kim et al., 2016, p. 140.

25) Song et al., 2012, p. 154.

26) Song et al., 2012, p. 164.

2 Bidding Programs for Large Facility Construction Projects

Here we analyze the effects of differences in bidding programs used for large facility construction projects in Korea. First, we compare the LPP and the GRP. Next, we compare the effects of the GRP and the LPP as applied to non-turnkey projects, turnkey projects, alternative projects, and technological proposal projects to delineate policy implications.

A. Effects of the GRP

The GRP was introduced in February 2016, replacing the role of the LPP with respect to all construction projects with estimated prices of KRW 30 billion or more. We sought to determine what effects this program has had by comparing the bidding details of construction projects worth KRW 30 billion or more before and after the program was introduced.

The data we used in our analysis included that on the details of construction contracts, bidders, and contractors, available on the OPPP (<http://data.g2b.go.kr>). Specifically, our analysis targeted construction projects with estimated prices of KRW 30 billion or more, for which bidding took place between January 2015 and March 2017.

Relatively larger construction projects with estimated prices of KRW 30 billion or more were more frequently ordered after February 2016, when the GRP was introduced. It was therefore necessary to limit our sample to projects of similar sizes when comparing the two programs. Introduction of the GRP had the effect of decreasing the number of participating bidders per project (from 46.28 to 34.18), and increasing the successful bid rate on average from 74.39 percent to 80.44 percent. The GRP, in other words, appears to have significantly improved the profitability of participating construction companies.

<Table III-3> Summary Statistics on Construction Projects with Estimated Prices of KRW 30 Billion or More (January 2015 to March 2017)

(Units: KRW 100 million, percentage, number of bidders)

LPP (January 2015 to January 2016), N = 58					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price	585.26	300.68	1,764.95	467.44	325.51
Projected price	596.39	295.37	1,832.19	486.54	321.44
Successful bid rate	74.39	66.08	98.38	73.57	5.29
No. of bidders ¹⁾	46.28	3.00	143.00	33.00	39.30
GRP (February 2016 to March 2017), N = 40					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price	671.69	301.18	1,718.10	472.84	917.85
Projected price	707.81	301.29	1,855.85	518.32	414.78
Successful bid rate	80.44	72.13	90.79	80.56	3.83
No. of bidders	34.18	6.00	83.00	33.00	19.26

Note: 1) The number of participating bidders in the LPP reflects only the 46 projects for which the necessary data was available.

Our analysis also showed no significant difference wrought by introduction of the GRP on the rate of participation by SMEs (<Table III-4>).

<Table III-4> Participation by Firms of Different Sizes in Bidding

	LPP (Jan. 2015 to Jan. 2016)	GRP (Feb. 2016 to Mar. 2017)
Construction projects with estimated prices ranging from KRW 30 to 50 billion		
Large corporations (%)	7.5	7.4
Medium-sized corporations (%)	14.9	14.6
SMEs (%)	77.7	78.0
No. of projects	27	21
Total no. of bidders	1,464	879

Introduction of the GRP has also reduced the percentage of large corporations winning bids, while increasing the percentage of winning SMEs. This contrasts with the popular expectation that the reinforced assessment of non-price factors, including technological capabilities, would work to the disadvantage of SMEs.

〈Table III-5〉 Bids Won by Firms of Different Sizes

	LPP (Jan. 2015 to Jan. 2016)	GRP (Feb. 2016 to Mar. 2017)
Construction projects with estimated prices ranging from KRW 30 to 50 billion		
Large corporations (%)	18.5	14.3
Medium-sized corporations (%)	37.0	19.1
SMEs (%)	44.4	66.7
No. of projects	27	21

When we compared construction projects of similar scale, there was little difference in the makeup of participating firms of different sizes under the two programs. However, the percentage of SMEs winning bids rather increased under the GRP. This may reflect the Korean government's effort to minimize disadvantages to SMEs in public contracts. It may, however, also indicate the lack of reliability and validity in the criteria of non-price factor assessment used in the GRP.

It is therefore important to check whether the GRP does indeed assess non-price factors with validity and reliability. Because no information on the actual outcomes of review was available from the OPMP, we had to resort to two indirect measures.

First, we compared the relative sizes of the price scores that winning bidders received under the two programs. Under the LPP, the bidder who offered the lowest price won. We therefore measured the winners' bidding prices as percentiles of the bidding prices offered by all participants. Under the GRP, on the other hand, we used a different formula to calculate the percentiles of winners' bidding prices. To make the comparison more intuitive, we made sure to allocate smaller numbers to higher price-factor scores under the GRP and the lower bidding prices under the LPP.

Next, we compared the likelihood of lowest-price bidders (under the LPP) and the bidders who won the highest price scores (under the GRP) to win bids. We also compared the final likelihood of highest price scores under the GRP to determine the relative importance of bidding prices offered under that program.

First, our comparison of the percentiles revealed that price factors were

indeed made more important under the GRP than the LPP.

Next, our comparison of the likelihood of bidders with the highest price scores to win bids revealed that there was no significant difference created by using one program or the other. The chances of participating bidders to win on the strength of the lowest prices under the LPP and the GRP, with respect to similar-scale projects, were 25.9 percent and 19.0 percent, respectively, suggesting that non-price factors played a relatively greater role under the GRP.

All in all, however, the GRP does not seem to have made significant differences to the validity and reliability of non-price factors used in reviewing bidders.

<Table III-6> Indirect Comparison of the Validity of Non-Price Factors Used for Assessment Under the LPP & the GRP

LPP (Jan. 2015 to Jan. 2016)		GRP (Feb. 2016 to Mar. 2017)	
All construction projects with estimated prices of KRW 30 billion or more			
%ile of winners' bidding prices	29.5	%ile of winners' bidding prices	18.3
Likelihood of winning for bidders offering lowest prices	23.9	Likelihood of winning for bidders with highest price scores	22.5
Number of projects	46	Number of projects	40
Construction projects with estimated prices of KRW 30 to 50 billion			
%ile of winners' bidding prices	29.3	%ile of winners' bidding prices	18.3
Likelihood of winning for bidders offering lowest prices	25.9	Likelihood of winning for bidders with highest price scores	19.0
Number of projects	27	Number of projects	21

Next, we sought to determine whether SMEs tried to increase their chances at winning the bids by offering excessively low prices. We thus examined the characteristics of companies that failed to pass the low-price review. Specifically, we defined bidders that failed to win despite having offered prices lower than winning bidders under the LPP as companies that failed the low-price review.

Our analysis confirmed that SMEs were significantly more likely than larger firms to fail the low-price review.

〈Table III-7〉 Firms of Different Sizes Failing the Low-Price Review (2015-2016)

Type	Failing review	Number of bidders
Construction projects with estimated prices of KRW 30 to 50 billion (N = 1,464)		
Large corporations	11.0	109
Medium-sized corporations	26.6	218
SMEs	39.5	1,137

Introduction of the GRP has raised the mean bidding price rates from firms of all sizes. Interestingly, the bidding price rates under the GRP showed no particular correlation to firm size. This suggests that the non-price factors used in review may lack validity in selecting optimal bidders. If we expect that large corporations have the advantage in technological capabilities over SMEs and are therefore likely to receive higher scores on non-price factors, the bidding price rates of large corporations would naturally be higher than those of SMEs. Large corporations may submit relatively high prices, but still be likely to win the bids by outscoring SMEs in non-price factors. If non-price factors used in review are designed to sort out winning bidders according to technological capabilities and other such factors, there should be significant differences in the bidding price rates submitted by firms of different sizes.

〈Table III-8〉 Summary Statistics of Bidding Price Rates

LPP (Jan, 2015 – Jan, 2016), N = 2,129					
Firm size (%)	Mean	Min.	Max.	Median	S.D.
Large corporations	77.2	65.1	96.3	76.5	6.4
Medium-sized corporations	76.7	65.2	101.2	76.9	5.6
SMEs	77.4	65.0	102.3	76.9	4.0
All	77.2	65.0	102.3	76.9	4.8
GRP (Feb, 2016 – Mar, 2017), N = 1,367					
Firm size (%)	Mean	Min.	Max.	Median	S.D.
Large corporations	81.9	72.0	102.7	81.2	5.7
Medium-sized corporations	81.4	72.1	102.7	81.0	5.0
SMEs	80.9	71.8	102.1	80.6	2.9
All	81.2	71.8	102.7	80.7	4.1

Our examination of the distribution of bidding price rates after the GRP was introduced did show some correlation between firm size and these rates, but not with any significance. This suggests that the non-price factors used in review under the GRP are not sufficiently valid.

B. Turnkey, Alternative & Technological Proposal Bids

In this section, we compare the effects of the LPP and the GRP to those of turnkey, alternative, and technological bids. As the turnkey style of bidding is mostly applied to large-scale projects, we limited our sample to projects with estimated prices of KRW 50 billion or more.

The successful bid rates of turnkey, alternative, and technological proposal bidding were considerably high, with only two or so bidders participating in each given opportunity on average. This is natural as the very design of the turnkey bidding system tends to limit the number of participating bidders.

〈Table III-9〉 Summary Statistics of Construction Projects with Estimated Prices of KRW 50 Billion or More (January 2015 to March 2017)

(Units: KRW 100 million, percentage, number of bidders)

LPP (N = 25)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price	869.23	514.69	1,764.95	828.79	314.26
Successful bid rate	73.12	66.08	80.01	72.26	3.92
Number of bidders ¹⁾	35.00	9.00	96.00	29.00	26.78
GRP (N = 19)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price	1,002.72	530.65	1,718.10	940.85	311.74
Successful bid rate	79.58	72.13	85.99	78.66	3.58
Number of bidders ¹⁾	25.68	6.00	51.00	22.00	13.77
Turnkey, alternative, and technological proposal bids (N = 25)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price	1,300.62	523.45	5,311.80	1,122.33	942.77
Successful bid rate	96.59	74.30	104.00	99.10	6.53
Number of bidders ¹⁾	2.21	2.00	4.00	2.00	0.54

Note: 1) The numbers of bidders participating in the LPP and turnkey, alternative and technological proposal bids were counted with respect to projects on which data was available. There were 19 projects of the LPP and another 19 turnkey, alternative and technological proposal bids that had published numbers of bidders.

Large corporations were disproportionately represented in turnkey, alternative, and technological proposal bids. Almost no SMEs even qualified as candidates. Not a single SME participated in these bids.

〈Table III-10〉 Firms of Different Sizes Participating in Different Bidding Programs

	LPP	GRP	Turnkey, alternative, technological proposal
All construction projects with estimated prices of KRW 50 billion or more			
Large corporations (%)	25.0	36.9	69.1
Medium-sized corporations (%)	40.8	41.6	31.0
SMEs (%)	34.3	21.5	0.0
Number of projects	19	19	19
Total number of bidders	665	488	42

The percentage of large corporations participating in the LPP was the smallest, while little difference was observed in their participation in the GRP and turnkey, alternative and technological proposal bids.²⁷⁾

〈Table III-11〉 Firms of Different Sizes Winning Bids in Different Programs

	LPP	GRP	Turnkey, alternative, technological proposal
All construction projects with estimated prices of KRW 50 billion or more			
Large corporations (%)	42.1	63.2	63.2
Medium-sized corporations (%)	42.1	21.1	36.8
SMEs (%)	15.8	15.8	0.0
Number of projects	19	19	19

27) One reason the percentages of large corporations participating and winning bids under the GRP are greater than in the LPP may be that the construction projects subject to the GRP are of a relatively greater size.

C. Implications

As not only the initial cost, but also lifecycle cost should be considered in commissioning public construction projects, it is natural and commendable that the Korean government seeks to ensure consideration of non-price factors as well as price, under the GRP, in selecting contractors to undertake public construction works. Introduction of the GRP has indeed significantly raised the successful bid rates, improving the financial sustainability of the Korean construction industry.

Nevertheless, the non-price factors used in review under the GRP are still not sufficiently valid or tailored to select the most optimal bidders as contractors. In order for the GRP to select bidders capable of providing quality results at appropriate prices by undertaking construction projects well, while discouraging excess competition on prices, it is critical to improve the accuracy and validity of non-price factors.

The current practice of price assessment, which assigns the highest scores to bidders who most accurately predict the average bidding prices, is also in need of improvement. This practice induces participating bidders not to predict the actual costs likely to be incurred by their projects and submit bidding prices adequately reflective of their current technological and financial capabilities, but rather to submit bidding prices similar to those submitted by competitors. Coupled with the less-than-accurate non-price factors, this practice of price assessment will lead bidders to behave in a way similar to that under the QRP, i.e., casting bidding prices based on their projections of the bid floor ratios.

The Korean government may consider assigning higher scores to bidders who submit low bidding prices, insofar as their non-price factors are reviewed with satisfactory accuracy. It is also crucial for the government to determine and involve appropriate bidding prices in the review process to discourage excessive competition over prices.

Large-scale projects requiring creativity and sophisticated technologies should be decided on the basis of turnkey, alternative and technological proposal bids, with the exact process of evaluation and participating experts remaining flexible from project to project. As these projects exert dramatic ripple effects

on the rest of the economy, it is critical to ensure thorough review of all the factors involved, and also to continue efforts to ensure transparency and fairness in the bidding processes.

3 Bidding System for Small-Scale Construction Projects

The QRP is the sole method of granting bids concerning all public construction projects with estimated prices below KRW 30 billion. In this section, we analyze the QRP-applied projects in terms of successful bid rates, bidder participation and behavior, and the characteristics of winning bidders. We resort to an empirical analysis to identify construction projects for which non-price factors mattered relatively more.

A. Characteristics of QRP-Applied Construction Projects

The respective weights of price and non-price factors used for review under the QRP are designed so that the latter will count more in proportion to the size of construction project. The diversity of non-price factors used for review, their weighting, and the scoring processes also means that the resulting successful bid rates also differ widely from one another. It was thus necessary for us to divide construction projects into five groups to analyze the effect of the QRP.²⁸⁾

Summary statistics of our analysis show that the number of bidders was inversely, and the successful bid rates proportionally, correlated to the size of construction project as the scale tends to raise the minimum bidding price (bid floor ratio).

28) The weights of price and non-price factors applied to projects involving specialized technologies, electronics and communications, fire safety facilities, and cultural heritage, with estimated prices of KRW 0.3 billion or more and less than KRW 5 billion, are the same as those applied to general construction projects with estimated prices of KRW 1 billion or more and less than KRW 5 billion, so these two types of projects were counted together.

<Table III-12> Summary Statistics of Projects with Estimated Prices Below KRW 30 Billion (January 2013 to March 2017)

Projects with estimated prices below KRW 0.3 billion (N = 2,475)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	1.73	0.45	3.00	1.62	0.61
Projected price (KRW 100 million)	1.85	0.48	3.53	1.73	0.64
Successful bid rate (%)	87.77	87.75	97.43	87.75	0.24
Number of bidders ²⁾	397.38	2.00	2,240.00	240.00	408.59
Projects with estimated prices of KRW 0.3 to 1 billion (N = 449)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	5.89	3.02	9.99	5.44	2.02
Projected price (KRW 100 million)	6.25	3.08	10.72	5.83	2.13
Successful bid rate (%)	87.80	87.75	98.04	87.75	0.50
Number of bidders ²⁾	352.20	2.00	1,574.00	373.00	207.47
Projects with estimated prices of KRW 1 to 5 billion ¹⁾ (N = 4,152)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	12.77	3.00	50.00	8.95	10.54
Projected price (KRW 100 million)	13.56	2.69	54.04	9.46	11.27
Successful bid rate (%)	86.78	86.75	94.95	86.75	0.20
Number of bidders ²⁾	396.72	2.00	6,880.00	254.00	447.70
Projects with estimated prices of KRW 5 to 10 billion (N = 702)					
Construction projects (N = 376)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	75.31	50.02	99.91	76.31	14.74
Projected price (KRW 100 million)	80.46	48.15	106.98	82.25	15.66
Successful bid rate(%)	86.03	86.00	86.78	86.01	0.74
Number of bidders ²⁾	220.36	5.00	896.00	144.50	203.14
Non-construction projects (N = 326)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	72.05	50.00	99.91	69.23	15.30
Projected price (KRW 100 million)	75.74	50.44	107.82	73.10	16.08
Successful bid rate (%)	85.67	85.50	88.48	85.53	0.35
Number of bidders ²⁾	131.60	3.00	700.00	98.00	134.74

〈Table III-12〉 Continued

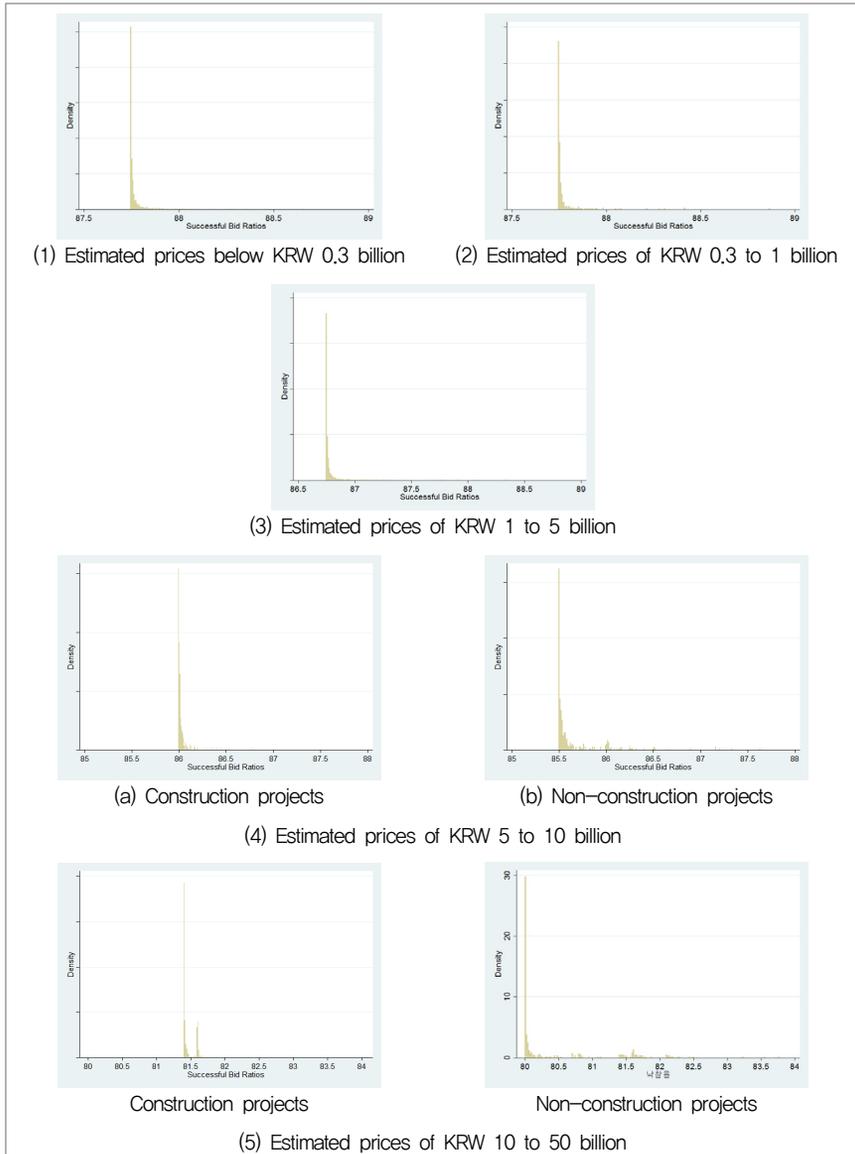
Projects with estimated prices of KRW 10 to 30 billion (N = 792)					
Construction projects (N = 377)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	136.69	100.13	294.85	123.56	38.56
Projected price (KRW 100 million)	145.42	99.43	314.56	131.43	41.35
Successful bid rate (%)	81.50	81.40	90.21	81.41	0.50
Number of bidders ²⁾	303.67	5.00	623.00	292.00	146.16
Non-construction projects (N = 415)					
Variable	Mean	Min.	Max.	Median	S.D.
Estimated price (KRW 100 million)	170.79	100.70	299.84	155.03	53.86
Projected price (KRW 100 million)	178.79	102.47	318.95	160.91	56.77
Successful bid rate (%)	80.38	80.00	86.76	80.01	0.80
Number of bidders ²⁾	234.92	2.00	672.00	237.00	169.13

Notes: 1) Special projects, involving specialized technologies, electronics and communications, fire safety facilities, cultural heritage, etc. have estimated prices of KRW 0.3 billion or more and less than KRW 5 billion.

2) The numbers of construction projects for which information on participating bidders was available were 2,402, 441, 3,987, 681, and 760, respectively.

The distribution of successful bid rates affirms that, irrespective of project scale, the successful bid rates for the majority of projects are concentrated on the range near the bid floor ratios. This suggests that non-price factors used in review under the QRP have failed to function as intended. Under the QRP, only bidders that have submitted prices above the bid floor ratio are included in review, which starts with the bidder that has submitted the lowest price. Bidders who manage to predict the bid floor ratios accurately thus win perfect scores and bids, so that the resulting successful bid rates are identical to the bid floor ratios.

[Figure III-1] Successful Bid Rate Distribution: Projects Under KRW 30 Billion (2013~2017)



We resorted to two indirect indicators of the accuracy and validity of non-price factors for projects of different sizes. The first indicator was the probability of bidders submitting the lowest prices (above the bid floor ratios) to win the bids. The mismatch between the winning bid and the bid of the lowest price above the bid floor ratio indicates that at least one of the bidders failed to earn a perfect score in the non-price factor assessment. Henceforth, the lower this probability, the more valid the non-price factors. The second indicator is the percentile of the winning bidder's bid price. Here bidders that submitted prices below the bid floor ratios were excluded from analysis. The higher this percentile, the greater the probability of bidders offering prices higher than the bid floor ratios, and therefore the more valid the non-price factors.

Our comparison revealed that the validity of non-price factors grew in proportion to project size. The probability of bidders submitting the lowest prices above the bid floor ratios was strictly inversely proportional to this project size. The percentiles of winning bidders' bid prices, on the other hand, grew in proportion to project size (except for projects with estimated prices ranging from KRW 1 to 5 billion, in which the percentiles of the winning bid prices were lower than for projects with estimated prices ranging from KRW 0.3 to 1 billion). As projects grow in scale, the weights of non-price factors also increase and the process of evaluation diversifies, resulting in significant difference in the validity of the non-price factor review. Nevertheless, the probability of firms

〈Table III-13〉 Probability of Lowest-Price Bidders to Win Bids & Relative Size of Winning Bid Prices

Project scale (estimated prices, in KRW 1 billion)	Up to 0.3	0.3 to 1.0	1.0 to 5.0	5.0 to 10.0			10.0 to 30.0		
				Const- ruction	Non- constr- uction	Overall	Const- ruction	Non- constr- uction	Overall
Lowest-price bidders' probability to win (%) ¹⁾	90.1	88.2	88.5	63.7	76.8	69.8	44.8	71.6	58.7
%ile of winning bidders' prices ²⁾	3.0	3.8	3.2	2.9	9.7	6.6	12.4	12.3	12.4
Number of projects	2,402	441	3,987	366	315	681	366	394	760

Notes: 1) The probability of bidders who submit the lowest prices above the given bid floor ratios.

2) The percentiles of the winning bid prices above the given bid floor ratios.

winning bids by submitting the lowest prices still exceeds 50 percent in projects of all sizes, suggesting that the overall validity of non-price factors remains marginal at best.

There was no clear correlation between firm size and submitted bid prices. Comparison of the medians, in particular, minimized the differences between firms of different sizes. This suggests that firms of all size tend to determine which prices to submit based on their predictions of bid floor ratios under the QRP.

〈Table III-14〉 Summary Statistics of Bidding Price Rates by Firm Size

Firm type	Mean	Min.	Max.	Median	S.D.
Large corporations	85.17	75.08	109.11	86.36	3.44
Medium-sized corporations	84.53	63.29	115.73	85.87	3.23
SMEs	86.77	60.01	119.52	87.07	1.88
All	86.74	60.01	119.52	87.06	1.93

The success of the QRP depends crucially upon the accuracy and validity of the non-price factors used in review. It is therefore particularly important to identify the characteristics of construction projects whose contractors were decided on the strength of their non-price factors to determine how best the QRP could be improved. We thus performed a regression analysis to identify factors contributing to the accuracy and validity of the QRP.

The dependent variable was designed to be proportional to the difference between actual successful bid rates and bid floor ratios. The following formula was used to adjust the absolute sizes of bid floor ratios.

$$\text{Indicator of Validity} = \frac{\text{Actual successful bid rate} - \text{Bid floor ratio}}{\text{Bid floor ratio}}$$

The explanatory variables included the construction scale dummy, the project type dummy, and the mode of competition (general or limited), with the year dummy variables included in all models of regression. The control variables included the ordering agency dummy and the number of participating bidders. The ordering agencies were divided into multiple types, such as public

corporations, schools, quasi-governmental institutions and local governments. It was important to distinguish these types in some models as the validity of non-price factors could accordingly depend significantly by type. As for the number of participating bidders, one model was made to account for the total number, another to reflect the number of firms of different sizes participating as bidders, and another reflecting no participating bidders at all. In light of the possible problem of endogeneity—with projects with less-valid non-price factors attracting more bidders to participate—this variable was kept out of some models.

Our regression analysis revealed that the regression coefficients for all project scale dummy variables were negative, indicating that the non-price factors used in review were less valid than those used in projects with estimated prices of KRW 10 to 30 billion. Validity was especially a problem with respect to architectural and civil engineering projects, but not as much a problem for machinery installation and other types of projects. Non-price factors were also relatively more valid in projects under limited competition than general competition, most likely because limited competition is applied to projects prioritizing specific types of technologies and processes over price.

The validity of non-price factors emerges as significantly compromised in projects subject to general construction and in relatively smaller-scale architectural and civil engineering projects. This may be attributable to a number of causes, including the very structures of the given industries, the lack of appropriate criteria for evaluation, and other unobservable characteristics of the projects involved. Nevertheless, the “review” required by the QRP is not working as intended with respect to these projects. Even the high level of validity in non-price factors as affirmed by our analysis should not be mistaken as indicating that non-price review is working successfully. Nevertheless, our analysis suggests that a great number of bidders receive perfect non-price scores and among them, only those able to predict bid floor ratios won the bids. It is thus critical to identify the exact causes compromising the validity of non-price factor review and find solutions.

We performed additional regression analysis on architectural and civil engineering projects for which non-price factors were especially problematic. Whether these projects were subjected to limited competition and involved estimated prices of KRW 10 billion or more made a significant difference to

the validity of non-price factors used to review bidders. The fact that the validity of non-price factors is especially problematic for architectural and civil engineering projects suggests that non-price factors seldom matter in reality for such projects of a smaller scale subjected to general competition.

〈Table III-15〉 Validity of Non-Price Factors Under the QRP

	(1)	(2)	(3)	(4)	(5)	(6)
Below KRW 0.3 billion dummy	-0.4429*** (0.0233)	-0.4484*** (0.0231)	-0.4355*** (0.0233)	-0.4408*** (0.0231)	-0.4708*** (0.0251)	-0.4738*** (0.0251)
KRW 0.3 to 1 billion dummy	-0.3078*** (0.0242)	-0.3136*** (0.0240)	-0.3001*** (0.0242)	-0.3057*** (0.0240)	-0.3615*** (0.0263)	-0.3642*** (0.0262)
KRW 1 to 5 billion dummy	-0.3648*** (0.0192)	-0.3677*** (0.0191)	-0.3600*** (0.0192)	-0.3630*** (0.0191)	-0.4088*** (0.0216)	-0.4064*** (0.0216)
KRW 5 to 10 billion dummy	-0.2657*** (0.0210)	-0.2639*** (0.0210)	-0.2722*** (0.0210)	-0.2706*** (0.0210)	-0.3090*** (0.0222)	-0.2995*** (0.0221)
Architectural projects	-0.2154*** (0.0155)	-0.2143*** (0.0152)	-0.1994*** (0.0158)	-0.1993*** (0.0154)	-0.1659*** (0.0157)	-0.1646*** (0.0154)
Facility maintenance projects	-0.0918*** (0.0167)	-0.0948*** (0.0165)	-0.0809*** (0.0167)	-0.0839*** (0.0166)	-0.0837*** (0.0165)	-0.0894*** (0.0164)
Electrical work projects	-0.0856*** (0.0128)	-0.0865*** (0.0127)	-0.0367** (0.0152)	-0.0376** (0.0152)	-0.0467*** (0.0151)	-0.0466*** (0.0151)
Communications projects	-0.0870*** (0.0150)	-0.0867*** (0.0150)	-0.0721*** (0.0152)	-0.0721*** (0.0152)	-0.0929*** (0.0151)	-0.0919*** (0.0151)
Civil engineering projects	-0.1053*** (0.0198)	-0.0999*** (0.0194)	-0.0945*** (0.0198)	-0.0883*** (0.0194)	-0.0907*** (0.0196)	-0.0803*** (0.0193)
Machinery projects	-0.0428** (0.0180)	-0.0423** (0.0178)	-0.0423** (0.0179)	-0.0428** (0.0177)	-0.0546*** (0.0177)	-0.0533*** (0.0175)
Limited competition dummy	0.1091*** (0.0120)	0.1045*** (0.0116)	0.1069*** (0.0119)	0.1032*** (0.0116)	0.0783*** (0.0120)	0.0713*** (0.0117)
Total number of bidders	N	N	Y	Y	N	N
Number of bidders by size	N	N	N	N	Y	Y
Ordering agency dummy	Y	N	Y	N	Y	N
Year dummy	Y	Y	Y	Y	Y	Y
Adj. 2	0.0749	0.0750	0.0786	0.0788	0.1030	0.1019
Obs.	8,251	8,251	8,251	8,251	8,251	8,251

Notes: 1. The asterisks, *, **, and ***, respectively indicate significance levels at 10 percent, five percent, and one percent.

2. Figures in parentheses indicate standard errors.

〈Table III-16〉 Validity of Non-Price Factors Under the QRP: Architectural Projects

	(1)	(2)	(3)	(4)	(5)	(6)
Below KRW 0,3 billion dummy	-0.3234*** (0.0432)	-0.3239*** (0.0429)	-0.3241*** (0.0431)	-0.3242*** (0.0428)	-0.3191*** (0.0432)	-0.3204*** (0.0429)
KRW 0,3 to 1 billion dummy	-0.3243*** (0.0345)	-0.3222*** (0.0341)	-0.3173*** (0.0344)	-0.3146*** (0.0340)	-0.3159*** (0.0346)	-0.3139*** (0.0342)
KRW 1 to 5 billion dummy	-0.3220*** (0.0327)	-0.3143*** (0.0320)	-0.3224*** (0.0325)	-0.3147*** (0.0319)	-0.3160*** (0.0326)	-0.3078*** (0.0319)
KRW 5 to 10 billion dummy	-0.3039*** (0.0346)	-0.2961*** (0.0333)	-0.3202*** (0.0348)	-0.3127*** (0.0336)	-0.3029*** (0.0350)	-0.2942*** (0.0339)
Limited competition dummy	0.2865*** (0.0378)	0.2710*** (0.0345)	0.2930*** (0.0377)	0.2775*** (0.0344)	0.2281*** (0.0434)	0.2100*** (0.0411)
Total number of bidders			-0.0001*** (0.0000)	-0.0001*** (0.0000)		
Number of large corporations					0.0219*** (0.0000)	0.0217*** (0.0076)
Number of medium-sized corporations					-0.0038*** (0.0012)	-0.0037*** (0.0011)
Number of SMEs					-0.0001*** (0.0077)	-0.0001*** (0.0000)
Ordering agency dummy	Y	N	Y	N	Y	N
Year dummy	Y	Y	Y	Y	Y	Y
Adj. o	0.0527	0.0549	0.0588	0.0611	0.0649	0.0673
Obs.	1,732	1,732	1,732	1,732	1,732	1,732

Notes: 1. The asterisks, *, **, and ***, respectively indicate significance levels at 10 percent, five percent, and one percent.

2. Figures in parentheses indicate standard errors.

〈Table III-17〉 **Validity of Non-Price Factors Under the QRP: Civil Engineering Projects**

	(1)	(2)	(3)	(4)	(5)	(6)
Below KRW 0.3 billion dummy	-0.7547*** (0.1199)	-0.7870*** (0.1094)	-0.5829*** (0.1140)	-0.6343*** (0.1044)	-0.4915*** (0.1143)	-0.5391*** (0.1051)
KRW 0.3 to 1 billion dummy	-0.7803*** (0.0774)	-0.7912*** (0.0734)	-0.5791*** (0.0754)	-0.6071*** (0.0716)	-0.4972 (0.0773)	-0.5263*** (0.0737)
KRW 1 to 5 billion dummy	-0.7562*** (0.0655)	-0.7475*** (0.0630)	-0.7415*** (0.0617)	-0.7630*** (0.0595)	-0.6297*** (0.0653)	-0.6527*** (0.0629)
KRW 5 to 10 billion dummy	-0.6682*** (0.0620)	-0.6469*** (0.0575)	-0.7768*** (0.0592)	-0.7926*** (0.0562)	-0.6472*** (0.0640)	-0.6619*** (0.0610)
Limited competition dummy	0.7316*** (0.0694)	0.7005*** (0.0593)	0.6709*** (0.0655)	0.7189*** (0.0561)	0.6239*** (0.0734)	0.6562*** (0.0676)
Total number of bidders			-0.0012*** (0.0001)	-0.0011*** (0.0001)		
Number of large corporations					0.0319*** (0.0072)	0.0337*** (0.0071)
Number of medium-sized corporations					-0.0035 (0.0022)	-0.0043** (0.0021)
Number of SMEs					-0.0011*** (0.0001)	-0.0010*** (0.0001)
Ordering agency dummy	Y	N	Y	N	Y	N
Year dummy	Y	Y	Y	Y	Y	Y
Adj. e	0.2060	0.2097	0.2971	0.2953	0.3160	0.3153
Obs.	837	837	837	837	837	837

Notes: 1. The asterisks, *, **, and ***, respectively indicate significance levels at 10 percent, five percent, and one percent.

2. Figures in parentheses indicate standard errors.

B. Implications

The QRP is used to ensure the consideration of both price and non-price factors in granting bids on public construction projects so as to ensure the financial sustainability of participating companies and the quality of resulting

work. Our analysis, however, reveals that the non-price component of review under the QRP fails to function as intended.

Of course, there is probably no need to invest excessively in the screening process for small-scale and general construction projects requiring no sophisticated techniques. These projects exert relatively little impact on the public and the national economy, and the costs of extra human and financial resources invested in the screening process may therefore fail to generate the desired additional utility. The current practice of differentiating the weights and process of non-price review by the scale of projects involved, in light of the possible ripple effects on the national economy and the total number of projects to be undertaken, is therefore wise. Our empirical analysis indeed affirms that this approach somewhat increases the validity of non-price review regarding projects subject to limited competition, with estimated prices of KRW 10 billion and more, and involving specific technological requirements.

Nevertheless, the successful bid rates in the majority of large projects—for which non-price factor review presumably matters much more than for small projects—are identical to the bid floor ratios. This strongly suggests that the non-price component of review is not working as intended and therefore calls to policymakers for attention. Thoroughgoing analysis of the causes and possible solutions is especially needed with respect to small-scale architectural and civil engineering projects subject to general competition as well as relatively larger projects (with estimated prices of KRW 10 to 30 billion) that exert significant effect on the economy. If the technological requirements of given projects are not so complex that it makes little sense to strengthen the non-price component of review, the Korean government should redesign the price component of review so as to encourage substantial price competition. Under the current system, bidders who are able to predict and approximate certain threshold prices win the bids. This distorts the incentives for price competition. As for projects without significant non-price requirements, it may be necessary to revive the practice of selecting bidders on the sole basis of price alone. Of course, in order to prevent the problem of dumping, it will be necessary for the Korean government to estimate realistic costs of construction and review the low prices submitted by bidders before reviving this price-based approach.

4 Conclusion

As construction projects involve significant amounts of both initial and lifecycle maintenance costs, it is critical for the government to grant public construction contracts to bidders who are actually capable of producing quality results at appropriate prices. Poor quality of public construction can incur immense societal costs. The governments of numerous other developed countries, too, apply programs that ensure a comprehensive review of bidders' non-price qualifications. The Korean government, accordingly, has replaced the LPP in public construction projects with the GRP. The QRP currently applies to public construction projects with estimated prices below KRW 30 billion and the GRP to larger projects so that price as well as non-price factors are reviewed in all public construction projects. In reality, however, the non-price factors of review used in the bidding process, including indicators of contract performance capabilities, fail to distinguish optimal contractors from those simply offering the lowest prices.

As one important expectation behind the GRP is that the program will reduce the overall lifecycle costs of maintaining public construction works, even if the initial costs were to be high, so as to improve the overall fiscal efficiency of government activities, it is important to evaluate the results of GRP-based projects in terms of lifecycle costs as well.

The QRP, which is applied to projects with estimated prices below KRW 30 billion, has been shown by our analysis as even more lacking in the validity of non-price factor review than the GRP. Non-price factors of review are indeed not working as intended under the QRP, also complicating the prospects of selecting bidders on the basis of price alone. It is therefore crucial to strengthen non-price factor review for projects with strong and complex technological requirements, while making prices the sole or main factor of granting bids for standard construction projects. The current price review system, which favors the bidders able to predict certain threshold prices most accurately, should also be revisited to encourage substantial and effective competition over price.

IV

Conclusion

This study discusses the findings of empirical analysis of public procurement contracts involving the supply of goods and construction works, based on data available from the OPPP, with a view to identifying the effects of various bidding programs on the efficiency of public procurement contracts. As for the efficiency of contracts on the supply of goods, we first examined data on public supply contracts handled via KONEPS involving remicon, ascon, and concrete blocks, and analyzed the difference created by the application of the SME capability review and the LPP to the final successful bid rates in the procurement of goods subject to competition among SMEs. Our analysis of contracts with estimated prices below KRW 100 million reveals that, whereas the use of the LPP was the more efficient choice in contracts for remicon and ascon, the SME capability review was the more efficient choice when it came to concrete blocks. As the type of goods concerned changes the effect of bidding programs on successful bidding rates, it is important for the Korean government to give state agencies choice over which programs to use for the various types of goods they seek to purchase on the public procurement market. Moreover, as different bidding programs affect the number of bidders (participation) differently and greater participation means greater efficiency, it is important to reform not only bidding programs, but also the qualifications to participate in bidding toward encouraging greater participation. As for goods not subject to competition among SMEs, we analyzed data on computer server contracts and how the use of the QRP, the DSCP and the NBCP changed successful bid rates. Our analysis confirmed that the QRP tended to induce the lowest successful bid rates on average. The

different numbers of bidders made little difference to the outcome of competitive bidding. The different designs of bidding programs, in contrast, affected successful bid rates significantly. This conclusion, however, may be limited to computer servers. The method used in our analysis, nonetheless, may be used to determine optimal bidding programs for other types of goods as well.

As for public construction contracts, we compared the effects of the GRP, which replaced the LPP for non-turnkey construction projects with estimated prices of KRW 30 billion or more as of February 2016, with those of the LPP. The GRP has been introduced to ensure the consideration of non-price factors, such as performance capability and past record with government contracts, in addition to price in the selection of winning bidders. Our analysis, however, shows that the GRP has made little difference to the importance of non-price factors used in review even when compared to the LPP. It is therefore crucial to enhance the validity of non-price factors used to review bidders in construction projects. The QRP, which applies to construction projects with estimated prices below KRW 30 billion, has also failed to ensure the adequate consideration of non-price factors. Under the QRP, in particular, bidders are likely to win construction project bids according to their ability to predict the projected prices. The PPS announced plans to enhance the validity of non-price factors under the GRP in December 2017, particularly increasing the importance of these factors with respect to the review of construction and material sourcing plans. While further research is needed to determine how effectively the new guidelines would increase this validity, the decision on PPS nevertheless signifies that the Korean government is aware of the problem.

In this study, we analyzed the effects of diverse bidding programs on the efficiency of public procurement contracts. The limited availability of data led us to focus much of our analysis on efficiency in terms of price and not non-price factors. With more information made available on these non-price factors, researchers will be able to identify the specific effects of bidding programs on the efficiency of public procurement contracts with greater accuracy. The public procurement market, of course, is used to achieve various policy purposes other than efficiency. As these policy purposes may come in conflict with one another, it is important to analyze different bidding programs applying different metrics tailored to different policy purposes.

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