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Assessing the Degree of Social Responsibility Integration in Socially Responsible Public Procurement in Korea

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Abstract: This study delves into the critical domain of public procurement, specifically focusing on Sustainable Public Procurement (SPP) and Environmental, Social, and Governance (ESG) considerations within the context of South Korea. The aim of this research is to empirically scrutinize the factors influencing the impact index of SPP, with a particular emphasis on services related to labor standards. The investigation spans three years, from January 1, 2019, to July 31, 2021, encompassing state agency orders and post-implementation legal changes. Leveraging the comprehensive Korea On-line E-Procurement System(KONEPS) platform, we meticulously collected data, ultimately culminating in 21,573 services meeting our criteria, from which 250 cases underwent an in-depth analysis. The study sheds light on the influence of social responsibility evaluation criteria on overall procurement scores, while also uncovering the moderating effects of various factors. The outcomes of this study offer valuable insights into the impact index of social responsibility evaluation criteria within South Korea's public procurement landscape. Factors including procurement year, classification, service period, and estimated price were identified as significant influencers. Moreover, the number and location of evaluation criteria items, inclusion of sincerity elements, and the evaluating agency were deemed pivotal determinants of the influence index. These findings hold profound implications for policymakers, procurement practitioners, and researchers and provide a roadmap for optimizing the utilization of social responsibility evaluation criteria to advance responsible and sustainable procurement practices. Future research avenues include conducting further study of additional moderating variables, expanding datasets to encompass a broader spectrum of procurement contexts, and evaluating the long-term repercussions of social responsibility evaluation on procurement outcomes. These endeavors promise to further refine and advance public procurement practices in South Korea and beyond.

Keywords: sustainable public procurement(SPP); environment; social and governance(ESG); south Korea; KONEPS platform

1. Introduction

Public procurement is a critical area of study, particularly in the context of sustainable and responsible practices. This study examines the factors influencing the impact index of Sustainable Public Procurement (SPP) and Environmental, Social, and Governance (ESG) considerations within the realm of public procurement in South Korea. Our primary objective is to empirically investigate whether various factors, including the year, procurement classification, service period, and estimated price, have a moderating effect on the impact index. In particular, we focus on services that pertain to violations of minimum wage, overdue wages, and failure to implement employment improvement measures. These services align with the social responsibility evaluation criteria outlined in Article 9(3)2 of the 'Detailed Criteria for Evaluating Contract Proposals by Negotiation of the Public Procurement Service.'(Statutes of the Republic of Korea (klri.re.kr) Our study is delimited to services ordered by state agencies over the past three years, spanning from January 1, 2019, to July 31, 2021. This timeframe allows us to consider the implementation of legal changes following the effective date of the criteria on July 1, 2018. The study primarily revolves around Korea On-line E-Procurement

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System(KONEPS) (www.g2b.go.kr), a national comprehensive electronic procurement site, with a specific focus on services due to resource, cost, and time constraints. We emphasize the proposed bidding method, as it aligns with the application of social responsibility evaluation criteria. Our research involved a meticulous data collection process, resulting in a final selection of 21,573 services that met our criteria. From this dataset, we identified 250 cases that incorporated social responsibility evaluation criteria for a subsequent in-depth analysis. In this paper, we presented in detail the methodology, variables, and the analytical approach used to investigate the influence of social responsibility evaluation criteria on the overall evaluation score in public procurement. Additionally, we explore the moderating effects of various factors.

2. Literature Review

2.1. SPP

Andrea et al. (2017) [1] undertakes a comprehensive evaluation of the public procurement literature by analyzing research published in the Journal of Public Procurement from 2001 to 2014. A total of 231 research outputs were systematically collected and examined, focusing on aspects such as the theoretical frameworks employed, research methodologies utilized, and the content of the papers. Through this analysis, the study offers an overview of previous research topics and findings while pinpointing key gaps in the existing literature. Manuel et al. (2019) [2] focuses on the situation of Spanish Public Procurement processes and available open data sources, particularly related to Request-For-Proposal (RFP) and tender submission data. It also covers relevant European and Spanish legislation and explains the Spanish Public Sector Contracting Platform, where procurement announcements and resolutions are published. It emphasizes how the analysis of public tenders can benefit various stakeholders, including politicians, public managers, project managers, executives, and citizens.

Then, what about sustainability? Monica et al. (2020) [3] aims to assess the level of sustainability integration into Canadian government procurement and offer recommendations to enhance the practices. Through a review of 50 publicly available Requests for Proposals (RFPs) issued from 2016 to 2019, the study evaluates the extent and depth of sustainability considerations and findings indicate that sustainability integration in RFPs is superficial, with limited inclusion in the evaluation process and narrow scope in environmental and social impact areas. Alok et al. (2020) [4] addresses the complex dynamics influencing sustainable public procurement, particularly in the context of developed and developing economies. Utilizing data collected from 546 public procurement practitioners across 102 countries, a structural equation model is developed and the conceptual model is validated across three categories of public procurement: goods, works, and services. Findings reveal that institutional pressures and citizens' attitudes towards sustainability significantly influence the level of sustainability adoption in public procurement. Moreover, the impact of these pressures varies between developed and developing economies.

What hinders sustainability? Javier et al. (2019) [5] aims to improve sustainable public procurement by identifying challenges faced by public servants and social economy entities. Surveys and interviews were conducted with 217 respondents from Spain and Europe. Findings were analyzed using a SWOT framework. The result shows that challenges include lack of training and internal resistance to change for the public sector, and small size and conflicts with social objectives for social entities. Adela et al. (2016) [6] investigates sustainable procurement practices in Saudi Arabian public and private organizations, aiming to understand their nature, extent, and the main barriers to implementation. Through a structured questionnaire survey involving 202 procurement directors/senior managers, the study employs multivariate and multiple regression techniques to analyze the relationship between organizations' sustainable procurement practices and barriers to implementation. Results indicate a predominantly negative state of sustainable procurement practices across organizations, with top management attitudes and organizational culture identified as primary barriers. Syed. et al. (2019) [7] aims to assess critical factors hindering the implementation of sustainable procurement in the public sector of Pakistan. Utilizing the Interpretive

 doi:10.20944/preprints202403.1454.v1

Structural Model, twelve key barriers to sustainable procurement implementation were identified and ranked based on literature review and Likert scale instrument. Analysis of tender documents from 75 public sector universities revealed a lack of sustainability elements. External factors such as government legislation and stakeholders' pressure were identified as the most critical barriers compared to inter-organizational factors. Based on a performance appraisal project conducted by the Guangzhou municipal government from 2012 to 2014, Li (2015) [8] identifies various challenges hindering the sustainable development of government procurement of public services. Using Guangzhou as a representative case study, the paper proposes several recommendations for ensuring the sustainable development of government procurement of public services, with a focus on addressing social work's resource dependence. Laura et al. (2019) [9] examines the impact of project-delivery methods and procurement procedures on the inclusion of social criteria in public construction procurement. Analyzing 451 tendering documents from 10 countries, content analysis, descriptive statistics, and logistic regression were applied. The findings highlight the influence of country and contract size on the inclusion of social criteria, with no significant differences observed between project-delivery methods or procurement procedures. However, certain social criteria were more prevalent in traditional delivery methods, while others were associated with lowest price procurement procedures. Laura et al. (2020) [10] addresses the barriers hindering the implementation of sustainability in public procurement within the construction industry. It highlights the lack of knowledge about which sustainability criteria to include and the subjectivity in defining their importance levels. To address this, the study aims to identify sustainability shortcomings in each European Union country and determine the importance of each sustainability category. Five environmental and eight social categories were established, and 42 national indicators were selected to assess sustainability performance across the 28 European countries using the Promethee method. Through cluster analysis, two groups of countries were identified: economically developed countries focusing on environmental performance, and others needing to balance social and environmental sustainability efforts. Helen & Stephen (2012) [11] investigates the interplay between sustainable procurement and e-procurement, two contemporary approaches in public procurement across numerous countries. Through a survey involving more than 280 public procurement professionals from 20 countries, responsible for a combined expenditure of $45 billion, the researchers explore the adoption of sustainable procurement and e-procurement. Utilizing multiple regression analysis, they construct a model illustrating that while e-procurement and effective communication with suppliers can facilitate certain aspects of sustainable procurement such as environmental, labor, and health and safety considerations, they may also impede other aspects. Specifically, e-procurement might hinder procurement from small local businesses that lack electronic capabilities.

Followed is regarding sustainability implementation. Mohamed & Charles (2016) [12] emphasizes the importance of considering the social dimension of sustainability in highway projects, alongside environmental and economic aspects. While many studies focus primarily on environmental sustainability, this study highlights the need to address social factors such as respect, awareness, diversity, vitality, and responsibility towards the workforce and society. The study identifies ten core factors crucial for social sustainability in highway projects and recommends their implementation at various stages of project development. Stephen & Helen (2010) [13] seeks to address gaps in understanding regarding sustainable procurement (SP) practices in public sector organizations internationally. The authors report findings from a survey of over 280 public procurement practitioners from 20 countries with a combined annual expenditure of $45 billion. Analysis reveals varying degrees of SP practices across regions, with some practices being evident in public procurement. The authors also identify key facilitators and barriers to SP engagement and investigate their significance for different dimensions of SP implementation. Azapagica & Perdan (2000) [14] addresses the pressing need for greater adoption of sustainable strategies in industry, focusing on the measurement of sustainability within industry, the paper proposes a comprehensive yet accessible framework comprising indicators across environmental, economic, and social dimensions. These indicators encompass factors such as environmental impacts, financial considerations, and ethical practices. While the framework is designed to be applicable across various

 doi:10.20944/preprints202403.1454.v1

industries, it emphasizes the importance of tailoring specific indicators to individual sectors. Lutz (2009) [15] aims to investigate how local government authorities in England utilize their procurement function to promote sustainable development, an area that has received less attention compared to the private sector. Employing an exploratory approach, the study involves qualitative research into leading local government authorities, building on existing literature. The findings reveal a variety of initiatives adopted by local government procurers to address all dimensions of sustainability. These initiatives are synthesized into a typology of sustainable supply chain management tailored for the public sector.

2.2. ESG

Stefan et al. (2012) [16] presents a rigorous examination of research in socially and environmentally responsible procurement (SERP), incorporating both quantitative and qualitative techniques. It underscores the critical juncture in SERP literature development and identifies shortcomings and potential fragmentation, emphasizing the importance of addressing these issues for SERP to become prominent in wider management discourse. The review provides a systematic analysis of existing contributions and their implications for practitioners, while also identifying neglected areas for future research critical from both academic and implementation perspectives. Joyce & Tim (2007) [17] examines the feasibility of implementing green procurement within English local government. Through desk research and interviews with five local authorities, it explores the background and current status of green procurement. The study reveals that while legislation, information provision, and barrier removal have encouraged green procurement, momentum was lost after the Gershon review. The analysis suggests that implementing a new action plan would embed green procurement within government practices. Additionally, linking green procurement with organizational goals could further expand its scope and impact. David et al. (2017) [18] presents a transparent and easily applicable methodology for selecting indicators of environmental sustainability, with the ultimate goal of enabling the comprehensive assessment of a country's environmental performance. The paper evaluates the utility of existing environmental sustainability indicators based on criteria such as policy relevance, utility, soundness, and data availability. By establishing differentiated indicator targets tailored to each nation's specific context, the methodology ensures that indicators are relevant to the unique circumstances of each country rather than applying generic regional standards. Francesco et al. (2016) [19] examines the factors influencing the inclusion of environmental criteria in public tenders, focusing on the context of Italian municipalities. The analysis indicates that increasing awareness and providing information about green public procurement (GPP) techniques significantly contribute to the development of environmentally friendly procurement practices. Additionally, the research highlights that the effectiveness of GPP is not solely dependent on the adoption of a certified Environmental Management System (EMS) by public authorities, but rather on the maturity level of the EMS, which adds value to GPP practices. Furthermore, the study suggests that despite limitations posed by the small size of public authorities, progress in GPP can be achieved through various European, national, and local support initiatives. Jolien & Dylan (2019) [20] investigates the impact of ability, motivation, and opportunity on six types of sustainable public procurement (SPP) policies: green procurement, social return on investment, circular economy, bio-based procurement, innovation-oriented procurement, and international social criteria. Through an online survey of procurers in Dutch public organizations, the study reveals that ability, motivation, and opportunity influence Green Public Procurement (GPP). Specifically, opportunity affects GPP, innovation-oriented procurement, and circular economy, but not other types of SPP. Bader et al. (2019) [21] explores internal factors influencing green procurement implementation in the United Arab Emirates (UAE) public sector, focusing on the relationship between organizational innovation capability and green procurement implementation, mediated by employees' commitment to change. A structural model is proposed using scales from literature, and primary research data collected from a cross-sectional survey of 50 respondents from public-sector organizations in Abu Dhabi. Findings indicate a positive influence of organizational innovation capability on green procurement implementation, alongside the impact of

 doi:10.20944/preprints202403.1454.v1

employees' commitment to change. Junqi et al. (2009) [22] investigates factors influencing the performance of Green Public Procurement (GPP) among Chinese procurement officials. Using data from 139 local government officials in China, a new conceptual model with direct and moderating effects was developed. The study reveals that officials' awareness of GPP implementation policies positively impacts their GPP performance. Additionally, receiving GPP training and working in local governments participating in the China national sustainable community (CNSC) program can positively moderate this relationship. However, awareness of GPP-related regulations does not have the same effect, and the mature CNSC program does not directly impact GPP performance. Francesco et al. (2016) [23] examines the incorporation of green criteria in tenders, focusing specifically on the building and construction sector. Analyzing 164 Italian public tenders using a protocol based on the GPP toolkit developed by the European Commission, the authors conducted a comprehensive content analysis to investigate the prevalence, distribution, and correlation of green criteria within the sample. The findings indicate a restrained utilization of green criteria, primarily embedded as technical specifications and award criteria. A case study of an innovative building project in Norway by Magnus et al. (2018) [24] highlights the challenges in implementing Green Public Procurement (GPP) due to a disconnect between policy requirements and formal governance.

While research on SPP and ESG is being conducted diversely in countries around the world, the situation in South Korea is relatively underdeveloped in this field on a global scale, with scarce research available, and notably, some existing research is not published in English. This serves as the starting point for our case study.

3. Methodology:

3.1. Data Collection

We initiated the data collection process by compiling a comprehensive list of services ordered over the past three years, resulting in a dataset comprising 427,224 services. To refine the dataset for our study, we focused on national institutions, resulting in a list of 60,539 services. We subsequently excluded services associated with private contracts, unit price contracts, minimum price contracts, and PQ screening, narrowing our focus to services utilizing the proposed bidding method. This meticulous process culminated in a final selection of 21,573 services.

3.2. Dependent Variable

Our study centers on the dependent variable termed the "influence index of the social responsibility evaluation criteria." This variable measures the extent to which social responsibility evaluation criteria impact the overall proposal evaluation score. The proposal evaluation process typically consists of two components: technology evaluation and price evaluation, which collectively add up to 100 points. Technology evaluation is further decomposed into quantitative (assessing creditworthiness and performance) and qualitative (evaluating participants' understanding of and approach to service) aspects. The influence index quantifies the influence of social responsibility evaluation criteria relative to the combined impact of technology and price evaluation. It is calculated by taking the difference between the maximum and minimum values of the social responsibility evaluation criteria distribution and applying the distribution ratio of technology to price evaluation. This calculation results in the ratio of social responsibility evaluation criteria to the total proposal evaluation score.

3.3. Independent Variables

Our independent variables encompass factors associated with social responsibility evaluation criteria, including the following:

- The number of evaluation criteria items, categorized as 1, 2, and 3, corresponding to the three specified criteria: minimum wage violations, overdue wages, and failure to implement employment measures.

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- The location of evaluation criteria, represented by a binary dummy variable: 1 signifies inclusion, while 0 signifies exclusion.
- Sincerity items, also represented by a binary dummy variable: 1 indicates inclusion, whereas 0 denotes exclusion.
- Evaluation criteria evaluation agency, categorized into two groups: self-evaluation (coded as 1) and procurement agency evaluation (coded as 0).

3.4. Control Variables

Our study integrates various control variables to account for potential moderating effects, including the following:

- Year, categorized as 1 for 2019, 2 for 2020, and 3 for 2021.
- Procurement classification, divided into central procurement (coded as 1) and self-procurement (coded as 0).
- Service period, measured in months and reset to five categories: 1 for 3 months or less, 2 for 3-6 months, 3 for 6 months to 1 year, 4 for 1-2 years, and 5 for more than 2 years.
- Notice period, measured in days and reset to four categories: 1 for 10 days or less, 2 for 11-20 days, 3 for 21-30 days, and 4 for more than 30 days.
- Estimated price, measured in Korean won and reset to five categories: 1 for less than 1.5 million won, 2 for 1.5 million won to 100 million won, 3 for 100.1 million to 500 million won, 4 for 500.1 million to 1 billion won, and 5 for more than 1 billion won.

4. Data Presentation

4.1. Dataset Overview

Our dataset encompasses a comprehensive compilation of services ordered over the last three years, amounting to a total of 427,224 services. This extensive dataset serves as the foundation for our investigation. However, we progressively refined it to focus on national institutions, resulting in a subset of 60,539 services. Subsequent to eliminating services associated with private contracts, unit price contracts, minimum price contracts, and PQ screening, we arrived at a carefully selected final dataset comprising 21,573 services. This dataset is representative of our study's scope and objectives

4.2. Descriptive Statistics

To gain insight into the characteristics of our dataset, we conducted an initial analysis, presenting essential summary statistics. This includes the calculation of means, standard deviations, and minimum and maximum values, which offer an overview of the distribution of critical variables.

4.3. Variable Relationships

While exploring our dataset, we examined potential relationships between variables through preliminary analyses. These exploratory insights set the stage for our more in-depth inferential analysis and regression modeling, which we discuss in subsequent sections.

Table 1. Data collection list.

Delimiting	Full	2019	2020	2021
Unconstrained	427,224	173,071	157,524	96,629
State Agency Limitation	60,539	22,918	22,435	15,186
Review for duplicates, etc.	21,573	8,277	9,031	4,265

 doi:10.20944/preprints202403.1454.v1

Final Sample Number	250	63	144	43

5. Results

5.1. General Characteristics of the Major Variables

In this section, we present the general characteristics of the primary variables under examination. Our sample consisted of 250 survey targets (100.0%). When considering the distribution by year, the majority of services were procured in 2020, accounting for 57.6% (144), followed by 2019 at 25.2% (63), and 2021 at 17.2% (43). Procurement classification revealed that central procurement was dominant at 74.4% (186), significantly surpassing self-procurement at 25.6% (64). In terms of service period, 47.2% (118) of services fell within the category of 6 months to 1 year, followed by 25.6% (64) for 3 to 6 months, 9.2% (23) for under 3 months and over 2 years, and 8.8% (22) for 1 to 2 years. Regarding estimated price, services with a value of less than 100 million won constituted the majority at 37.2% (93), with less than 50 million won to 100 million won at 21.2% (53), more than 1 billion won at 17.2% (43), less than 50 million won at 14.4% (36), and the lowest category, less than 50 million won, represented at 10.0% (25).

In the context of the social responsibility evaluation criteria, we examined the number of items within the evaluation criteria, with three items being the most common at 82.0% (205), followed by two items at 16.8% (42), and one item at 1.2% (3). Additionally, evaluation criteria were primarily standalone items, accounting for 78.8% (197), with a smaller proportion integrated into other factors at 21.2% (53). When assessing the inclusion of sincerity items, 50.8% (127) of services included them, slightly more than the 49.2% (123) that did not. Lastly, in terms of the evaluating agency, self-evaluation was predominant at 66.8% (167), while the Public Procurement Service's evaluation accounted for 33.2% (83).

Table 2. General Characteristics.

Delimiting		Frequency	%
Full		250	100.0
Year	2019	63	25.2
	2020	144	57.6
	2021	43	17.2
Procurement classification	Central procurement	186	74.4
	Self-procuring	64	25.6
Service period	Less than 3 months	23	9.2
	3-6 months or less	64	25.6
	6 months to less than 1 year	118	47.2
	1-2 years or less	22	8.8
	Over 2 years	23	9.2
Estimated price	Less than 50 million	25	10.0
	50 million to less than 100 million won	53	21.2
	Less than 100 to 500 million won	93	37.2
	5 to less than 1 billion won	36	14.4

 doi:10.20944/preprints202403.1454.v1

Delimiting		Frequency	%
	Over 1 billion	43	17.2
Evaluation criteria item number	1	3	1.2
	2	42	16.8
	3	205	82.0
Evaluation standard organization location	Newcomers	53	21.2
	Single	197	78.8
Includes Integrity Items	Contains	127	50.8
	Not included	123	49.2
Evaluation standard evaluation agency	Self-evaluation	167	66.8
	Procurement agency evaluation	83	33.2

5.2. Analysis of influence index

In this section, we analyze the influence index, a central variable in our study, while considering various general characteristics. The overall influence index was found to have an average value of 3.88±1.49, with a distribution range spanning from a minimum value of 0.48 to a maximum value of 6.00.

Table 3. General Characteristics of Influence Index of Social Responsibility Evaluation Criteria.

Delimiting	Frequency	Average	Standard deviation	Minimum value	Maximum value
Total Impact Index	250	3.88	1.49	0.48	6.00

5.3. Verification of Differences in Influence Index by General Characteristics

5.3.1. Influence Index by Year

Our analysis revealed statistically significant differences in the influence index based on the year of procurement. Specifically, services procured in 2020 exhibited the highest average influence index at 4.22±1.50, followed by 2019 with an average of 3.50±1.28, and 2021 with the lowest average at 3.32±1.46. The calculated F value of 9.55 indicated a noteworthy difference.

5.3.2. Influence Index by Procurement Classification

Significant variations in the influence index were observed between different procurement classifications. Self-procurement demonstrated a substantially higher average influence index of 4.75±1.51, compared to central procurement with an average of 3.59±1.36. The t-value of 5.73 indicated statistical significance.

5.3.3. Influence Index by Service Period

Our analysis further explored the relationship between service duration and the influence index. Services with shorter durations displayed higher influence indices. Notably, services with durations of three to six months or less exhibited the highest average influence index at 4.68±1.59. The F value of 8.22 indicated statistical significance.

 doi:10.20944/preprints202403.1454.v1

5.3.4. Influence Index by Estimated Price

Differences in the influence index were evident based on the estimated price of services. Services with lower estimated prices displayed higher influence indices. Services with an estimated price of less than 50 million won to 100 million won had the highest average influence index at 5.03±1.18. The F value of 22.21 indicated statistical significance.

5.3.5. Influence Index by Number of Items in Evaluation Criteria

Our analysis highlighted a positive association between the number of items in the evaluation criteria and the influence index. Services with two items in the evaluation criteria exhibited the highest average influence index at 4.86±1.55. The F value of 11.77 indicated statistical significance.

5.3.6. Influence Index by Location of Evaluation Criteria

The location of evaluation criteria also had an effect on the influence index. Services with evaluation criteria integrated into other factors had a slightly higher average influence index at 4.29±1.81 compared to services with standalone evaluation criteria. The t-value of -2.26 indicated statistical significance.

5.3.7. Influence Index by Inclusion of Sincerity Items

The analysis explored the influence index based on the inclusion of sincerity items in the evaluation criteria. Services that included sincerity items had a slightly higher average influence index at 4.00±1.49 compared to services that did not include them. However, the t-value of -1.20 suggested no statistically significant difference based on the inclusion of sincerity items.

5.3.8. Influence Index by Evaluation Criteria Evaluation Institutions

Finally, differences in the influence index were identified based on the evaluating institution. Services evaluated through self-assessment exhibited a notably higher average influence index at 4.20±1.43 compared to services evaluated by the Public Procurement Service. The t-value of -5.02 indicated statistical significance.

Table 4. Verification of Differences in Influence Index by General Characteristics.

Delimiting		Frequency	Average	Standard Variance	t/F
Year	2019	63	3.50	1.28	9.55***
	2020	144	4.22	1.50	
	2021	43	3.32	1.46	
Procurement classification	Central procurement	186	3.59	1.36	5.73***
	Self-procuring	64	4.75	1.51	
Service period	Less than 3 months	23	3.71	1.65	8.22***
	3-6 months or less	64	4.68	1.59	
	6 months to less than 1 year	118	3.75	1.24	
	1-2 years or less	22	3.08	1.21	
	Over 2 years	23	3.29	1.61	
Estimated price	Less than 50 million	25	4.44	1.49	22.21***

 doi:10.20944/preprints202403.1454.v1

Delimiting		Frequency	Average	Standard Variance	t/F
	50 million to less than 100 million won	53	5.03	1.18	
	Less than 100 to 500 million won	93	3.88	1.37	
	5 to less than 1 billion won	36	3.01	1.33	
	Over 1 billion	43	2.89	1.03	
Evaluation criteria item number	1	3	3.67	0.58	11.77***
	2	42	4.86	1.55	
	3	205	3.69	1.41	
Evaluation standard organization location	Newcomers	53	4.29	1.81	-2.26*
	Single	197	3.78	1.37	
Includes integrity items	Contains	127	4.00	1.49	-1.20
	Not included	123	3.77	1.48	
Evaluation standard evaluation agency	Self-evaluation	167	4.20	1.43	-5.02***
	Procurement agency evaluation	83	3.24	1.39	

***p< 0.001, **p< 0.01, *p< 0.05.

5.4. Correlation Analysis

Pearson correlation analysis was employed to explore the relationships between various factors and the overall influence index, a central variable in this study. The analysis encompassed both general service characteristics related to social evaluation criteria and characteristics of social responsibility evaluation criteria. Additionally, it considered factors such as year, procurement classification, service period, estimated price, and characteristics of the social responsibility evaluation criteria, including the number of evaluation criteria items, location of evaluation criteria organization, inclusion of sincerity items, and the evaluation criteria evaluation agency. This examination also assessed the presence of multicollinearity.

5.4.1. Multicollinearity Assessment

Multicollinearity was evaluated based on the correlation coefficients between variables. It was found that none of the variables exhibited a correlation coefficient exceeding 0.9, which is the threshold for determining multicollinearity. Generally, significant correlations were observed between variables at the 0.05 significance level.

5.4.2. Correlations with Influence Index

The overall influence index displayed correlations with specific variables:
Procurement Classification: A negative (-) correlation.
Service Period: A negative (-) correlation.
Estimated Price: A negative (-) correlation.
Number of Evaluation Criteria Items: A negative (-) correlation.
Evaluation Criteria Arrangement Position: A positive (+) correlation.
Evaluation Criteria Evaluation Agency: A positive (+) correlation and was statistically significant.
Strength of Relationships
The strength of these relationships was assessed using Pearson correlation coefficients (r):

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Estimated Price: Presented the highest correlation with the influence index (r = -0.46).
Procurement Classification: Exhibited a correlation of -0.34.
Evaluation Criteria Evaluation Agency: Displayed a correlation of 0.30.
Number of Evaluation Criteria Items: Presented a correlation of -0.25.
Service Period: Showed a correlation of -0.23.
Evaluation Criteria Organization Location: Presented the lowest correlation at 0.14.
In summary, lower estimated prices, self-procurement as opposed to central procurement, self-evaluation rather than Public Procurement Service evaluation, a smaller number of evaluation criteria items, a shorter service period, and an evaluation criteria organization location corresponding to new delivery rather than standalone delivery were associated with a higher overall influence index.

Table 5. Correlation analysis.

Delimiting	1	2	3	4	5	6	7	8	9
1	1.00								
2	0.00	1.00							
3	-0.34***	-0.20**	1.00						
4	-0.23***	-0.15*	0.31***	1.00					
5	-0.46***	-0.11	0.55***	0.47***	1.00				
6	-0.25***	-0.16*	0.62***	0.18**	0.26***	1.00			
7	0.14***	-0.04	-0.44***	-0.07	-0.16**	-0.57***	1.00		
8	0.08	-0.49***	0.03	-0.08	-0.06	0.10	-0.04	1.00	
9	0.30***	0.19**	-0.34***	-0.28***	-0.32***	-0.28***	0.05	0.00	1.00

1) 1. Overall Influence Index, 2. Year, 3. Procurement classification, 4. Service period, 5. Estimated price, 6. Number of items to be evaluated, 7. Evaluation criteria organization location, 8 Whether Integrity Items are Included, 9 Evaluation Criteria Evaluation Agency. 2) ***p< 0.001, **p< 0.01, *p< 0.05.

5.5. Verification of Influencing Factors of Influence Index

In this section, we examine the moderating effect of several variables, including year, on the relationship between social responsibility evaluation factors and the influence index, which are central to this study. A multiple regression analysis is employed with the influence index as the dependent variable, and independent variables encompass the number of evaluation criteria items, the location of evaluation criteria, the inclusion of sincerity items, and the evaluation criteria evaluation institution. We conduct two regression analyses for each moderation variable, proceeding stepwise to verify the moderation effect.

5.5.1. Year as a Moderating Variable:

Model 1: In the initial model, we examine the relationship between the influence index and independent variables, including the number of evaluation criteria items, evaluation criteria organization location, whether sincerity items are included, and the evaluation criteria evaluation agency.
Model 2: In the subsequent model, interaction terms related to the year are introduced in addition to the variables from Model 1 to investigate the moderation effect.

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Results of Model 1

Model 1 explains 11.6% of the variance in the influence index (adj-R2). Among the independent variables, the number of evaluation criteria items and the evaluation criteria evaluation agency significantly influence the influence index. The number of evaluation criteria items has a negative (-) effect (β = -0.178), indicating that a smaller number of evaluation criteria items is associated with a higher influence index. The evaluation criteria evaluation agency has a positive (+) effect (β = 0.260), suggesting that self-evaluation by the agency, rather than evaluation by the Public Procurement Service, is linked to a higher influence index. Model 1 is statistically significant (F value = 7.50).

Results of Model 2

In Model 2, which introduces interaction terms, the interaction term related to the inclusion of sincerity items is statistically significant, while the interaction terms for the number of evaluation criteria items, evaluation criteria organization location, and evaluation criteria evaluation agency are not. The significance of the interaction term regarding sincerity items indicates that the relationship between the inclusion of sincerity items and the influence index varies according to the year. Model 2 is statistically significant (F value = 9.69) and explains 14.9% of the variance in the influence index (adj-R2), representing an improvement of approximately 3.3% in explanatory power compared to Model 1.

Overall, these findings highlight that the number of evaluation criteria items and the entity responsible for the evaluation play essential roles in determining the influence index. Additionally, the interaction effect related to sincerity items and year suggests there is a dynamic nature in how sincerity criteria affect the influence index, potentially reflecting changing trends or attitudes toward sincerity-related considerations in public procurement.

Table 6. Regulation Effect Analysis: Year.

Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
Evaluation criteria item number	-0.624*	0.272	-0.178	-1.280	0.737	-0.365
Evaluation standard organization location	0.098	0.270	0.027	-0.297	0.740	-0.082
Includes Integrity Items	0.224	0.205	0.075	-2.535***	0.689	-0.854
Evaluation standard Evaluation agency	0.818***	0.201	0.260	0.987	0.604	0.313
Year	-0.088	0.164	-0.038	-1.922	1.003	-0.837
Evaluation basis items*year				0.354	0.322	0.461
Evaluation criteria organization location*year				0.266	0.395	0.145
Including integrity items*year				1.385***	0.325	0.862
Rating basis rating agency*year				-0.138	0.306	-0.100
N	250			250		

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Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
adj-R2	0.116			0.149		
F	7.50***			9.69***		

***p< 0.001, **p< 0.01, *p< 0.05.

5.5.2. Procurement Classification as a Moderating Variable:

Model 1: In the initial model, we examine the relationship between the influence index and independent variables, including the number of evaluation criteria items, evaluation criteria organization location, whether sincerity items are included, and the evaluation criteria evaluation agency, while considering procurement classification as a moderating variable.
Model 2: In the subsequent model, interaction terms related to procurement classification are introduced in addition to the variables from Model 1 to investigate the moderation effect.

Results of Model 1

Model 1 explains 14.9% of the variance in the influence index (adj-R2). Among the independent variables, both procurement classification (control variable) and the evaluation criteria evaluation agency (independent variable) significantly influence the influence index. Procurement classification has a negative (-) effect (β = -0.242), indicating that the influence index is higher when the procurement classification is self-procurement rather than central procurement. The evaluation criteria evaluation agency has a positive (+) effect (β = 0.207), suggesting that self-evaluation by the agency, rather than evaluation by the procurement agency, is linked to a higher influence index. Model 1 is statistically significant (F value = 9.69).

Results of Model 2

In Model 2, which introduces interaction terms, the interaction term related to the evaluation criteria organization location is statistically significant, while the interaction terms for the number of evaluation criteria items, inclusion of sincerity items, and evaluation criteria evaluation agency are not. The significance of the interaction term regarding evaluation criteria organization location indicates that the relationship between the location of the evaluation criteria and the influence index varies according to the procurement classification. Model 2 is statistically significant (F value = 7.73) and explains 19.6% of the variance in the influence index (adj-R2), representing an improvement of approximately 4.7% in explanatory power compared to Model 1.

In summary, these findings suggest that procurement classification plays a significant role in moderating the relationship between certain independent variables and the influence index. Specifically, self-procurement is associated with a higher influence index. Additionally, the location of the evaluation criteria has a varying impact on the influence index depending on the procurement classification. These results highlight the importance of considering procurement classification when examining the influence of evaluation criteria on the overall proposal evaluation score.

Table 7. Analysis of Control Effects: Procurement Classification.

Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
Evaluation criteria item number	-0.190	0.296	-0.054	0.901	0.562	0.257
Evaluation standard organization location	-0.009	0.265	-0.003	1.812**	0.536	0.499

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Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
Includes integrity items	0.259	0.175	0.087	0.763*	0.352	0.257
Evaluation standard Evaluation agency	0.653**	0.200	0.207	0.181	0.735	0.057
procurement classification	-0.824**	0.264	-0.242	2.287	2.156	0.672
Evaluation criteria item count*procurement classification				-0.979	0.677	-0.865
Evaluation criteria organization location*procurement classification				-2.547***	0.629	-0.465
Including integrity items*procurement classification				-0.523	0.404	-0.171
Evaluation criteria evaluation institute*procurement classification				0.401	0.763	0.134
N	250			250		
adj-R2	0.149			0.196		
F	9.69***			7.73***		

***p< 0.001, **p< 0.01, *p< 0.05.

5.5.3. Service Period as a Moderating Variable:

Model 1: In the initial model, we examine the relationship between the influence index and independent variables, including the number of evaluation criteria items, evaluation criteria organization location, whether sincerity items are included, and the evaluation criteria evaluation agency, while considering the service period as a moderating variable.
Model 2: In the subsequent model, interaction terms related to the service period are introduced in addition to the variables from Model 1 to investigate the moderation effect.

Results of Model 1

Model 1 explains 13.0% of the variance in the influence index (adj-R2). However, none of the independent and control variables are statistically significant. The F value is 8.47, and Model 1 is statistically significant.

Results of Model 2

In Model 2, which introduces interaction terms, none of the interaction terms related to the service period are statistically significant. This suggests that there is no significant difference in the relationship between the independent variables and the influence index based on variations in the service period. Model 2 is statistically significant (F value = 7.73) and explains 13.6% of the variance in the influence index (adj-R2). The explanatory power increased by approximately 0.6% compared to Model 1, although this increase is minimal.

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Overall, the findings indicate that service period, at least in the context of this analysis, does not significantly influence the relationship between social responsibility evaluation factors and the influence index. The lack of statistical significance suggests that other factors or variables not considered in this analysis may have a more substantial impact on the influence index.

Table 8. Adjustment Effect Analysis: Service Period.

Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
Evaluation criteria item number	-0.540	0.269	-0.154	0.640	1.388	0.182
Evaluation standard organization location	0.130	0.265	0.036	2.418	1.316	0.666
Includes integrity items	0.244	0.177	0.082	0.378	0.530	0.127
Evaluation standard evaluation agency	0.698	0.202	0.222	0.844	0.624	0.268
Service period	-0.191	0.090	-0.132	0.967	1.424	0.668
Evaluation criteria items*service period				-0.343	0.470	-0.770
Evaluation criteria organization location * service period				-0.751	0.411	-0.601
Whether to include sincerity items*service period				-0.027	0.177	-0.028
Evaluation criteria evaluation institution * service period				-0.057	0.195	-0.056
N	250			250		
adj-R2	0.130			0.136		
F	8.47***			5.34***		

***p< 0.001, **p< 0.01, *p< 0.05.

5.5.4. Estimated Price as a Moderating Variable:

Model 1: In the initial model, we examine the relationship between the influence index and independent variables, including the number of evaluation criteria items, evaluation criteria organization location, whether sincerity items are included, and the evaluation criteria evaluation agency, while considering the estimated price as a moderating variable.
Model 2: In the subsequent model, interaction terms related to the estimated price are introduced in addition to the variables from Model 1 to investigate the moderation effect.

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Results of Model 1

Model 1 explains 24.0% of the variance in the influence index (adj-R2). Among the independent variables, both the estimated price (moderating variable) and the evaluation criteria evaluation agency (independent variable) significantly influence the influence index. The estimated price has a negative (-) effect (β = -0.378), indicating that the influence index is higher when the estimated price is lower. The evaluation criteria evaluation agency has a positive (+) effect (β = 0.152), suggesting that self-evaluation by the agency, rather than evaluation by the procurement agency, is linked to a higher influence index. Model 1 is statistically significant (F value = 16.70).

Results of Model 2

In Model 2, which introduces interaction terms, the interaction terms related to the number of evaluation criteria items, evaluation criteria organization location, and inclusion of sincerity items are statistically significant, while the interaction term for the evaluation criteria evaluation agency is not. The significance of the interaction term regarding the number of evaluation criteria items implies that the relationship between the number of items in the evaluation criteria and the influence index varies based on changes in the estimated price. Model 2 is statistically significant (F value = 11.46) and explains 27.4% of the variance in the influence index.

In summary, these findings indicate that estimated price plays a significant role in moderating the relationship between several independent variables and the influence index. Specifically, lower estimated prices are associated with a higher influence index. Additionally, the number of evaluation criteria items, location of evaluation criteria, and inclusion of sincerity items have varying impacts on the influence index depending on changes in the estimated price. This suggests that the influence of social responsibility evaluation criteria on the overall proposal evaluation score may be influenced by the estimated price of the services being procured.

Table 9. Adjustment Effect Analysis: Estimated Price.

Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
Evaluation criteria item number	-0.400	0.252	-0.114	1.725*	0.865	0.492
Evaluation standard organization location	0.033	0.248	0.009	2.045*	0.913	0.563
Includes integrity items	0.187	0.166	0.063	1.373**	0.454	0.462
Evaluation standard evaluation agency	0.478*	0.190	0.152	1.261*	0.568	0.400
Estimated price	-0.468***	0.074	-0.378	2.005*	0.870	1.619
Valuation basis item count*estimated price				-0.717*	0.285	-1.869
Evaluation criteria organization location*estimated price				-0.624*	0.284	-0.505
Including integrity items*estimated price				-0.380**	0.137	-0.435
Valuation criteria valuation agency*estimated price				-0.239	0.158	-0.261

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Delimiting	Model 1			Model 2		
	B	S.E	β	B	S.E	β
N	250			250		
adj-R2	0.240			0.274		
F	16.70***			11.46***		

***p< 0.001, **p< 0.01, *p< 0.05.

6. Discussion and Implications

Consideration of Estimated Price: The findings underscore the importance of factoring in estimated prices when designing procurement procedures. Services with lower estimated prices exhibit a higher susceptibility to social responsibility evaluation criteria. This suggests the need for a nuanced approach to pricing strategies, ensuring that they align with social responsibility objectives.

Strategic Evaluation Criteria Design: The number of items in the evaluation criteria emerges as a pivotal factor, particularly concerning estimated price. Careful selection and balancing of evaluation criteria items are advised in order to effectively capture social responsibility concerns without unduly burdening procurement processes.

Emphasis on Self-Evaluation: The study highlights the influence of the evaluation criteria evaluation agency. Instances of self-evaluation by the agency demonstrate a notable impact on the overall proposal evaluation score. Procurement agencies should deliberate on the advantages of integrating self-evaluation processes within their procurement protocols.

Understanding Yearly Trends: Variations in influence indices across different procurement years call for a nuanced understanding of yearly trends. In particular, services procured in 2020 exhibited the highest average influence index. A thorough examination of the underlying reasons behind these trends can inform tailored procurement strategies.

Impact of Procurement Classification: Distinctions between central procurement and self-procurement significantly affect the influence index. Notably, self-procurement yields a higher average influence index compared to central procurement. Agencies should carefully weigh the implications of their procurement classification on the integration of social responsibility criteria.

Limited Influence of Service Period: The duration of service provision demonstrates limited moderating effects on the relationship between independent variables and the influence index. This suggests that while service period is a consideration, its impact on social responsibility evaluation criteria may be relatively constrained.

Inclusion of Sincerity Items: While the inclusion of sincerity items does not exhibit a statistically significant difference in the influence index, it is prudent to consider their integration within the evaluation criteria. Their presence may yield unmeasured benefits in advancing social responsibility objectives.

Continuous Monitoring and Adaptation: Given the dynamic nature of procurement, a vigilant approach is recommended. Ongoing monitoring of the influence of social responsibility factors, coupled with a willingness to adapt evaluation criteria and procedures, is vital to align procurement practices with evolving social responsibility goals.

7. Conclusions

The results of this study provide valuable insights into the influence index of social responsibility evaluation criteria in the context of public procurement in South Korea. The influence index was found to be impacted by various factors, including the year of procurement, procurement classification, service period, and estimated price. Furthermore, the number of evaluation criteria items, location of evaluation criteria, inclusion of sincerity items, and the evaluation criteria evaluation agency were identified as important determinants of the influence index. The moderating effects of these factors were also examined, revealing nuanced relationships that contribute to a

deeper understanding of the dynamics involved in social responsibility evaluation in public procurement.

These findings have significant implications for policymakers, procurement professionals, and researchers in the field of public procurement and social responsibility evaluation. They offer guidance for optimizing the use of social responsibility evaluation criteria to achieve desired outcomes and promote responsible and sustainable procurement practices.

Future research in this area may explore additional moderating variables, expand the dataset to include a broader range of procurement contexts, and investigate the long-term impact of social responsibility evaluation on procurement outcomes. Such endeavors will contribute to the ongoing development and improvement of public procurement practices in South Korea and beyond.

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