Social Sustainability in Delivery and Procurement of Public Construction Contracts
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Abstract: Boosting sustainability in public construction procurement implies new challenges associated with incentivizing integrated approaches and the inclusion of sustainability criteria in tendering procedures. Thus, the choice of project-delivery method and procurement procedure is a key decision to ensure project success for sustainable outcomes. This study focused on the social dimension of sustainability and analyzed 451 tendering documents from 10 countries to assess the influence of procurement procedures and delivery methods on the inclusion of social criteria in public construction procurement. Content analysis, descriptive statistics, and logistic regression were applied. The results show the international trends in delivery methods and procurement procedures. Country and contract size were found to be the most influential variables for the inclusion of social criteria in tendering procedures. There were no significant differences between project-delivery methods and between procurement procedures with respect to the inclusion of social criteria. However, criteria associated with employment and cultural heritage were mainly considered in traditional delivery methods, whereas professional ethics and cultural heritage were associated with the lowest price procurement procedures. Finally, subjective methods were predominantly used to assess social sustainability.
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Author keywords: Social; Sustainability; Procurement procedure; Delivery method; Construction.

Introduction

Public procurement represents a large volume of public spending each year, constituting over 10% of the gross domestic product in developed countries (Zhu et al. 2013). Thus, numerous studies have highlighted the main role of public procurement in influencing the market in terms of sustainability (Barber and El-adaway 2015; Hosseini et al. 2018; Mont and Leire 2009), with sustainability framed within a three-dimensional framework that involves three levels, economic, social and environmental (Kornevs et al. 2014). During the last decades, a great number of countries worldwide have implemented policies to encourage the development of social principles in public procurement (Iles and Ryall 2016), encompassing the public procurement of the construction industry (Green 2014). However, in this industry, there is still much that needs to be done (Roman 2017). In terms of social practices, the construction industry is one of the most lagging industries (Loosemore 2015) and needs to be transformed to address increasing social challenges (Whyte and Sexton 2011).

Social requirements in construction procurement potentially affect processes and management systems and have important implications for both procuring organizations and suppliers (Sutherland et al. 2015). Hence, with the thrust of social sustainability in public construction procurement, new challenges have emerged. Barraket and Weissman (2009) stated that advances in the social procurement of the construction industry must be located within a relational approach to procurement. This relational approach represents a change from the traditional procurement toward new alternative methods of procurement procedures (Petersen and Kadeferos 2016) and project-delivery methods (Sporrong and Kadefors 2014).

Within public construction procurement, the two basic procurement procedures are the lowest price and the best value (Molenaar and Johnson 2003). In general, the lowest price is used when aiming to maximize savings, whereas the best value is used more for complex projects (Ballesteros-Pérez et al. 2017). However, historically, contracting authorities of construction services have selected the lowest price rather than the best value regardless of the complexity of the project (Korytárová et al. 2015). Currently, with the implementation of sustainability in public construction procurement, the formulation of environmental and social criteria in the tendering procedure is imperative to reflect clients’ needs and project objectives (Palmujoki et al. 2010). The best value procurement procedure gives scope to public bodies to consider social policy objectives in their procurement activities (Brammer and Walker 2011).

Regarding project-delivery methods, different approaches have been developed during recent years to satisfy specific requirements related to risk transfer, funding, and ownership (Broosterhuizen et al. 2014) or to encourage integration and collaboration among the diverse organizations involved in delivering construction projects...
Several researchers have suggested that sustainable construction projects require a higher level of stakeholder engagement and collaboration to generate more intensive cooperative behavior (Ball and Fortune 2000; Berry and McCarthy 2011; Broerse and Zijlstra 2014; Hanák and Muchová 2015; Naoum and Egbo 2016; Olanipekun et al. 2018; Wu et al. 2017). Authors such as Molenaar et al. (2009), Korkmaz et al. (2010), Naoum and Egbo (2016), and Manata et al. (2018) have pointed out team integration as a key factor for project success. The concept of team integration is based on the involvement of all the participants in the project at the correct time (Drexler and Larson 2000), and it is defined by such aspects as the timing of the involvement of project participants, early collaboration by the project participants, or the timing of communication (Mollaoglu-Korkmaz et al. 2013).

Based on team integration, according to Pellicer et al. (2016) and Naoum and Egbo (2016), the research team established two groups of delivery methods: traditional and integrated. In the traditional delivery method, or design-bid-build (DBB), team integration is scarce because design and construction are undertaken by different entities (Pellicer et al. 2016). Integrated approaches include design-build (DB), integrated project delivery (IPD), and public–private partnerships (PPPs) and other concessionaire alternatives. The client generally provides initial planning and design criteria, and the contractor team is completely or partially responsible for the design, construction, operation, and maintenance of the facility (Altamirano 2010; Broerse and Zijlstra 2014; Gurgun and Tournian 2014; Molenaar et al. 2009). Partially integrated delivery systems, such as construction management at risk (CMR), where the contractor is involved in the design, and variants of DB, IPD, and PPP are also considered integrated methods (Mollaoglu-Korkmaz et al. 2013; Pellicer et al. 2016).

Thus, providing motivation to the contractor and improving the efficiency of communication between the design team and the contractor are characteristics of integrated project-delivery methods that foster a better chance of achieving sustainability goals than traditional methods (Molenaar et al. 2009). Consequently, moving from traditional procurement procedures and delivery methods becomes a key factor for the sustainability of the construction industry (Ruparathna and Hewage 2015a; Xia et al. 2015) to ensure the achievement of sustainable outcomes (Naoum and Egbo 2016).

**Knowledge Gap and Goals of the Research**

Most of the literature published on construction procurement has focused on the basis of evaluation, analyzing the relationship with different types of procurement procedures or project-delivery methods (Ruparathna and Hewage 2015a; Sourani and Sohail 2011; Elwardani et al. 2006; Xia et al. 2013). In terms of sustainability in public construction procurement, considering the three dimensions (economic, environmental, and social), the majority of research has been conducted on economic and environmental issues, overshadowing the social dimension (Illankoon et al. 2017). In fact, Loosmore (2016) stated that although there has been considerable research in construction procurement during the last 50 years, the study of social procurement has barely been addressed. Social and economic objectives associated with sustainable procurement have only received attention more recently (Walker and Phillips 2009). Thus, there is clearly a need for the study of the social dimension of sustainability and its inclusion in public construction procurement, analyzing the aspects that demonstrate a significant influence on its implementation at the international level.

Therefore, the aim of this study was to assess the influence of procurement procedures and project-delivery methods on the inclusion of social criteria in public construction procurement. To that end, an introductory analysis was conducted to investigate how procurement procedures (lowest price and best value) and project-delivery methods (traditional and integrated) are considered at the international level (Goal 1 [G1]). Subsequently, the use of social criteria at each stage of the tendering procedure was analyzed, considering the existing differences between procurement procedures (Goal 2 [G2]). Finally, a global analysis was conducted to identify which variables associated with project characteristics are the most influential in introducing social criteria in public construction procurement (Goal 3 [G3]). The achievement of these goals can be of great interest to procurers and companies, showing them a comparative view of a small sample of the current situation in social sustainability terms in the public construction industry at the international level.

**Research Method**

To achieve the goals stated in the previous section, the authors followed the overall research method summarized in Fig. 1. The first step was to develop a content analysis of tendering documents related to construction products and services, published in English or Spanish, aiming to determine the inclusion of social criteria in public construction procurement. With the final sample, two logistic regressions were performed to determine how procurement procedures and project-delivery methods are related to the project contract size, project infrastructure, and country where tendered. Later, descriptive statistics were used to find the use of social criteria at each stage of the tendering procedure. Lastly, a logistic regression was performed to determine the variables that influence the introduction of social criteria in public construction procurement. These steps are explained in depth in the following paragraphs.

Content analysis of tender documents was the method developed to gather data in this research. Content analysis is a research technique that allows researchers to make replicable and valid inferences from data to their context (Krippendorff 1989). This is a systematic technique that is based on an objective analysis. It allows analyzing large volumes of written material through the frequencies, meanings, and relationships of the data (Krippendorff 1989; Neuendorf 2017). According to the recommendations of Neuendorf...
(2017) and Stanford et al. (2016), this study’s content analysis was based on five tasks: defining the protocol, collecting tender documents, examining documents according to the protocol, establishing inter-rater reliability, and statistically analyzing the data.

The protocol to guide content analysis was developed based on the recommendations of Stanford et al. (2016) and Neuendorf (2017). The aim of the protocol was to establish the coding procedure, variables of interest, recommended search terms, and examples of expected typical results. Thus, a literature review was undertaken to identify the characteristics of tendering documents and the different groups of social criteria to be analyzed throughout the protocol (Table 1). On the one hand, the variables associated with project characteristics were as follows: (1) infrastructure type, discriminating between buildings and civil engineering projects; (2) contract size, represented by the initial budget of the project; (3) procurement procedure, based on the lowest price and best value; (4) project-delivery method, discerning between traditional and integrated; and (5) country, which was classified based on Anglo-Saxon countries (ASCs) and Spanish-speaking countries (SSCs). On the other hand, seven groups of social criteria were identified (Table 1): (a) cultural heritage, which considers criteria associated with the preservation of historic and cultural resources and the consideration of professional expertise in cultural heritage in the project; (b) employment, which gathers criteria such as job creation, employment for vulnerable groups, job stability, and industry participation planning; (c) health and safety, regarding workplace health and safety management planning, occupational health and safety certifications, professional expertise in health and safety, or ensuring public safety; (d) training, which is focused on improving the workforce skills in technical and sustainability terms; (e) effects on users, with respect to avoiding or minimizing the harm done to the neighborhood, the neighborhood’s existing services, and mobility disruption; (f) local, boosting local development through criteria such as local preferences, local participation, or improving social value; and (g) professional ethics, which encompasses ethical aspects in the development of work and staff recruitment, such as nondiscriminatory hiring practices, commitment to anticorruption, gender equality, or fair wages. Once the variables were identified, the protocol was defined, and the scope of the research was established.

To identify the materials to be analyzed, websites of contracting authorities and national databases in each country were searched to gather tendering documents related to construction products and services. The search was conducted from January 2016 to January 2017, and only those tendering documents that were published in English or Spanish and were available free online were selected. Initially, 534 tendering documents from 13 countries were obtained; however, those tendering documents that did not include tender characteristics, the technical specifications of the project, and contract performance clauses were removed from the sample. Finally, 451 tender documents were selected from 10 countries, as displayed in Table 2: four ASCs, Australia, Canada, the United Kingdom, and the United States, and six SSCs, Argentina, Chile, Colombia, Panama, Peru, and Spain. One-third (33%) of the tendering documents did not contain information about the budget in the award phase. These tenders correspond mainly to Australia, Canada, and the United Kingdom. Regarding the types of civil engineering projects gathered in the sample, 53% were road and highway projects, 22% were projects for hydraulic work, and the rest of the tenders were for railways, airports, and maritime projects.

Once the tendering documents were gathered, these were analyzed according to the protocol. To ensure the objectivity of the analysis and guarantee the correct implementation of the content analysis, the inter-rater reliability for each variable was measured. Following the recommendations of Stanford et al. (2016), two coders examined one tendering document randomly selected from each country to refine the coding process and ensure consistency. Then, 50 tendering documents, more than 10% of the total of gathered documents (Cohen 1960), were randomly selected for independent coding to measure inter-rater reliability. The percentage of agreement between raters (PA_r) was calculated for the continuous

| Table 1. Variables used |
|-------------------------|
| **Group**               | **Variable**                                | **References**                          |
| Project characteristics | Infrastructure type: Buildings and civil engineering projects | Granberg and Barton (2007); Xia et al. (2013) |
|                        | Contract size: Initial budget (€)            | Lines and Miao (2016); Stanford et al. (2016); Xia et al. (2013) |
|                        | Country: Anglo-Saxon countries (ASCs) and Spanish-speaking countries (SSCs) | Fatokun et al. (2015); Gajurel (2014); Montalbán-Domingo et al. (2018) |
|                        | Procurement procedure: Lowest price and best value | Molenaar et al. (2010); Stanford et al. (2016); Xia et al. (2013) |
|                        | Project-delivery method: Traditional (DBB) and integrated (DB, CMR, concessions, PPP, etc.) | Granberg and Barton (2007); Naoum and Egbu (2016); Pellicer et al. (2016); Xia et al. (2013) |
| Social criteria        | Cultural heritage: Preserve historic and cultural resources | ISI (2015); Kylliö et al. (2016) |
|                        | Employment: Contribution to new opportunities for employment, job stability, employment of the vulnerable population, participation of small and medium enterprises, etc. | Azapagic and Perdan (2000); Balubaid et al. (2015); Shen et al. (2005); Sierra et al. (2017) |
|                        | Health and safety: Prevention of accidents or injuries in workplaces and public environments | Amiril et al. (2014); FHWA (2012) |
|                        | Training: Improving the workforce skills in technical and sustainability terms | Sierra et al. (2016) |
|                        | Effects on users: Measures to minimize harm to people due to the development of work | Krajangsi and Pongpang (2017); Ugwu and Haupt (2007) |
|                        | Local: Measures to boost local development in the project | Dobrovolskiæ and Tamošiæniæ (2016) |
|                        | Professional ethics: Ethical aspects in the development of work and staff recruitment | Sierra et al. (2016); Ugwu et al. (2006); Ugwu and Haupt (2007) |
calculation as follows:

\[
\kappa = \frac{(P_{A_o} - P_{A_g})}{(1 - P_{A_g})}
\]

where \(P_{A_o}\) is the proportion of agreement observed; and \(P_{A_g}\) is the proportion of agreement expected by chance [for additional details on the calculation of \(P_{A_g}\), see Cohen (1960)]. Both measures, \(P_{A_o}\) and \(\kappa\), range from 0.0 to 1.0, with a 1.0 indicating perfect agreement (Stanford et al. 2016). Values equal to or greater than 0.8 are often considered satisfactory (Neuendorf 2017). In this research, inter-rater reliability proved satisfactory by achieving values greater than or equal to 0.8 for every variable.

After assessing the inter-rater reliability of the sample, statistical analyses were undertaken using IBM SPSS Statistics 23.0. To answer how procurement procedures and project-delivery methods are considered at the international level (G1), a logistic regression analysis was performed. Logistic regression analysis is a technique that is generally used to predict the probability of failure (or success) of a given process, system, product, or phenomenon (Aznar et al. 2017). However, this technique is also widely used to identify those variables (predictors) that demonstrate a strong relationship with the dependent variable subject of study (Aznar et al. 2017). Two logistic regressions were conducted to determine which procurement procedure (0 = lowest price; 1 = best value) and which project-delivery method (0 = traditional; 1 = integrated) are used considering the project contract size, project infrastructure, and country of origin. For statistical analysis, the groups of contract size 1–10 M€ and those with an unspecified budget were grouped after verifying that both did not show significant differences. The analysis of the logistic regression results was based on the following: coefficients of the independent variables (B) allow predicting the probability of occurrence of a dichotomous dependent variable, whereas the Wald statistic assesses the significance of the best coefficient values (B) found for the logistic regression model. This corresponds to the ratio between the square of B and the square of the standard error and is asymptotically distributed as a chi-square distribution (Aznar et al. 2017). The odds ratio [\(\exp(B)\)] is an indicator of the change in odds resulting from a unit change in the predictor (Field 2013).

To assess the use of social criteria in each stage of the tendering procedure considering significant differences between procurement procedures (G2), first, three phases were defined within a tendering procedure: selection criteria (SC), which includes information about selection and exclusion provisions and solvency conditions; award criteria (AC), which gathers the criteria that are considered to select the best bid; and technical specifications and contract performance clauses (TS&CPC), which are detailed prescriptions of the characteristics that the product or service must accomplish to be accepted and the execution clauses with which the awarded company contract must comply.

Second, to assess how social criteria are included, two terms were differentiated based on the indicator and the metric (Winter and Lasch 2016). Social indicators represent those requirements that are defined to evaluate and motivate progress toward specific objectives. Metrics are those indicators whose definition includes quantitative measurement. Once the authors prepared the data, descriptive statistics were developed based on the frequencies of occurrence of each group of social criteria in tendering documents, considering each criterion if it appears at least once in the tendering document. To analyze whether there are significant differences between procurement procedures with respect to the mean of social criteria, the Mann–Whitney U-test was performed. This is a non-parametric statistical procedure for comparing two samples that are independent (Loosmore and Denny-Smith 2016; Xia et al. 2014a).

Finally, a global analysis was developed to identify which variables are the most influential in introducing social criteria in public construction procurement (G3). To meet this research goal, for each group of social criteria, one logistic regression was conducted with the dependent variable as each of the social criteria and the independent variables as the rest of the analyzed variables (procurement procedure, project-delivery method, contract size, type of infrastructure, and country). The Wald statistic was calculated to inform the individual contribution of those predictors that showed significant differences (Field 2013).

### Results and Discussion

**Current Trends in the Use of Project-Delivery Methods and Procurement Procedures**

The success of a project is significantly influenced by the criteria that are established to evaluate the bids. In fact, numerous investigations (Bruno et al. 2018; Doloi 2013; Hanák and Muchová 2015; Palmuojoki et al. 2010; Ruparathna and Hewage 2015a; Wang et al. 2006; Witjes and Lozano 2016) highlight the important problem associated with the use of the lowest price as the sole evaluation criterion to reach sustainability goals. This is because including suitable criteria is key to ensuring the technical, economic, and professional capability of the contractor and to illustrate the needs of clients and project goals. Thus, during the last decades, construction procurement has experienced a transformation from lowest price to best value procurement (Okunlola 2012). This fact can be seen in Table 2, which shows that best value procurement is considered in 61% of the analyzed sample; and in Fig. 2, which shows that more
than 50% of traditional delivery methods include best value procurement procedures. These percentages are highly influenced by the results associated with ASCs because these countries show a clear predisposition toward the use of best value procurement in both traditional and integrated delivery methods.

Nevertheless, although the transformation toward best value procurement is a fundamental feature to include social sustainability criteria in the awarding of a project, Broesterhuizen et al. (2014) remarked that in the procurement phase of a construction project, not only setting sustainable criteria is important, but also the choice of an integrated delivery method can be decisive in facilitating project sustainability. Numerous researchers (Oyegoke et al. 2009; Pellicer et al. 2016; Ruparatha and Hewage 2015a; Shrestha et al. 2012; Stanford et al. 2016; Xia et al. 2014a) have highlighted that in recent years, projects have been evolving toward integrated approaches. However, the data gathered in Table 2 show that only 20% of the sample comprises integrated delivery contracts. This fact concurs with the findings by authors such as Naoum and Egbu (2016), who emphasized that the traditional form is still the dominating procurement method.

To assess the use of project-delivery methods and procurement procedures within the gathered sample, two logistic regressions were developed. First, the interaction between the project-delivery method (the dependent variable with two possible outcomes: 0 = traditional or 1 = integrated) and the independent variables (contract size, infrastructure, and country) was investigated. The results in Table 3 show that the three independent variables are statistically significant (p-value < 0.05). According to the Wald statistic of each independent variable, the project contract size is the most influential variable with respect to the decision of using integrated project-delivery methods, followed by the type of infrastructure. Based on the odds ratio [Exp(B)], building projects tend to be procured through integrated project-delivery methods; however, civil engineering projects are more oriented toward traditional methods.

Furthermore, ASCs show a greater use of integrated methods in comparison with SSCs. The use of integrated delivery methods increases considerably in projects whose contract size is over 10 M€. Oyegoke et al. (2009) stated that the use of integrated delivery methods, such as DB, has increased for projects with important contract value due to the needs of achieving significant change in project organization, structure, and communication channels. However, the countries that have primarily boosted these types of delivery methods are the United States (Hale et al. 2009) and the United Kingdom (Barraket and Weissman 2009), especially in building projects. In fact, Xia et al. (2014b) pointed out that 75% of the current new building construction projects seeking sustainability certification in the United States were delivered with integrated project-delivery methods.

Regarding procurement procedures, the logistic regression considered the dependent variable to be 0 = lowest price or 1 = best value, whereas the independent variables were infrastructure, project-delivery method, contract size, and country. According to the results (Table 4), the four independent variables are statistically significant. Best value prevails in integrated delivery methods, where the odds ratio is 3.5 times higher with respect to traditional methods. The use of best value is notably higher in ASCs compared with SSCs, where the odds ratio is 2.3 times higher. Furthermore, the greater the contract size, the higher the odds of using the best value method. Additionally, the Wald statistics highlight that contract size is the most influential variable, followed on a similar level by the project-delivery method and country. These findings are consistent with the literature because authors such as Molenaar et al.
(2010) and Xia et al. (2015) have highlighted that integrated delivery methods tend to utilize best value procurement to provide opportunities for the contractor to pursue sustainability objectives and those concerning time, cost, and quality. Moreover, Doloi (2013) remarked that the traditional method generally selects the lowest price to reduce the costs associated with the project. However, civil engineering projects are oriented toward the use of the lowest price due to the many uncertainties in the pre-construction stage (Varnäs 2008) and the difficulty in defining objective criteria (Ruparathna and Hewage 2015a). Thus, the results obtained in both logistic regressions confirm the robustness of the analyzed sample for drawing conclusions.

Inclusion of Social Criteria Depending on Procurement Procedures

The following step was to assess how social criteria are included in tendering documents depending on the procurement procedure. As can be seen in Fig. 3, the main differences between both procurement procedures lie in the AC phase. Predictably, the percentage of social criteria in the AC phase of lowest price procurement procedures is 0; however, best value considers social criteria as award criteria in 55% of the tenders. This percentage is low if it is compared with that found by Testa et al. (2016), who stated that, regarding tenders based on best value, environmental criteria were included as award criteria in 87% of their sample. Conversely, the mean number of social criteria included in this phase of best value procurement tenders is 1.5 (Table 5). This value is slightly lower than the one found by Ruparathna and Hewage (2015b), who disclosed that the mean number of social criteria included in their analyzed tendering documents was 2.04. Additionally, it is worth pointing out that only 3% of the tenders based on best value procurement use metrics to assess social criteria in the AC phase. This result is in line with the findings by Park et al. (2015), who remarked on the lack of appropriate evaluation procedures that avoid the subjectivity of best value criteria and ensure the transparency, objectivity, and equitability of bid-selection processes. Consequently, these results highlight the low consideration of social criteria as award criteria and the lack of objective methods for bid evaluation, depicting two of the main challenges for sustainable procurement.

Regarding the inclusion of social criteria in the SC and TS&CPC phases, Fig. 3 reveals that there are no strong differences between procurement procedures with respect to the percentage of tenders that considering any social criteria (SC phase: 42.8% for the lowest price, 49.3% for best value; TS&CPC: 96.0% for the lowest price, 96.4% for best value). To analyze whether there are

Table 4. Results of logistic regression with procurement procedures as dependent variable

| Independent variable | B     | SE  | Wald | DOF | Sig. | Exp(B) |
|----------------------|-------|-----|------|-----|------|--------|
| Infrastructure       | -0.659| 0.267| 6.116| 1   | 0.013| 0.517  |
| Project-delivery method | 1.253| 0.35 | 12.821| 1   | 0.000| 3.500  |
| Country              | 0.818 | 0.229| 12.727| 1   | 0.000| 2.267  |
| Contract size        | —     | —   | 32.048| 2   | 0.000| —      |
| Contract size: 1-0   | 1.568 | 0.310| 25.557| 1   | 0.000| 4.799  |
| Contract size: 2-0   | 2.104 | 0.412| 26.037| 1   | 0.000| 8.195  |
| Constant             | -0.912| 0.344| 7.038| 1   | 0.008| 0.402  |

Note: B = regression coefficients (in log-odds units); DOF = degrees of freedom; Exp(B) = log-odds of success; SE = square error; Sig. = 2-tailed p-value (significant if <0.05); and Wald = Wald statistic. Infrastructure: 0 = building; and 1 = civil engineering. Project-delivery method: 0 = traditional; and 1 = integrated. Country: 0 = SSC; and 1 = ASC. Contract size: 0 = <1 M€; 1 = 1–10 M€ + unspecified budget; and 2 = >10 M€.

Table 5. Statistical description of the number of social criteria included in tenders that consider any social criteria

| Procurement procedure | Statistics | AC Phase | TS&CPC Phase | Total |
|-----------------------|------------|----------|--------------|-------|
| Lowest price          | Mean       | 1.96     | 0.00         | 2.90  |
|                       | SD         | 1.03     | 0.00         | 1.79  |
| Best value            | Mean       | 1.54     | 1.53         | 2.81  |
|                       | SD         | 0.68     | 0.79         | 1.61  |
| Mann–Whitney U        | Sig.       | 0.008    | —            | 0.348 |

Note: AC = award criteria; SC = selection criteria; SD = standard deviation; Sig. = 2-tailed p-value (significant if <0.05); and TS&CPC = technical specifications and contract performance clauses.

Fig. 3. Percentage of tenders with social criteria in each phase of the procurement procedure.
significant differences between procurement procedures with respect to the mean of social criteria included in the SC and TS&CPC phases, the Mann–Whitney U-test was conducted. The results in Table 5 show that only the SC phase has statistically different means (p-value < 0.05), revealing that lowest price procurement procedures tend to include a greater number of social criteria in the SC phase in comparison with best value procedures. However, the mean of social criteria for both procurement procedures is similar in the TS&CPC phase (p-value > 0.05). Additionally, the global analysis of tenders shows that, regarding the mean of social criteria per tender, there is no significant difference between the lowest price and best value procurement procedures, because the mean of social criteria per tender is approximately 3 for both procurement procedures (Table 5).

Thus, it can be emphasized that even using lowest price procurement, contractors are forced to reduce the initial bid price (Lo and Yan 2009), and the inclusion of performance indicators is key to ensure compliance with clients’ needs and social sustainable objectives (Bruno et al. 2018). Tenders based on lowest price procurement only compensate for the lack of inclusion of social criteria in the AC phase with an increase of these criteria in the SC phase.

Regarding the use of the different groups of social criteria in each phase of the tendering procedure, results show the following: (a) health and safety and employment are the most considered social criteria in the SC phase for both lowest price (30 and 25%, respectively) and best value (29 and 22%, respectively) procurement procedures, followed by local criteria (9% in lowest price and 12% in best value); (b) in the AC phase, the most frequently used criteria in tenders based on best value procurement are health and safety (31%), local (21%), employment (15%), and training (10%); and (c) in the TS&CPC phase, every group of social criteria is similarly included in both procurement procedures. However, professional ethics criteria are considered more in the lowest price projects (46%) than in the best value projects (24%), and local is included in 24% of the best value tenders and 13% of the lowest price tenders. Finally, the global analysis on tendering documents shows that health and safety, professional ethics, and employment are the social criteria most frequently used in the lowest price procurement procedure, whereas health and safety, employment, and effects on users are the social criteria most commonly included in the best value procurement procedure.

### Influential Variables in the Inclusion of Social Criteria

To identify the most influential variables in the inclusion of social criteria in public construction procurement, a logistic regression was developed for each group of social criteria. For each logistic regression, the dependent variable was the social criteria, categorized as 0 (not inclusion) and 1 (inclusion), and the independent variables were project-delivery method, procurement procedure, infrastructure, country, and contract size. Table 6 gathers only the results associated with those independent variables that were significant (p-value < 0.05). Health and safety are not included because this criterion is used in practically all the tendering documents, and the differences with respect to each independent variable were not significant.

Table 6 shows that for the inclusion of social criteria in public construction procurement, based on the results of the Wald statistics, the most influential variables are country and contract size. The insertion of cultural heritage, employment, and professional ethics in tendering documents is notably influenced by the contract size. Alternatively, training, effect on users, and locality depend mainly on the country. As Kahlenborn et al. (2010) asserted, national policies are the main drivers to integrate social sustainability in public procurement, and the inclusion of social performance indicators in tendering procedures increases with the contract size and with the complexity of the project.

Cultural heritage and employment are strongly influenced by contract size and country. Their odds ratios show that the use of both increases significantly with the contract size, and these are more common in ASCs. However, employment is also influenced by the project-delivery method, which is more frequent in the

### Table 6. Results of logistic regressions with social criteria as dependent variables

| Dependent variable | Independent variable | Wald | DOF | Sig. | Exp (B) |
|--------------------|----------------------|------|-----|------|---------|
| Cultural heritage  | Contract size        | 16.433 | 2   | 0.000 | —       |
|                    | Contract size: 1-0    | 11.394 | 1   | 0.001 | 4.880   |
|                    | Contract size: 2-0    | 16.374 | 1   | 0.000 | 9.008   |
|                    | Country              | 13.249 | 1   | 0.000 | 2.468   |
|                    | Procurement procedure | 8.826  | 1   | 0.003 | 0.469   |
|                    | Project-delivery method | 5.595 | 1   | 0.018 | 0.423   |
|                    | Infrastructure       | 5.293  | 1   | 0.021 | 2.018   |
| Employment         | Contract size        | 24.633 | 2   | 0.000 | —       |
|                    | Contract size: 1-0    | 16.348 | 1   | 0.000 | 3.804   |
|                    | Contract size: 2-0    | 23.994 | 1   | 0.000 | 7.684   |
|                    | Project-delivery method | 12.896 | 1 | 0.000 | 0.358   |
|                    | Country              | 10.725 | 1   | 0.001 | 2.018   |
| Training           | Country              | 69.631 | 1   | 0.000 | 7.185   |
| Effect on users    | Country              | 69.007 | 1   | 0.000 | 7.405   |
|                    | Infrastructure       | 22.648 | 1   | 0.000 | 3.765   |
| Local              | Country              | 82.264 | 1   | 0.000 | 10.742  |
| Professional ethics| Contract size        | 24.994 | 2   | 0.000 | —       |
|                    | Contract size: 2-0    | 21.361 | 1   | 0.000 | 6.294   |
|                    | Procurement procedure | 8.820  | 1   | 0.003 | 0.506   |
|                    | Country              | 5.207  | 1   | 0.022 | 1.641   |

Note: DOF = degrees of freedom; Exp(B) = log-odds of success; Sig. = 2-tailed p-value (significant if <0.05); and Wald = Wald statistic. Project-delivery method: 0 = traditional; and 1 = integrated. Procurement procedure: 0 = lowest price; and 1 = best value. Country: 0 = SSC; and 1 = ASC. Infrastructure: 0 = building; and 1 = civil engineering. Contract size: 0 = <1 M€; 1 = 1–10 M€ + unspecified budget; and 2 = >10 M€.
traditional method. Regarding professional ethics, in addition to the contract size, this criterion is also influenced by the procurement procedure; because it is more commonly used in the lowest price projects and in ASCs. Furthermore, training, effect on users, and local criteria are especially considered in ASCs (Montalbán-Domingo et al. 2018); however, effect on users is strongly influenced by the type of infrastructure because it tends to be considered more in civil engineering projects.

Regarding the inclusion of social criteria in tendering documents the results show that there are generally no significant differences between project-delivery methods and between procurement procedures. Only employment and cultural heritage are more frequently included in traditional delivery methods. Additionally, criteria associated with professional ethics and cultural heritage are important in lowest price procurement procedures to ensure that the cost-cutting tactics that characterize this type of project (Lines and Miao 2016) do not end up affecting social heritage and malpractice.

Conclusions

Contributions

By assessing 451 tendering documents from 10 countries, this research analyzed the influence of project-delivery methods and procurement procedures on the insertion of social criteria in public construction procurement. The research method was based on content analysis, descriptive statistics, and logistic regression techniques. To consider the robustness of the sample, the use of project-delivery methods and procurement procedures was assessed. The results confirm what is widely highlighted by numerous researchers: the best value procurement procedure is achieving strength, especially in integrated delivery methods, where it is prevailing.

However, the use of the traditional delivery method is still dominant, and practically, this type of delivery method uses the lowest price as the main procurement procedure. The choice of the project-delivery method and procurement procedure is highly influenced by the variable contract size because the use of integrated delivery methods and best value procurement procedures increases considerably with the project contract size.

Additionally, significant differences exist between types of infrastructure and countries regarding the use of project-delivery methods. Building projects are more focused on integrated delivery methods than civil engineering projects, which tend to use the traditional method. The SSCs are still closely focused on traditional methods, forgetting that the need for bolstering sustainability in public construction procurement departs from enhancing the use of best value procurement procedures and integrated delivery methods.

Regarding the inclusion of social criteria in the analyzed tendering documents, the descriptive statistics showed that there are hardly any differences between both procurement procedures. The lack of social criteria in the AC phase of the lowest price tenders is only compensated by increasing social criteria in the SC phase. However, only 50% of tenders with best value procurement procedures consider social criteria in the AC phase, and there is an absence of metrics to assess social criteria, encouraging subjective assessments.

In terms of determining the most influential variables including social criteria in public construction procurement, the logistic regressions showed that these variables are country and contract size; ASCs are clearly ahead of SSCs regarding the consideration of social criteria, and procurers generally appear to be more aware of social sustainability as the contract size increases. Finally, it is worth emphasizing that no significant differences were found between project-delivery methods and between procurement procedures with respect to the inclusion of social criteria. However, there is a visible trend toward the use of employment and cultural heritage in traditional delivery methods and the use of professional ethics and cultural heritage in lowest price procurement procedures.

Recommendations

The study of social sustainability in public construction procurement is required to know how to overcome the current barriers that are affecting successful implementation. Major efforts should be made to integrate social sustainability appropriately within contractual procedures. In fact, although the use of social criteria in tendering procedures is a reality, in general, less than three groups of social criteria are included per tender. Instead of being defined according to the particular needs of the environment where the projects will be developed, these are mainly established based on national policies that are implemented in each country. Additionally, the use of subjective methods to assess social criteria in tendering procedures is the predominant option. Thus, working on these weaknesses and increasing social awareness in the construction industry are needed steps. For that purpose, providing a mutual understanding of social policies and explaining how these can be adjusted for each specific project and how these can be implemented depending on procurement procedures and project-delivery methods would be useful for procurers to reduce their uncertainty of how to incorporate social sustainable issues in tendering procedures. The inclusion of performance indicators in construction procurement, regardless of the project-delivery method or procurement procedure, is required to ensure that the procurer’s objectives are achieved. Increasing the number of social criteria in the tendering documents and including metrics to allow an objective assessment of social sustainability in tendering procedures are key measures to boost the social sustainability effectively. These recommendations are especially important in integrated projects, where aspects such as the early collaboration of the project’s participants and the timing of communication are most likely to achieve sustainable outcomes. They are also key in projects with best value procurement procedures in which the social criteria can be a fundamental part of the award criteria in the tendering procedures. Hence, tools, guides, and training programs are needed to drive procurers toward the effective inclusion of social criteria.

Limitations

The data collection was based only on those documents that were available free online on the public procurement Internet websites of each country. Tendering documents were mainly from national or regional agencies, which notably reduced the number of documents from local authorities. Although the searches of the government procurement sites were largely consistent, it is possible that some tendering documents were mischaracterized, excluding them from the search results. Thus, this study cannot claim a truly random sample. However, these limitations are also shared by other studies based on the content analyses of tendering documents. Furthermore, the sample distribution (i.e., contract size) for groups of countries is not balanced; despite considering the contract size as an independent variable in the statistical analysis, the results related to contract value may be skewed.

Future Lines of Research

Future research is needed to assess the social effects of the choice of project-delivery methods and/or procurement procedures in con-
struction projects, depending on contract size, country, and type of infrastructure. Additionally, an analysis of the weights of the criteria that are considered in the AC phase would be useful to understand the level of importance that each country assigns to social and environmental sustainability. Finally, establishing an automatic process that enables defining the weights of sustainability in AC depending on the environmental demands of each specific project would be extremely useful.

Acknowledgments

The authors acknowledge the financial support of the Spanish Ministry of Economy and Competitiveness, along with FEDER funding (Project BIA2017-85098-R) and the Valencian Regional Government (Project GV2018/085). Furthermore, the valuable commentaries and suggestions of three anonymous reviewers are highly appreciated.

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