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Additional Costs of Public Works Contracts in Portugal—Descriptive Statistical Analysis in Light of the Quality of Information

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Abstract: The aim of this work is to analyse the quality and transparency of data on the additional costs of public works. The problem identified is the lack of detailed and accessible information that allows for an adequate analysis of the performance and final state of public works, especially in relation to prices and deadlines. This is a case study carried out in Portugal, in which information from public works contracts with a closing date in 2022 was analysed. The data were extracted from the public access portal, responsible for making available and publishing information on the execution of public works contracts. The information was subjected to a statistical treatment process seeking to identify answers to transparency issues. The originality of this study lies in the quantitative and statistical approach applied to the evaluation of the transparency of the data made available on the portal, contributing to the debate on improving public management. The results indicate the need to expand the content available on the portal since the information provided does not allow for an analysis of the final state and performance of the works carried out, especially those relating to price and deadline, which in turn limits the construction of forecasting models and performance indicators. Corrective measures are proposed that include information that allows for answering questions about transparency and that allows for the construction and analysis of statistics and indicators, contributing to identifying the need for improvements in legislation, and the adoption of mechanisms that can improve, correct and or reinforce actions with an impact on the management of public resources.

Keywords: public works; statistical analysis; additional costs of public works; quality of information; transparency

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1. Introduction

The occurrence of differences between the final value and the value initially contracted for a public works project characterizes the concept of cost deviations. This necessitates an exploration of the sources, origins and implications of additional costs for public works, improvements to avoid delays in the works, the improvement and quality of the project execution and the implications of financial control, as well as the improvement in the management of public works. Monitoring these impacts leads to a detailed understanding of the occurrence of additional costs, with the possibility of extracting elements to improve the management of these assets, with due transparency in both contracting and accounting. Therefore, the lack of information constitutes an obstacle to understanding the conditions under which the works were executed, limiting the scope of analysis that allows for the construction of situational and performance indicators.

Several studies [1–4] address the issue of contracting public works from a local approach, seeking to identify and characterize performance factors related to price, deadline and the respective sources of deviations. We evaluate different phases, considering pre-

contracting mechanisms, project preparation and even issues related to the guarantee of the works.

The recurrence of additional costs in public works coincides with the recurrence of studies on the origin and sources of deviations in costs and deadlines [5–8]. This is evidenced, firstly, by the local factor and the specific and typified nuances according to the rules contained in the territorial organization of each study. Furthermore, there are economic and cyclical reasons for the sector that contribute to highlighting the need for continued in-depth investigation and answers on the spectrum of issues that require solutions on the topic. To this end, ref. [9] proposes an integrated approach to the topic, which goes beyond the organization's internal environment, including the creation of a central organization for management, which could favour and strengthen the capacity of those involved.

In the studies carried out, there is no characterization description specifically aimed at discussing deviations in costs and deadlines from the perspective of the availability of official data and the quality of the information conveyed. Therefore, the objective of this study is to carry out a descriptive statistical analysis of public works deviations so that data analysis provides the tools that allow for identifying the conditions of information in light of the concepts of quality and transparency. The study allows us to construct, in a critical and analytical way, suggestions for conditions to improve not only the dissemination of information but, above all, the mechanisms that can contribute to the origin of deviations in costs and deadlines. Therefore, it is necessary to obtain performance indicators or to create and monitor them to verify compliance with deadlines, costs and even current legislation.

Controlling the costs of a project is the task of monitoring the progress of the project itself and, of course, updating the budget and changes made to the cost baseline. The main objective of cost control is to provide the means of recognizing the correct application and variation of planning. Therefore, anticipation and adequate planning are essential to prevent cost escalation factors from compromising project success [10]. Ref. [11] uses site planning as a strategic tool in preventing and combating deviations. In this way, it is possible to implement prevention and/or correction measures that reduce the risks associated with possible changes. According to [12], risks in the context of project execution are related to the uncertainty in the occurrence of an event or condition with the potential to affect the project objectives according to its preparation.

Ref. [13] states that the economic and cost management of a project are as important or more important than the technical management of a project. In fact, without correct budgetary control, all future steps can be compromised since costs would not be able to support adequate and correct execution according to the description defined in the project scope with the means necessary for its execution. Ref. [14] mentions the need to create adequate planning and supervision protocols to control deviations, constituting a primary task that can guarantee the necessary balance between cost and quality.

In addition, the impact of costs on the delivery time of works and additional costs caused by delays in completion deadlines must be considered. This includes not just the financial costs but also the losses caused by the opportunity for services that could be used in projects to be completed.

Ref. [15] points out that recognizing the origins of costs provides evidence for the control and escalation of these occurrences. The origin of unforeseen costs and delays is related to several factors. The literature is extensive on the subject; however, invariably improving the management system of these works, public or private, is a concept highlighted as a solution to prevent and reduce the risks of changes to the schedule and initial budget. Therefore, it is necessary to adopt control mechanisms in the administrative process whose objective is to investigate, repair and prevent the occurrence of possible errors [16]. Such controls can only be carried out through access to data on efficiency indicators, enabling interventions according to the results obtained. However, in addition to identifying causes and mitigation measures for price deviation solutions, it is necessary to investigate the effectiveness of the proposed solutions to put the suggested measures into practice [17].

Public administration must be governed by guiding principles, including purpose, efficiency, effectiveness, transparency and economy. The translation of such principles contained in regulatory frameworks does not always materialize in reality since deviations in the costs and quality of project execution may be based on obstacles linked to various construction elements but also on sources of human nature, such as the diversion of resources through corruption, for example [18].

For [19], in the study Factors Affecting Schedule Delay, Cost Overrun, and Quality Level in Public Construction Projects, the schedule, budget and quality level are affected in significantly different ways in relation to the critical factor's success of a project. Therefore, public managers must compile the factors and treat them through an individualized vision that can contribute to the management of the project as a whole, preventing and treating possible deviations. The limiting factor in achieving this approach is exactly constructing and obtaining public works data. Information constitutes a planning tool, without which public action is limited to managing current circumstances, making it impossible to act in future events. The analysis of cost variations in public works indicates a substantial gap in the research, particularly with regard to the quality of the information that is currently accessible and the integration of official data. While earlier research has examined deviation factors from many angles, few studies have concentrated on descriptive statistical analyses that connect cost deviations to transparency and information quality.

The objective of this work is to fill this gap, providing an assessment of the quality of information in the construction of the characterization and elucidating additional cost factors. By presenting an innovative perspective, this study not only enriches the theoretical understanding of the causes of deviations but also suggests concrete practices that can be implemented by public managers, contributing to improving efficiency and effectiveness in the execution of public works.

2. Materials and Methods

The methodology of this study is based on four stages; the first consists of obtaining data from public works with a focus on cost deviations in the execution phase. Once such data are obtained, the second stage involves processing them and carrying out statistical analysis based exclusively on the information extracted. The third stage is related to the analysis of the means and form of availability and the content of publicly accessible information. The quality of the information is inferred from the data obtained, as opposed to the results of the statistical characterization carried out, allowing for the variables transmitted by the public access portal and potential data not found to be individually identified, which would allow for a more realistic and adequate characterization.

In other words, the statistical characterization is carried out only based on the available data and the iterations that can be carried out by combining this information. In turn, the quality of information is described exactly by the potential of undisclosed data, which, in the last stage, allows for the proposition of improvement with the objective of creating a broad and comprehensive situational analysis. In this scenario, there would be the possibility of creating monitoring, inspection and analysis mechanisms, in addition to constructing elements of predictability and control of public works expenses. In summary, the steps for statistical descriptive analysis in light of information quality are as follows:

(a) Obtain publicly accessible data.
(b) Construction of a descriptive statistical analysis of the data obtained.
(c) Analysis and evaluation of extracted information.
(d) Proposal for improvement and quality of information.

Therefore, we decided to carry out a case study of the execution of public works in Portugal for the year 2022, where it was possible to evaluate the means and forms of public data availability. After obtaining this information, as recommended by the methodology, a descriptive statistical analysis was carried out, which allowed us to analyse the results obtained from this stage in light of the quality of the variables found. Finally, the data limitations were analysed with a proposal to improve publicly accessible information.

3. Case Studies

Database

The initial step in evaluating the factors of transparency elements relating to costs in public works in Portugal is obtaining data from the public contracts portal. Then, ref. [20] establishes the following in its Article 2:

1. The public contracts portal is intended to disseminate public information about public contracts subject to the Public Contracts Code regime.
2. The public procurement portal also constitutes the central instrument for producing statistical information on national public procurement, particularly for the purposes of preparing statistical reports to be sent to the European Commission.
3. The operating and management rules of the public contracts portal are approved by the order of the members of the Government responsible for the areas of finance and public works.

No. 3 of Article 2, also of [20], stipulates the need to create rules for the management and operation of the portal, which in turn is implemented through [21]. Article 4 of this Ordinance describes the content of the public area, that is, with open access, which must be disclosed. It is exactly with this information that the quality and transparency of the public information that should be conveyed by the portal was analysed. The data can be extracted automatically, openly and free of charge. The contracting authorities are responsible for transmitting the information.

Therefore, based on the description of these elements, a search was carried out on the base portal using the following parameters:

1. Type of procedure: All.
2. Type of contract: Among the research options are the acquisition of real estate, the concession of public works, the concession of public services, the leasing of movable assets and, finally, the interest of this study: PUBLIC WORKS CONTRACTS.
3. Price: There are only two options in this cell: effective and contractual price. The use of the contractual price was due to the possibility of a detailed analysis of the data, with the works divided according to the definition contained in Table 1, in which the types of procedure, except for permitted exceptions, are limited by the base price values. Therefore, following this same logic, we also decided to obtain the following data from the stratification defined in the CCP:
   (a) Public works with a contractual price of up to EUR 30,000.00.
   (b) Public works with a contractual price of EUR 30,000.00 to EUR 150,000.00.
   (c) Public works with a contractual price of EUR 150,000.00 to EUR 5,350,000.00.
   (d) Public works with a contractual price above EUR 5,350,000.00.

Table 1. Choosing the procedure for forming public works contracts. Source: Adapted from [22].

	Type of Procedure	Condition
Choosing the procedure for forming public works contracts (Article 19, CCP)	Public competition or competition limited by prior qualification, with publication of an announcement in the *Official Journal of the European Union*	Whatever the value of the contract
	Public competition or competition limited by prior qualification, without publication of an advertisement in the *Official Journal of the European Union*	When the value of the contract is lower than the threshold referred to in paragraph (a) of paragraph 3 of Article 474 (EUR 5,350,000.00)
	Prior Consultation, with an invitation to at least three entities	When the contract value is less than EUR 150,000.00
	Direct fit	When the contract value is less than EUR 30,000.00

4. Dates: Options include contract date, publication date and closing date. The closing date (understood as the date of payment of the last invoice accepted by the public contractor) was chosen as the objective is to analyse completed works. Works with a closing date between 1 January 2022 and 31 December 2022 were defined, that is, works with a closing date in the year 2022.
5. Finally, there is the execution location, where the option of country, district and municipality can be inserted. We chose to define only the country (PORTUGAL) since the file extracted from the research contains district and municipality information.

From the filters used, a file in .csv format was extracted, which was transformed into .ls. The information contained in the file is as follows:

1. Object of the contract.
2. Type of procedure.
3. CPV contract types.
4. COGS Type.
5. COGS Designation.
6. COGS Value.
7. Contracting entity(ies).
8. Contracting entity(ies).
9. Contract price.
10. Publication date.
11. Date of conclusion of the contract.
12. Lead time.
13. Place of execution.
14. Rationale.
15. Cause of contract termination.
16. Contract closing date.
17. Effective total price.
18. Reason for changing the deadline.
19. Causes of price change.
20. State.
21. Framework agreement registration number.
22. Description of the framework agreement.
23. Centralized procedure.
24. Link to procedure parts.
25. List of suppliers (contractors).
26. Acquisition under the framework agreement of another EU Member State.
27. Special Measures.
28. Regime.
29. Material Criteria.
30. CCP.
31. Group Members.

As it did not provide elements that could contribute to the statistical analysis, it was necessary to exclude some data, including the following:

1. The object of the contract only provides the name of the work; therefore, it cannot contribute to statistical analysis.
2. The group CPV contract types, CPV Type, CPV Designation and CPV Value were also excluded since the CPVs analysed correspond indiscriminately to a global presentation for different objects.
3. Contracting entity and Contracting entity were also omitted from the data since for each district, there is a considerable number of entities. Therefore, depending on the filters used, for a meaningful analysis, the sample size of the same entity (contractor or adjudicator) would not be sufficient to endorse a correct interpretation of the data. In this case, we chose to use the district as a discrete variable.

4. The date of publication and the date of signing the contract are similar data. In this case, we chose to analyse only the information on the date of signing the contract.
5. The justification is also excluded since for all data, there is the information: "Article 19, paragraph (d) of the Public Contracts Code". In other words, it deals with the basis for choosing the procedure for forming public works contracts.
6. The initial filter that conditions the presentation of results only for works with a closing date in the year 2022 presupposes the presentation of only completed works. Therefore, the cause for the termination of the contract for all data is "Full compliance with the contract", which is why this column was also deleted.
7. As the contract closing date is 2022 for all data, this information was also excluded.
8. The causes of term and price changes, according to the model presented by the base portal, are qualitative information, with general and global descriptions. Therefore, it could not be used in the analysis.
9. In the files extracted from the base portal, the Status column does not contain any information, so there is nothing to analyse.
10. In the columns Registration number of the framework agreement and Description of the framework agreement, for works that do not derive from a framework agreement, the text "not applicable" is filled in. In turn, when dealing with a procedure derived from a framework agreement, the first column has an identification number, while the second has an explanatory text about the contracted object. The types of procedures already contain information according to the framework; therefore, these columns do not contain data that can be statistically analysed.
11. The existence of centralized procedures or not and the correlation analysis with the occurrence of additional costs could be carried out. However, in the centralized procedures column, all data appear as "FALSE".
12. The Link to procedure parts column, when completed, has a link with the electronic address to access information about the procedure. This information was not connected to the statistical analysis.
13. The Supplier List column has all data filled in as "FALSE".
14. The Acquisition under the framework agreement of another EU member state column is not completed.
15. Special measures, in most cases, are not completed. When completed, the source of origin of the resources is described, such as Projects Financed or Co-financed by European funds or the Recovery and Resilience Plan—PRR.
16. The data in the Regime column only contains the information that it is the Public Contracts Code Regime.
17. Material Criteria, in turn, are fulfilled, with very rare exceptions as false for all data.
18. The CCP column has true and false options; practically all data have the FALSE option. The purpose of this information is unclear, which is why it was also deleted.
19. Finally, the group members column does not contain any information, that is, no data are provided in this column.

Once this information was excluded, it was also necessary to include the following data initially not directly described in the base portal:

1. Base price: The base portal does not present a column with this information, so it was necessary to access each work individually and check the base price value. Not all procedures were able to identify such information.
2. Deviation from the base price and percentage of deviation from the base price corresponds to the difference between the base price and the contractual price. These data are important as they may indicate greater or lesser differences between the predicted price and the actually contracted price and may highlight occurrences of price deviations in public works. A company can, hypothetically, as a competition strategy, reduce the proposal for the work with the aim of winning the competition. However, this relies on the subsequent incidence of additional costs to cover the differences in the initial proposal.

3. Price deviation and percentage of price deviation: This information is the most important in the analysis, as it derives from the difference between the total effective price and the contractual price. Whenever this difference is positive, it indicates that the work had a higher cost than that initially contracted. Likewise, negative results mean the prevalence of less work during the execution of the contract. A positive or negative result of this equation does not mean that there was no more work, less work or price revision, it just means that there was a prevalence of one of these elements in relation to the others. The base portal does not identify individual cost elements, only the final value of the work.
4. Regarding the deadlines for the work, the date of signing the contract, the execution period in days and the closing date of the work are included. The latter does not refer to the end of the work, just the date of payment of the last invoice. The base portal does not indicate whether there has been a deviation from deadlines, it only allows those responsible for transmitting information to freely describe the occurrence of a deadline deviation and the cause of this deviation in the same cell. Therefore, to approximate information about the end of the work, we agree to call it the administrative execution of the contract, which is the result of the equation of the closing date minus the date of signing the contract. This result indicates how many days the administrative execution of the contract takes.
5. Knowing the number of days of administrative execution of the contract minus the deadline for carrying out the work, it was possible to obtain a deviation from the deadline for the work. It is important to highlight that this is not a real deviation, as we do not know the start date of the work, which is not the same as the date of signing the contract and, in the same way, we do not know the end date of the work, which coincides with the date of provisional reception of the work. Therefore, the deadline deviation discussed here is only an indication of the time elapsed between the administrative execution of the work and the execution deadline.

Once the information on price deviation values was obtained, only works with positive deviations were selected, that is, those in which the total effective price was higher than the contract price. The analysis was carried out exclusively with these data. The objective of this selection is in line with the objective of the work, which is to analyse the additional costs of public works in light of the quality of information and access to public data.

In summary, after excluding some data obtained on the platform and, similarly, after including information derived from the equation of initial elements, the final statistical analysis included the following references:

1. Type of procedure.
2. District.
3. Base price.
4. Contract price.
5. Deviation from base price: (Base price—Contract price).
6. Percentage of deviation from the base price: (Base price—Contract price)/Base price.
7. Effective total price.
8. Price deviation: (Total effective price—contractual price).
9. Percentage of price deviation: (Total effective price—Contract price)/Contract price.
10. Date of conclusion of the contract.
11. Contract closing date (year)
12. Execution time (days).
13. Administrative execution of the contract (days): (Contract closing date—Contract conclusion date).
14. Deviation of deadline (days): (Administrative execution of the contract—Execution period).
15. Percentage of deadline deviation: (Administrative execution of the contract—Execution deadline)/Execution deadline.

The graphs in Figures 1 and 2 identifies the initial result obtained from the insertion of the filters already described. Therefore, from the stratification of contractual prices, a total of 4313 works were identified, of which 1652 (38.30%) presented a positive price deviation. For works with a contractual price between EUR 150,000.00 and EUR 5,350,000.00, there were 642 results with positive deviations, which represents the highest percentage relative to total occurrences (59.17%). In other words, of the 1085 works carried out in this price range, 642 showed price deviations. On the other hand, for works between EUR 30,000.00 and EUR 150,000.00, there were 703 results with positive deviations, representing 42.55% of the 1652 works identified with deviation.

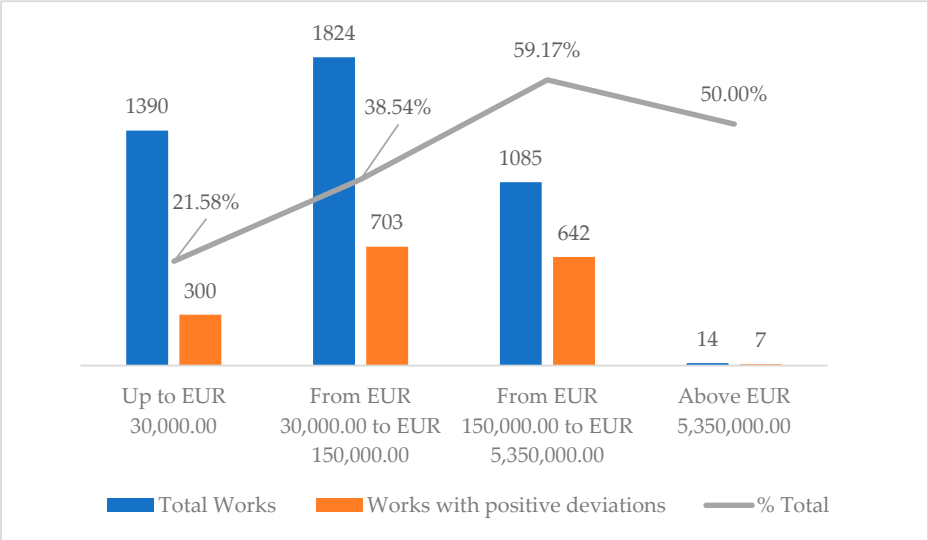

Figure 1. Total works X works with deviation.

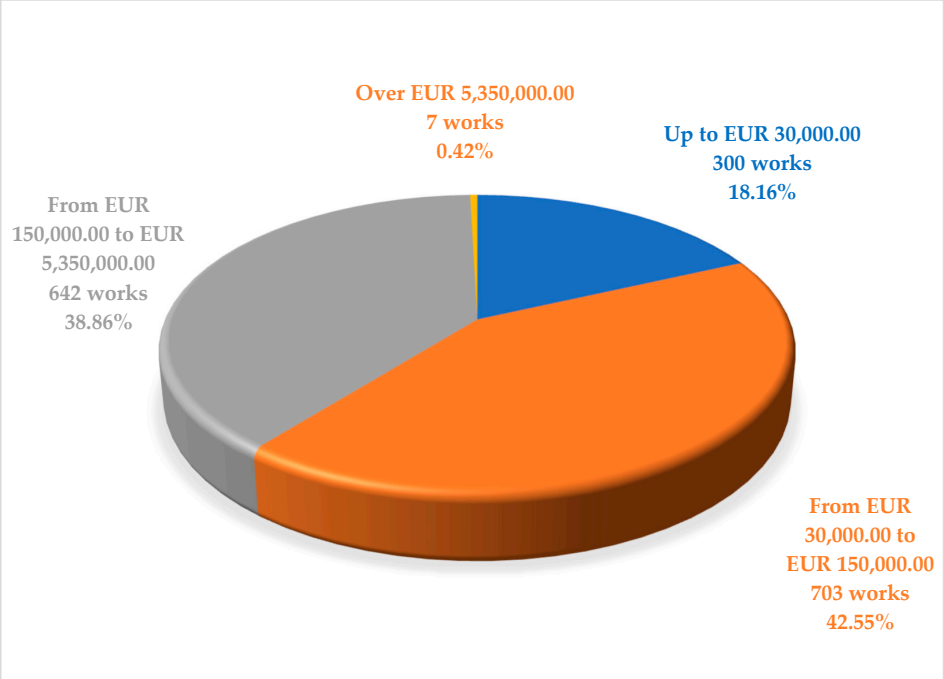

Figure 2. Works with deviation and price distributed according to the contractual price.

In the following topic of the analysis of descriptive statistics, only data from works with positive deviations were included, that is, 1652 works were analysed.

4. Results

The objective is to place deviation data at the centre of the analysis. Here, we only have information in which the final price was higher than the initial price, that is, 1652 works were analysed. The aim is to characterize and identify the iterations between the variables so that the content can provide elements of characterization and an understanding of cost deviations within the scope of public works contracts in Portugal.

Eleven continuous variables and three discrete variables were analysed (district, type of procedure and contractual price group). The data were analysed using SPSS (Statistical Package for the Social Sciences) software version 29 for Windows [23].

4.1. Continuous Variables

An initial description of the characteristics of the analysed data is necessary as a situational point of the variables that make up the set of analysed data. Therefore, the following Table 2 presents the descriptive statistics of the continuous variables.

As can be seen, the set presents a total of 1652 data points. The reference to the base price and, consequently, the percentage of deviation from the base price has 1240 data points since, as previously mentioned, this information was added through the individual analysis of each of the works described. However, it was not possible to find this information for all the works.

There are eleven continuous variables, seven of which are related to the price, and four variables are related to the term of the work, namely, execution period, administrative execution of the contract, deadline deviation and percentage of deadline deviation. The latter were included with the aim of identifying the term conditions for carrying out works in Portugal. Even in view of the limitations described above regarding the data relating to construction deadlines, the slowness of the public administration can be seen, since, while the average execution time for works with deviation was 147.87 days, the average execution time for administrative execution of works was at least three times longer than 553.92 days. In other words, the average time between signing the contract and paying the last invoice was at least three times longer than the average execution time. In a short-term project, the definition of the administrative execution deadline may not have important impacts; however, in works with a longer execution period, this difference has an important impact that can affect medium- and long-term public planning.

When evaluating the price deviation variable individually, that is, the price deviation values, it is clear that the lowest deviation value was EUR 0.01, while the highest value was EUR 3,122,958.71. The sum of all deviations for works with a closing date in 2022 was EUR 43,724,352.37 (forty-three million, seven hundred and twenty-four thousand, three hundred and fifty-two euros and thirty-seven cents). The average value of the deviation was around EUR 26,467.52.

Table 2. Choosing the procedure for forming public works contracts.

Descriptive Statistics					
	N	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
Base Price	1240	4670.06	18,500,000.00	405,602.89	1,025,923.67
Contract Price	1652	2113.79	17,443,880.00	314,126.92	850,740.46
Deviation from Base Price	1240	0.00	4,518,578.41	45,382.31	184,573.36
Percentage Deviation from Base Price	1240	0.00	63.15	7.33	9.32
Total Effective Price	1652	2186.76	20,566,838.71	340,594.45	923,605.37
Price Deviation	1652	0.01	3,122,958.71	26,467.52	97,437.68
Deviation Percentage	1652	0.00%	71.04%	8.13%	8.64%
Execution Deadline (Days)	1652	5	1095	147.87	143.04
Administrative Execution of the Contract (Days)	1652	20	4557	553.92	385.80
Deadline Deviation (Days)	1652	−414	4257	406.05	338.04
Deadline Deviation Percentage	1652	−77.78%	14,140.00%	534.2309%	804.65%

4.2. Discrete Variables

Discrete variables were analysed according to frequency of occurrence. Thus, according to the results in Table 3, the districts of Porto and Lisbon stand out as those with the highest number of works with deviations, with 313 works identified in Porto, corresponding to 18.9% of the data, while in Lisbon, 264 works were carried out with positive deviations with a closing date in 2022. The exact location of two works could not be identified, so we decided to identify them as Portugal. The district of Évora was the one with the lowest number of works with diversion, just 13.

Table 3. Discrete variable: district.

	Frequency	Percentage	Cumulative Percentage
Aveiro	92	5.6	5.6
Beja	41	2.5	8.1
Braga	37	2.2	10.3
Bragança	14	0.8	11.1
Castelo Branco	33	2.0	13.1
Coimbra	70	4.2	17.4
Évora	13	0.8	18.2
Faro	115	7.0	25.1
Guarda	30	1.8	26.9
Leiria	67	4.1	31.0
Lisboa	264	16.0	47.0
Portalegre	45	2.7	49.7
Porto	313	18.9	68.6
Santarém	89	5.4	74.0
Setúbal	144	8.7	82.7
Viana do Castelo	41	2.5	85.2
Vila Real	89	5.4	90.6
Viseu	108	6.5	97.2
Região Autonoma da Madeira	24	1.5	98.6
Região Autonoma dos Açores	21	1.3	99.9
Portugal	2	0.1	100.0
Total	1652	100.0	

The analysis of the type of procedure (Table 4) and its respective frequency of occurrence reveals that the Public Tender has the highest number of occurrences, with 793 works carried out through this procedure, which corresponds to 48% of the total set of procedures. The base portal presents the framework agreement in the column that describes the procedures adopted for contracting; in this sense, the same perspective as the portal was adopted, although the CCP does not recognize the framework agreement as a procedure, but as a contracting mechanism. Therefore, the agreement has a total of 72 contracted works. The competition limited by prior qualification instructed the contracting of only eight works carried out with positive deviations, that is, less than 1% of the total data set.

Table 4. Discrete variable: type of procedure.

	Frequency	Percentage	Cumulative Percentage
Direct Fit	231	14.0	14.0
Prior Consultation	548	33.2	47.2
Public Tender	793	48.0	95.2
Framework Agreement	72	4.4	99.5
Competition Limited by Prior Qualification	8	0.5	100.0
Total	1652	100.0	

The frequency distribution divided by the contractual price (Table 5), according to the initial division, reveals that the data set has the highest number of deviations in works that have a price of EUR 30 to EUR 150 thousand, with 703 works in this price range, which corresponds to 42.6%. Only seven works with positive deviations were identified whose contractual price exceeds the limit of EUR 5,350,000.00, that is, less than 1% of the total data.

Table 5. Discrete variable: contractual price groups.

	Frequency	Percentage	Cumulative Percentage
Works up to EUR 30,000.00	300	18.2	18.2
Works from EUR 30,000.00 to EUR 150,000.00	703	42.6	60.7
Works from EUR 150,000.00 to EUR 5,350,000.00	642	38.9	99.6
Works above EUR 5,350,000.00	7	0.4	100.0
Total	1652	100.0	

4.3. Descriptive Statistical Analysis

The data were crossed between the type of procedure and the categorical group of prices (Table 6). The results show that for works up to EUR 30,000, the direct adjustment has the largest number of works carried out in this price range. In turn, for works between EUR 30,000.00 and EUR 150,000.00, Prior Consultation stands out in relation to other types of procedures. Likewise, Public Tender has 91.7% of all works whose contractual price is between EUR 150,000.00 and EUR 5,350,000.00. The Framework agreement has only 72 works from the total data, and this number is divided into the first three groups of values, with 25 works up to EUR 30,000.00, 23 in group 2 (EUR 30,000.00 to EUR 150,000.00) and 24 in group 3 (EUR 150,000.00 to EUR 5,350,000.00). Finally, Limited Competition by Prior Qualification has a total of eight works in the data set, five of which were executed in the price range between EUR 150,000.00 and EUR 5,350,000.00.

Table 6. Descriptive statistics—type of procedure X contractual price group.

		Price Group				Total
		Works up to EUR 30,000.00	Works from EUR 30,000.00 to EUR 150,000.00	Works from EUR 150,000.00 to EUR 5,350,000.00	Works Above EUR 5,350,000.00	
Direct Fit	Count	199	21	9	2	231
	% in Procedure Type	86.1%	9.1%	3.9%	0.9%	100.0%
	% in Price Group	66.3%	3.0%	1.4%	28.6%	14.0%
Consultation Preview	Count	60	473	15	0	548
	% in Procedure Type	10.9%	86.3%	2.7%	0.0%	100.0%
	% in Price Group	20.0%	67.3%	2.3%	0.0%	33.2%
Contest Public	Count	16	185	589	3	793
	% in Procedure Type	2.0%	23.3%	74.3%	0.4%	100.0%
	% in Price Group	5.3%	26.3%	91.7%	42.9%	48.0%
Agreement Frame	Count	25	23	24	0	72
	% in Procedure Type	34.7%	31.9%	33.3%	0.0%	100.0%
	% in Price Group	8.3%	3.3%	3.7%	0.0%	4.4%
Contest Limited by Prior Qualification	Count	0	1	5	2	8
	% in Procedure Type	0.0%	12.5%	62.5%	25.0%	100.0%
	% in Price Group	0.0%	0.1%	0.8%	28.6%	0.5%
Total	Count	300	703	642	7	1652
	% in Procedure Type	18.2%	42.6%	38.9%	0.4%	100.0%
	% in Price Group	100.0%	100.0%	100.0%	100.0%	100.0%

Crossing the type of procedure and price deviation (value) variables (Table 7) indicates that Public Tender is the one with the highest incidence in the total set of data, with

793 occurrences. The smallest price deviation identified was EUR 0.01, which occurred in Preliminary Consultation and Public Tender, which may indicate an error in filling out or rounding the data. We decided to keep these data, precisely to highlight any failures in the dissemination of information conveyed on the base portal. In turn, the largest deviation value was identified in the Limited Competition by Prior Qualification procedure with a total value of EUR 3,122,958.71. The table below also presents the average deviation by type of procedure, where the lowest average is recorded in Direct Adjustment with a value of EUR 5567.70.

Table 7. Descriptive statistics—type of procedure X price deviation (value).

	Price Deviation				
	N Valid	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
Direct Fit	231	0.40	528,697.78	5567.70	37,316.58
Prior Consultation	548	0.01	88,189.57	6199.88	8364.02
Public Tender	793	0.01	787,573.58	43,383.39	79,450.34
Framework Agreement	72	20.00	89,401.67	9670.32	19,146.76
Competition Limited by Preliminary Qualification	8	12,979.78	3,122,958.71	492,672.84	1,067,626.65

The next tables present the crossing of the district X price deviation (Table 8) and district X percentage of price deviation (Table 9) variables. From the analysis in the table, it appears that Porto district has the largest number of works with diversion with a total of 313 works. In turn, Faro has the smallest deviation identified with just an EUR 0.01 increase in relation to the contractual price. The district of Viana do Castelo, with 41 works carried out with deviation, has the work with the highest individual value of deviation with a total of EUR 3,122,958.71, and also the highest average price deviation with a price of EUR 117,196.25.

Table 8. Descriptive statistics—district.

			Price Deviation			
	N Valid	**Percentage**	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
Aveiro	92	5.6	0.39	418,415.62	26,861.54	68,495.18
Beja	41	2.5	218.67	96,722.56	16,730.32	24,116.59
Braga	37	2.2	382.49	185,281.01	34,094.78	41,427.90
Bragança	14	0.8	1912.42	141,955.35	27,859.59	37,876.14
Castelo Branco	33	2.0	201.80	787,573.58	55,459.89	160,911.51
Coimbra	70	4.2	0.04	172,463.36	22,244.08	35,791.58
Évora	13	0.8	0.31	325,583.20	67,994.52	98,651.32
Faro	115	7.0	0.01	203,617.59	17,013.98	30,716.18
Guarda	30	1.8	262.36	389,515.57	29,029.27	71,581.33
Leiria	67	4.1	0.01	88,163.76	11,815.00	19,856.52
Lisboa	264	16.0	177.03	709,645.96	25,345.88	77,957.51
Portalegre	45	2.7	208.80	142,127.30	14,266.56	27,915.07
Porto	313	18.9	11.91	357,935.55	21,548.15	45,863.36
Santarém	89	5.4	188.19	360,412.41	26,796.17	59,932.95
Setúbal	144	8.7	63.50	416,939.04	32,282.22	65,748.67
Viana do Castelo	41	2.5	0.02	3122958.71	117196.25	487675.95
Vila Real	89	5.4	239.91	330,464.71	22,991.82	58,046.81
Viseu	108	6.5	62.63	144,044.05	13,743.57	21,674.44
Região Autonoma da Madeira	24	1.5	230.01	330,021.80	29,741.52	69,847.99
Região Autonoma dos Açores	21	1.3	526.57	417,091.44	40,919.91	91,994.49
Portugal	2	0.1	270.00	4941.68	2605.84	3303.38
TOTAL	1652	100.00				

Table 9. Descriptive statistics: district.

	Deviation Percentage				
	N Valid	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
Aveiro	92	0.00%	36.95%	7.76%	7.42%
Beja	41	0.48%	47.76%	9.15%	10.71%
Braga	37	0.51%	59.03%	10.69%	9.91%
Bragança	14	0.78%	12.72%	5.35%	3.63%
Castelo Branco	33	0.10%	23.18%	7.07%	5.85%
Coimbra	70	0.00%	57.40%	9.10%	10.98%
Évora	13	0.00%	30.50%	10.50%	8.33%
Faro	115	0.00%	39.60%	8.21%	6.51%
Guarda	30	0.73%	32.34%	9.22%	8.98%
Leiria	67	0.00%	43.47%	5.39%	6.52%
Lisboa	264	0.14%	50.68%	8.03%	8.17%
Portalegre	45	0.15%	29.22%	4.96%	4.74%
Porto	313	0.03%	71.04%	7.90%	9.15%
Santarém	89	0.23%	37.65%	6.61%	6.53%
Setúbal	144	0.22%	49.78%	10.24%	9.97%
Viana do Castelo	41	0.00%	42.98%	9.47%	9.06%
Vila Real	89	0.65%	45.10%	7.69%	8.32%
Viseu	108	0.28%	50.00%	10.54%	11.09%
Região Autonoma da Madeira	24	0.24%	7.12%	2.48%	1.91%
Região Autonoma dos Açores	21	1.03%	18.18%	6.36%	5.07%
Portugal	2	0.15%	3.11%	1.63%	2.09%

Discrete variables were analysed according to frequency of occurrence. Thus, the districts of Porto and Lisbon stand out as those with the highest number of works with deviations, with 313 works identified in Porto, corresponding to 18.9% of the data, while in Lisbon, 264 works with positive deviations were carried out with a date of closing in 2022. The exact location of two works could not be identified, so we decided to identify them as Portugal. The district of Évora had the lowest number of works with diversion, just 13.

In turn, regarding the comparison with the percentage of deviation, the districts of Porto, with 71.04%, Braga, with 59.03%, Coimbra, with 57.04% and Lisbon, with 50.8%, have the highest percentages of deviation compared with a single work. These percentages cannot currently be accepted because of the limitations of the Public Contracts Code. The district of Braga has the highest average deviation percentage of 10.69%, followed by the district of Évora, with 10.50%, and Setúbal with an average of 10.24%.

The data crossing also verified the frequency distribution of the types of procedures by district (Table 10). The Lisbon district has the highest number of procedures carried out in the Prior Consultation and Public Tender procedures, with 95 and 147, respectively. In turn, the Porto district has the highest number of procedures carried out in the data set for the Direct Adjustment and the framework agreement procedures. In the latter case, of the 72 procedures carried out under the framework agreement, 71 of them were carried out in the Porto district. Finally, the Autonomous Region of Madeira leads in the number of procedures carried out by Limited Competition by Prior Qualification, with three works identified.

Table 10. Descriptive statistics: district.

	Type of Procedure									
	Direct Fit		Prior Consultation		Public Tender		Framework Agreement		Limited Preview Contest Qualification	
	Count	% of N of the Line	Count	% of N of the Line	Count	% of N of the Line	Count	% of N of the Line	Count	% of N of the Line
Aveiro	8	8.7%	38	41.3%	46	50.0%	0	0.0%	0	0.0%
Beja	4	9.8%	22	53.7%	15	36.6%	0	0.0%	0	0.0%
Braga	4	10.8%	4	10.8%	29	78.4%	0	0.0%	0	0.0%
Bragança	0	0.0%	2	14.3%	12	85.7%	0	0.0%	0	0.0%
Castelo Branco	8	24.2%	7	21.2%	18	54.5%	0	0.0%	0	0.0%
Coimbra	9	12.9%	23	32.9%	37	52.9%	0	0.0%	1	1.4%
Évora	1	7.7%	2	15.4%	10	76.9%	0	0.0%	0	0.0%
Faro	17	14.8%	42	36.5%	56	48.7%	0	0.0%	0	0.0%
Guarda	5	16.7%	11	36.7%	14	46.7%	0	0.0%	0	0.0%
Leiria	16	23.9%	20	29.9%	31	46.3%	0	0.0%	0	0.0%
Lisboa	21	8.0%	95	36.0%	147	55.7%	1	0.4%	0	0.0%
Portalegre	14	31.1%	15	33.3%	16	35.6%	0	0.0%	0	0.0%
Porto	47	15.0%	77	24.6%	116	37.1%	71	22.7%	2	0.6%
Santarém	12	13.5%	37	41.6%	40	44.9%	0	0.0%	0	0.0%
Setúbal	21	14.6%	55	38.2%	67	46.5%	0	0.0%	1	0.7%
Viana do Castelo	2	4.9%	13	31.7%	25	61.0%	0	0.0%	1	2.4%
Vila Real	7	7.9%	29	32.6%	53	59.6%	0	0.0%	0	0.0%
Viseu	23	21.3%	44	40.7%	41	38.0%	0	0.0%	0	0.0%
Região Autonoma da Madeira	3	12.5%	10	41.7%	8	33.3%	0	0.0%	3	12.5%
Região Autonoma dos Açores	9	42.9%	0	0.0%	12	57.1%	0	0.0%	0	0.0%
Portugal	0	0.0%	2	100.0%	0	0.0%	0	0.0%	0	0.0%

An analysis of the number of works carried out per year of signing the contract (Table 11) reveals that when considering the year 2022 as the closing date, the year 2021 has 50.8% of the works carried out, which corresponds to 840 data points. Next is 2020, with 418 works (25.3%).

Table 11. Frequency distribution of works with deviation by year of contract signing.

Year	Frequency	Percentage	Cumulative Percentage
2010	1	0.1	0.1
2011	2	0.1	0.2
2015	3	0.2	0.4
2016	4	0.2	0.6
2017	22	1.3	1.9
2018	56	3.4	5.3
2019	147	8.9	14.2
2020	418	25.3	39.5
2021	840	50.8	90.4
2022	159	9.6	100.0
Total	1652	100.0	

Since the number of contracts signed before 2019 for this study sample did not prove to be significant, and considering only the beginning of the COVID-19 pandemic in 2019, an analysis of the frequency distribution between works with contracts from 2019 and the percentage of identified price deviations was performed (Table 12). The table below shows that the percentage of deviation has an average between 6.49% (2019) and 8.53% (2021). In other words, the average variation in the percentage of deviation peaks in 2021, although the difference between the years analysed is not very significant, with minimal variations.

Table 12. Descriptive statistics: year of contract signing X percentage of deviation.

		Deviation Percentage				
		N Valid	**Minimum**	**Maximum**	**Average**	**Standard Deviation**
Years	2019	147	0.00%	71.04%	6.49%	8.77%
	2020	418	0.00%	47.76%	7.87%	7.66%
	2021	840	0.00%	57.40%	8.53%	8.63%
	2022	159	0.08%	59.03%	8.20%	10.21%

5. Data Limitations and Improvement Proposals

Having made considerations for obtaining the acquired data, for a better analysis, it was necessary to infer from the combination of information and search for additional data that could complement and correct discrepancy data, or even exclude those that actually do not comply with the legislation in question. An example of excluded or corrected data is those in which the difference between the contractual price and the effective price exceeds 50%. Some of the data clearly presented a filling error with the addition of digits and/or out-of-place commas. In these cases, a correction was possible and was performed by accessing the parts of the procedure; however, some data could not be understood, such a discrepancy, which is why we decided to exclude such information.

The data limitation is related to the number of interactions in which it is possible to design an evaluative structure. In this case, a small number of structures and discrete and continuous variables can be related, not only to price but across the entire set of publicly accessible data. It is with this information that the analysis was carried out, considering three discrete variables: type of procedure, district and the division of prices into four groups. These three variables mentioned here are already related to additional costs since the analysis at this stage only concerns work with price deviations.

The initial and main limitation of the data is that even when knowing the works in which the total effective price is equal to, higher or lower than the contractual price, it is not possible to individualize the deviation elements (complementary works, work to eliminate errors and omissions, fewer jobs and price review). This calls into question the possibility of an analysis closer to reality. However, it is exactly the existence of this limitation that drives this study, as it highlights the need to change the model that is currently implemented so that the transmission of these data can enable adequate clarification of the application of public resources.

Given the aim of studying works with additional costs, the first inference was to identify which works had additional costs. The result of the difference between the total effective price and the contract price provides such information. In other words, all works resulting in positive values of this difference show that there were additional costs. However, works that have negative values, that is, in which the contract value was not executed in its entirety and, likewise, works with positive values or no changes, do not mean that there was no more work, less work or price review. The base portal does not individually identify additional work, less work or price revision; this information is incorporated globally into the total effective price, that is, in the final value of the work. Therefore, there is a limitation in the analysis here since the information on the occurrence of deviation is provided solely in the description of those responsible for providing the information, and there is no specific field for such values to be individually entered, only in a textual descriptive manner, so there is no parameterization of this data. An example of this is the understanding of a price review as a price deviation. It is not uncommon to come across positive differences from the effective total price to the contractual price, that is, in this case, it is assumed that there was a price deviation. However, in the description presented by the Public Institution when transmitting the data, it appears as if there had been no price change. In this case, it was assumed that the price revision was not classified and interpreted as a price deviation for the work.

Another limitation is the analysis of the beginning and end of the work. There is no way to objectively infer whether there was a change in the deadline; we can only obtain an idea from the non-uniform transcript sent by the public body. There is no way of knowing whether there was a deviation from the deadline and what the magnitude of the deviation was in days, months or years, as the file only contains the date of the contract, which effectively does not mean the start date of the work and the closing date, which also does not mean the end of the work. In this case, it would be necessary to objectively identify the start and end date of the work with any deviations that occurred during execution.

There is no objective information on the occurrence of an extension of the deadline and/or suspension of work in the number of days. Therefore, the DEVIATION OF DEADLINE as indicated here is only an indicative parameter for the comparison between the execution deadline and the administrative execution of the contract.

Still, in relation to the deadline for the execution of the works, the information provided by the file extracted from the portal includes the date of publication, date of conclusion of the contract, date of closing of the contract and deadline for execution. If it is not possible to objectively identify deviations in the deadline for execution of works, one can at least indicate the inefficiency and slowness of the administrative management of public works contracts.

The CPV of the work, as an objective description of the type of work that was carried out, provides only a general description allowing for the provision of information to be in a comprehensive manner, which in turn conditions the interpretation and, subsequently, a more specific classification of the type of work. The most characteristic example that can be evaluated is the indiscriminate use of CPV 45000000-7, which characterizes construction works. However, a quick analysis of the objects contracted with this classification reveals the following transcription verbs: construction, Repaving, execution, improvement, repair, Installation, Conservation, Enlargement, Requalification, Paving, Regularization, Assembly, Disassembly, Replacement, etc. In other words, the CPV classification requirement is made by analysing the data, in general, without, however, allowing for the use of these data for characterization and correct interpretation of the data.

Procedure parts are not always available. When a possible filling error was identified, individual information about the work was accessed to verify the origin of the error. However, it was not always possible to access it, as in some cases, it was not available.

The extracted file does not provide data regarding the base price of the procedure. This information is necessary as it can facilitate a subsequent analysis between the discount percentages of the proposals and the incidence of additional work or unfinished work, for example. Access to these data was only possible through the procedural documents when these were available. Therefore, an assessment of the discount percentages between the base price and the contractual price was not possible for every set of data.

After obtaining the data, an analysis of the results found with positive deviations was carried out. All the information was investigated only from these works with the aim of finding possible errors. For the four sets of data, it was necessary to correct or exclude works that clearly had some inconsistencies, such as in cases where the final price was substantially higher than the contractual price. In some cases, in the description carried out when filling out the causes for price and term changes, the Public Institution states that there were no deviations, or that the values of change were different to those found in the extracted file, therefore suggesting that the data were actually incorrectly filled in by error or mistake. This analysis was carried out only for positive deviations; therefore, it is to be assumed that in the total data set, a greater number of data disagree and are in need of correction.

Regarding the final values of the work, a field would be necessary for objective identification of the base price, the contractual price, the price of less work (and its origins), the price of excess work (and its origins), the price review and the methods and percentages used. The final result would be an operation to combine these values, which would consequently contribute to the correction of any filling errors since the final value would

be generated automatically only with the insertion of these data and not as it is currently completed only by the textual description.

The identification of limitations provides a correction path with the need to insert objective data, such as the start date of work, the end date of work, the date of award (partial and/or total), the presentation of proposals, qualification, competitors, too much work, too little work and price review (methods), in addition to other attributes provided for in current legislation. The construction of these elements has a legal basis and provision, being set out in the Public Contracts Code; however, they necessarily need to be publicized in order to guarantee legal and unrestricted access to the information constructed throughout the entire process of contracting, execution and monitoring of public works in Portugal.

Furthermore, as provided for in the Public Contracts Code, there are characteristic elements of each procedure that could help clarify the occurrence of price deviations in public works contracts. Not only that, but they would also contribute to a global understanding of compliance with legislation and to the construction of a statistical database that would allow for a solid reading of the conditions under which contracts are executed. Next, based on the legal provision, a series of questions are listed that cannot be answered since the lack of transparency and quality of information limits access; obviously, each of the following questions and, consequently, all answers are asked as a proposal to improve the data currently released:

- ✔ How many works were carried out through division into lots?
- ✔ What was the value of additional works for construction in Portugal?
- ✔ What were the values of additional works carried out by a specific public entity, contractor or designer?
- ✔ How much less work was carried out by a given public entity, contractor or designer?
- ✔ What price review values were paid in Portugal?
- ✔ What method was used in the price review?
- ✔ How many works used the auction mechanism?
- ✔ How many works used the negotiation mechanism?
- ✔ How many works have a deadline deviation?
- ✔ What is the average value in the number of days of deadline deviation?
- ✔ How many works were diverted in a given district?
- ✔ Which district had the highest number of cost and deadline deviations?
- ✔ How many projects were not provided with a deposit and what was the reason?
- ✔ How many works were carried out with mixed contracts?
- ✔ How many and which procedures used the participation system for micro and small companies?
- ✔ Was the execution of the work suspended? Partial or total? What is the justification?
- ✔ Was there an extension of the deadline for the execution of the work? For how many days? What is the justification?
- ✔ Were contractual sanctions applied? What is the justification? Who was responsible for the payment?
- ✔ What was the base price of the work?
- ✔ Was the winning proposal part of a group of entities?
- ✔ Were there any plans for reserved contracts?
- ✔ Was any entity identified that was prevented from participating in the procedure?
- ✔ Were errors and omissions identified in the specifications?
- ✔ Was there a request for document classification?
- ✔ Was there a proposal in which prices were considered abnormally low?
- ✔ What were the award criteria? Monofactor or Multifactor?
- ✔ Was the procedure derived from a previous procedure?
- ✔ Was there a deposit provided and reinforcement of the deposit? If so, what percentage was defined? Or if not, what was the justification?
- ✔ Was the contract reduced to writing? If not, what was the justification?
- ✔ Was there a price advance? If so, what was the justification?

- ✔ Was there a payment of premiums for early compliance? If so, what was the basis?
- ✔ Was the work inspection contracted or was it internal?
- ✔ Was there a transfer of the contractual position? If so, what was the basis?
- ✔ Was there subcontracting? If so, what was the basis?
- ✔ Were there expropriations, easements and occupations of public buildings? If yes, were there any compensation payments?
- ✔ Was there a request for a financial balance because of increased costs in carrying out the work? If so, what was the amount paid?
- ✔ Was there a need to change the work plan and payment plan? What was the justification?
- ✔ What was the start and end date of the work?
- ✔ Were there objective changes to the contract?
- ✔ What was the date of the provisional reception?
- ✔ What was the PSS approval date?
- ✔ What was the Consignment date?
- ✔ What was the date of contract signing?
- ✔ What was the award date?
- ✔ Was there a delay in carrying out the work? How long? Was there a contractual sanction applied?
- ✔ What was the origin of the sources of price and term deviation?

The answer to each of these questions would contribute to the creation of transparency indicators, the risk of price and the term deviations that occur. Through adequate treatment, it would also contribute to the analysis of predictability, correction and reinforcement of measures that make public action effective and efficient in the physical and budgetary execution of public resources.

6. Conclusions

The results of this study, although they are from a case study, can be expanded globally, as they corroborate the need for expansion and improvement, quality and transparency in public data. We advocate for the expansion of data accessible to the public, since, according to the results obtained, they could contribute to better analysis, resulting in a diagnosis of current conditions and allowing for statistical inference studies. This, in turn, could contribute to the identification of predictability, correction, alteration and perhaps the introduction of specific measures in works data that may prove to be incompatible with legal standards.

It is necessary to identify and highlight planned elements that are not currently included in public procurement transparency platforms. Therefore, considering the need for detailed extraction of data that allows for a detailed analysis of the specific condition of a public works contract or the context of public works contracts, the set of public information must be expanded. As a result, there is a significant gain in the amount of information per work, as well as in the means and research methods available. The expansion of advanced search engines will allow for cross-searching between each of the elements inserted in the information. Regarding price changes, any fact or circumstance that may modify the initial cost of the public work must follow the logic of mandatory transparency not only of the additional values but, above all, of the causes that gave rise to the additional values. In the case of Portugal, it was observed that the causes of these changes are not justified in the data accessed; however, there has been progress in the Portuguese legal system of transparency with the requirement that all changes due to objective modifications of a contract be published, eliminating the limits where publication was only required based on changes representing 10% of the contractual price. Given that the data included works prior to the introduction of these changes, it was not possible to access additional contracts.

Refs. [15,24] studied the relationship between typologies, deadlines and project size with the incidence of deviations; however, in this study, because of the access to public data and the number of variables available, it was not possible to construct correlation analyses

that effectively indicate the origins and causes of deviations. Consequently, it was also not possible to construct mechanisms that prevent and correct such occurrences.

Ref. [25] suggested the construction of a study that considers different types of projects in different regions; for the authors, this would allow for a broad comparative analysis, which in turn would be able to provide information on local and regional variations in deviation factors. The authors' suggestion is precisely in connection with the results of this work, as it was concluded that obtaining a greater number of variables would contribute to the execution of a transversal analysis, allowing for the construction of a characterization of the occurrence of deviations.

Because of the lack of references similar to this study, there is no way to compare the results of this work with those of previous research since none of the references analysed used the transparency and quality of public information as a parameter to study cost deviations. The results of this work are not intended to discredit previous work. On the contrary, they support and add to the knowledge built on the topic, indicating an alternative approach.

Solutions and Proposals

Currently, the base portal for completed public works contracts discloses a limited number of variables that allow for a poor characterization of the object. As a solution and perspective for the future, this work proposes the creation of an environment where transparency is the rule and not the exception, providing all citizens with the right to access and analyse detailed information about how public resources are used. Effective supervision is an essential tool to ensure that public contracts are executed responsibly and in accordance with current legislation, ensuring the appropriateness of the use of public resources.

The portal information identifies the descriptive variables, without, however, making references to the parallels between them, with the individual identification of geographic zones, values by zones and type of procedure and any other connection. We advocate for the creation of a portal that provides data interpreted in light of public transparency, with a detailed indication of deadlines, values, suspensions, extensions, price reviews and complementary work, in addition to the insertion of data defined in accordance with the legislation of each country. In other words, the results found here must be made available directly on public portals so that citizens can access the data interpreted under the protection of the quality and transparency of the information. Additionally, execution indicators must be provided directly, including a readout of the link between each of the variables. The platform itself must offer comprehensive and interpreted access indicators, evaluating the quality of information regarding deadline compliance, compliance with current legislation, and compliance criteria, since average citizens lack the skills necessary to analyse the data as they are currently available. This also includes the bidders' and winners' performance, and, most importantly, the costs incurred and any modifications made while the job was being completed.

Expanding the data contained in the Excel file to perform an extended diagnosis will provide a greater number of iterations, general and specific, by location, type of procedure, type of auctioneer, contract value, base price value, publication date, contract date, award date, PSS approval date, shipment date, work start date, work end date, contracts with contracted supervision, works with excess work, lack of work, price review, application of contractual sanctions, date of provisional receipt, type of excess work and lack of work, value of excess and lack of work, value and price review method, among others. In other words, the expansion of discrete and continuous variables constitutes tools that expand the results of statistical treatments, enabling the characterization and construction of performance evaluation and monitoring mechanisms.

It is important to highlight that the unrestricted availability of all elements relating to the competition is advocated, as it involves public expenditure. Transparency allows for an inspection to be carried out at different levels: locally, by the contracting entity

itself, by control bodies, by related entities and by any interested party. Furthermore, implementing a transparent and accessible public data system strengthens society's trust in institutions, promoting integrity and efficiency in public procurement. Ensuring that all stages of the process are available for public consultation not only meets the principles of transparency but can also inhibit illicit practices, as it promotes comprehensive oversight of administrative processes.

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