



Research Article

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Influence of the quality of the definition of the activity name on the unit price

Influencia de la calidad de definición del nombre del rubro en el precio unitario

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ABSTRACT The dispersion among building unit prices would be considered normal since no two projects are alike; however, it is shown that price dispersion tends to decrease as the level of detail in the item name (NDN) increases. Therefore, different databases of unit prices for projects in Ecuador from the last five years are obtained to analyze the relationship between the NDN and price variations. Furthermore, the results are analyzed and discussed with reference to variables such as the location of the project, year of execution, and type of work. It is emphasized that the findings contribute, on the one hand, a guide for generating construction item names that lead to more accurate and fair cost estimates. They also provide technical arguments to regulatory bodies to determine potential underestimations or overestimations of prices.

RESUMEN La dispersión entre los precios unitarios de los edificios se entendería normal ya que no existen dos proyectos iguales; no obstante, se demuestra que la dispersión en los precios tiende a disminuir conforme el nivel de detalle del nombre del rubro (NDN) se incrementa. Por lo expuesto se obtienen diferentes bases de datos de precios unitarios de proyectos en Ecuador de los últimos cinco años, para analizar la relación entre el NDN con la variación en los precios, además, los resultados son analizados y discutidos en referencia a variables como ubicación, año de ejecución y tipo de obra. Se destaca que los hallazgos contribuyen por un lado una guía para generar nombres de rubros de construcción que deriven en estimación de costos más precisas y justas. Asimismo, aportan argumentos técnicos a los organismos de control para determinar posibles subestimaciones o sobreestimaciones de precios.

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KEYWORDS activity name, unit price, fair price, construction item, construction budget

PALABRAS CLAVE nombre de actividad, precio unitario, precio justo, rubro de construcción, presupuesto de construcción



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1. Introduction

The construction industry has low productivity due to inaccuracies in costs, deadlines, and quality (Morochó, 2018). This problem has been addressed from different perspectives, but in terms of the approach or definition of scope, there is a gap in the knowledge acquired (Campbell et al., 2023). A project is successful if it meets the triple constraint triangle of scope, cost, and time (PMI, 2004). Managing scope involves implementing actions and tools to plan, monitor, and control the work required to achieve the desired result. Thus, the scope must be correctly defined to increase the probability that cost estimates will be accurate at the time of project execution (Okafor et al., 2022).

When defining scope according to the Project Management Institute, it is necessary to develop a work breakdown structure (WBS), which is a hierarchical decomposition of the project into parts until it is broken down to its simplest form. In the case of a building, the WBS would consist of dividing and subdividing generic elements such as structure, masonry, or architectural details into their simplest form: construction items. Insufficient clarity in the scope definition leads to cost estimation errors. These errors are absorbed by the builder, reducing profits, or, conversely, affect the client due to cost overruns or quality failures (Love et al., 2022).

In the field of public procurement, Palacio et al. (2024) establish that public tendering is a consequence of the need for efficient administration, while Obicci et al. (2021) mention that waste and inefficient management in public procurement affect the State's assets. The problem of overpricing affects the global level. In Argentina, for example, Monteverde (2018) estimates that corruption in public works costs 46,12%. In Ecuador, the Comptroller General of the State (2020) reports losses of more than 17 million due to overpricing in irregular contracts, one cause identified by auditors being the absence of cost references.

Ecuadorian regulations require public resources to be administered with efficiency, effectiveness, transparency, and honesty (National Assembly of Ecuador, 2021; Official Register Supplement, 2020), obliging public officials to ensure that processes are awarded under the principle of "fair price". The regulation establishes penalties for government officials or suppliers who are found to have engaged in overpricing (National Assembly of Ecuador, 2021). Article 294.1 of the COIP establishes that the Comptroller General of the State must determine whether there is overpricing. This raises the question: When determining overpricing, is it possible to avoid subjectivity that may favor particular interests? The search for answers to this question leads, among other things, to the question: What are the criteria that make it possible to substantiate the existence of overpricing?

Legal loopholes, coupled with a lack of coordination among state entities across the different phases of a procurement process, do not guarantee efficient control of the process. This allows some suppliers and public officials to commit the crime of overpricing (Campoverde-Briones et al., 2021) without penalty and, therefore, with impunity (Castillo, 2024). It is also possible that there are practices that circumvent the rules, screening competitive price offers that, upon execution of the contract, are subject to additions that can be compensated with above-market prices (Valdes, 2012).

In the field of architecture, Zotić and Alexandru (2013) mention that the quality of the constructed project depends not only on the conceptual and aesthetic soundness of the design, but also on the accuracy with which prices and schedules are executed. In this sense, as noted by Lima et al. (2021), items constitute fundamental units in the planning and execution of a project, serving as the technical-economic link between the project design and the physical materialization of the building.

This study aims to determine specifically how the level of detail in the definition of a line item (hereinafter NDN) affects the price offered, thus providing strategies that allow the auditor to detect and determine, without prejudice to the State, the existence of overpricing in public works (Longo et al., 2020), as well as to understand the behavior of unit prices in Ecuador.

Item type	What does the item name respond to per question		NDN calculation
	Question code	Detail analyzed	
Excavation	a	Activity	R/6 %
	b	Manual or machine	
	c	Indicates whether the soil is dry, saturated, or contains water	
	e	Isolated footing, strip footing, foundation slab	
	f	Trench width and excavation depth	
Structural steel	g	Soil type	R/7 %
	a	Activity	
	b	Manual or machine	
	d	Level of implementation	
	e	Column, beam, joint, diagonal	
Reinforcing steel	f	Section dimensions, thicknesses	R/7 %
	g	Strength	
	a	Cold or hot rolled	
	a	Activity	
	b	Manual or machine	
Formwork	d	Level of implementation	R/4 %
	e	Footing, wall, column, beam, slab, staircase	
	f	Longitudinal reinforcement or stirrup	
	g	Diameter range	
	g	Strength	
Concrete	a	Activity	R/7%
	b	Concrete plant or ready-mix	
	d	Level of implementation	
	e	Footing, wall screen, column, beam, slab, staircase	
	f	Section or thickness	
Masonry	g	Concrete strength	R/9%
	g	Use of additives	
	a	Activity	
	b	Manual or machine	
	d	Level of implementation	
Plaster	e	Placement range	R/10%
	f	Brick or block in its different types	
	g	Dimension of masonry	
	a	Wall thickness	
	b	Mortar joint thickness	
Filling and painting	d	Strength or dosage of the mortar mix	R/8 %
	a	Activity	
	b	Manual or machine	
	d	Level of implementation	
	e	Is the work indoors or outdoors?	
	f	Horizontal or vertical	R/10%
	g	Smooth, palletized, textured	
	a	Edge, strip, or area	
	b	Thickness of the plaster	
	d	Mortar strength or dosage	
	e	Use of additives	R/8 %
	a	Activity	
	b	Manual or machine	
	d	Level of implementation	
	e	Is the work indoors or outdoors?	
	f	Horizontal or vertical	R/8 %
	g	Wall or ceiling height	
	a	Edge, strip, or area	
	b	Type of filler and/or paint	

Question coding:

What needs to be done?
 What should be used?
 Under what conditions will it be done?
 In which part of the building will it be done?
 What architectural or structural element will be obtained?
 What are the dimensions of the element?
 What are the mechanical parameters of the material?

Table 1: NDN assessment template. (2025)

2. Methodology

This work uses a quantitative approach, collecting numerical data that allows identification of patterns, relationships, and trends in how an item is named and its implications for its price. The research tools used are surveys of professionals with experience in preparing construction budgets and a search of the Official State Contracting System (SOCE) platform, which provides information on the prices estimated by institutions for the items covered by this study.

2.1. Obtaining the study sample

To facilitate data access in time and space, the study universe consists of public buildings constructed between 2019 and 2023. Public entities have issued a total of 1,936 tenders through the SOCE platform, of which 430 have been completed or are in the process of being accepted, and 71 correspond to buildings. From this latter group, 48 processes are randomly selected, corresponding to an error equivalent to 8,11% with 95% confidence. The sample applies the criterion of avoiding selecting two processes from the same institution executed in the same year. This consideration avoids repeated values that could affect the interpretation of results. General and specific information about the project is extracted from the specifications. General data includes the year of publication, the city where the building is located, and the building type. Specific information includes the item name, unit of measurement, and unit price. For this study, the items corresponding to the most common activities in the construction of structural work in buildings are considered, resulting in a database with 1,038 items that are grouped according to the following types: excavation, cyclopean concrete, plain concrete, structural reinforcement, structural steel, formwork, masonry, plastering, and painting.

2.2. Characterization of items

To ensure the success of a project, Lledó (2017) suggests that the first step in planning is to clearly define its scope, avoiding misinterpretation by those involved. In cost control, items are grouped by elements, bringing them closer to execution and providing a tool understandable to everyone involved in the project (Campana, 2023). For this reason, the items are characterized according to the NDN. Table 1 presents the NDN evaluation template by type (column 1), the questions and the details to be answered (columns 2 and 3); and the fourth column indicates the calculation of the level of compliance based on the number of details answered (R) out of the total number of desired details to be answered. For example, if we analyze an item labeled "manual excavation", it is rated an NDN of 2/6 because it only answers questions a and b.

Although technical specifications complement each item, this work focuses on the first steps of scope planning, specifically on the naming of each item.

2.3. Surveys of professionals

In Ecuador, since 2008, through Resolution 0038-2007-TC of the Constitutional Court, professionals are not required to belong to professional associations, which makes it difficult to know the number of civil engineering or architecture professionals. Therefore, the study sample is calculated using Equation 1.

$$n = \frac{Z_{\alpha}^2 \cdot p \cdot q}{e^2} \quad (1)$$

Where: n, minimum number of surveys; Z_{α} , parameter that depends on the confidence level, probability in favor, probability against, maximum expected estimation error (Mirás, 2000).

As a filter, responses from professionals with more than 3 years of construction experience are accepted to eliminate potential errors caused by the respondent's inexperience.

Respondents answer the question: In the case of items related to excavations, concrete, reinforcing steel, structural steel, formwork, masonry, plastering, filling, and painting, do you think the names of the items should be improved?

Five possible answers are offered:

1. Yes, the name does not fully define the work to be done in 75% to 100% of cases
2. Yes, but in 50 to 75% of cases
3. Yes, but in 25 to 50% of cases
4. Yes, but in less than 25% of cases
5. No, the names fully describe the work to be done.

The results of this survey will demonstrate, from the builders' perspective, whether an improvement to the NDN is needed.

2.4. Analysis of results

Using Microsoft Power BI and an algorithm developed in Visual Basic using Microsoft Excel, two analyses of the study sample are performed: first, the NDN is measured according to Table 1; and second, this value is related to the variable type, location, and year of construction.

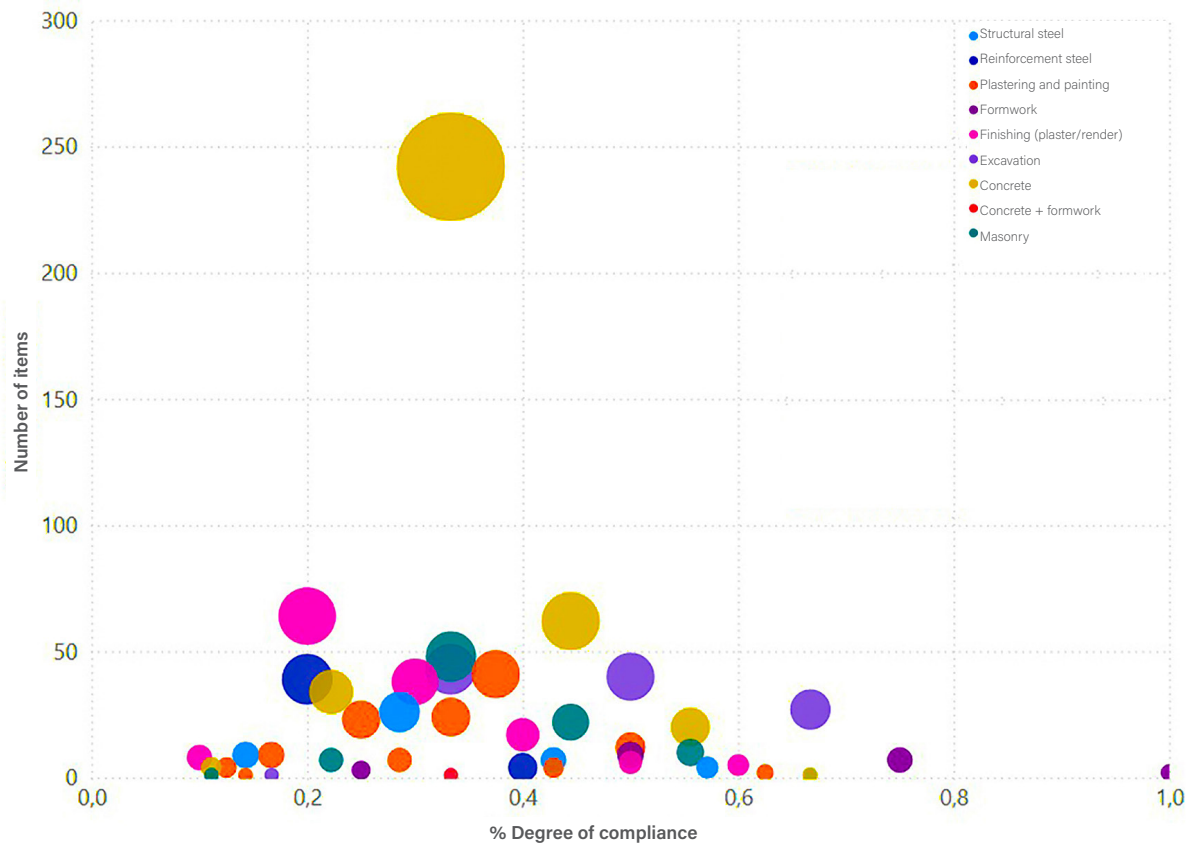


Figure 1: Distribution of the degree of conformity in the naming of items. SOCE (2024)

3. Results

3.1. Responses from construction professionals

A total of 108 responses were obtained from construction professionals, distributed across the Sierra (76,6%), Costa (9%), and Oriente (14,4%) regions. Respondents answered:

- 81,98% of respondents believe that, for every 10 items, more than 5 should have their names redefined.
- 6,2% believe that the items are correctly defined and fully detail the work to be carried out.
- 11,82% believe that the names of the items should be improved in less than half of the cases.

From the SOCE, 48 bidding processes for building construction are obtained, of which 1,038 items are analyzed, distributed as follows:

- 362 items for plain concrete,
- 142 plastering items,
- 122 excavation items,
- 99 painting items,
- 89 masonry items,
- 61 reinforcement steel items,
- 50 for structural steel,
- 48 filling and painting,
- 43 for cyclopean concrete, and
- 22 formwork.

For each type, the relationship between the estimated unit price and the variables is analyzed: degree of conformity in the name of the item, city, type of building, and year of execution. The results of these analyses are shown below.

3.2. The unit price in relation to the NDN

The NDN is determined by the percentage of the item's name that responds to the questions in section 2.2, as shown in Figure 1, where the horizontal axis represents the degree of conformity in the item's

Typology	Degree of compliance						Pearson
	Gap/average						
Structural steel	1/7	2/7	3/7	4/7			-0.04
	31%	157%	69	55			
Reinforcing steel	1/7	2/7					-1.00
	74%	35%					
Filling and painting	1/8	2/8	3/8	4/8	5/8		-0.02
	536	1159	2663	890	102		
Formwork	1/4	2/4	3/4	4/4			-0.14
	90%	110%	176	49			
Plaster	0.10	0.20	0.30	0.40	0.5	0.60	-0.64
	145	187%	207	205	45	56	
Excavation	2/6	3/6	4/6				-0.84
	241%	208	209				
Concrete	2/7	4/7	5/7				-0.21
	80%	143%	63				
Masonry	0.22	0.33	0.44	0.55			-0.89
	318%	294%	112	131			

Table 2: Gaps vs. NDN by type and correlation calculation. (2025)

naming and the vertical axis represents the number of items that meet this condition. It is represented by circles whose size is related to the number of items obtained.

An analysis of Figure 1 shows that 57,67% of items are between 20% and 40% compliant, 23,24% are between 40% and 60% compliant, and 14,66% are less than 20% compliant. Only one item met all the requirements, representing 0,1%, and items in the 60%-80% range accounted for 4,34%. This distribution indicates that, in 95,56% of the sample, the nomination of the item has a compliance rate below 60%.

Table 2 shows that the price gap (expressed as gap/average in %) decreases as NDN increases, with the highest percentages observed when compliance is less than 0,5. The Pearson evaluation confirms this observation. Although the results do not show a strong correlation in all cases, it should be noted that the nature of this study does not facilitate the obtaining of a sufficient number of statistically significant values. However, it should be noted that, in all cases, an inverse relationship was observed, indicating the finding.

3.3. Unit price in relation to the city where the work was carried out

Table 3 compares the three highest unit prices per city with the national average, noting that in all cases the values exceed the overall average, with some reaching three times the national average.

Then, the coefficient b is calculated for each city, allowing us to observe how far prices are from the national average. It is calculated by type, relating the average price Pt to the national average Xt (Equation 2).

The b coefficients are calculated using two criteria: first, for $NDN < 0.5$; and second, for $0.5 < NDN < 0.75$. This analysis yields Figure 2, which shows price dispersion for each city, with the b coefficient decreasing as NDN increases. It is worth mentioning that 11 of the 33 cities analyzed fall under case b.

Figure 2 shows that when the item name has a lower NDN, the price gap widens, leading to possible price overestimation of up to 2,5 times the national average. On the other hand, there may be processes with prices underestimated by up to 0,14 times the national average.

$$\beta_t = \frac{\bar{P}_t}{\bar{X}_t} \quad \text{equation 2}$$

Category	Highest price per city						$\bar{X}$
Structural steel	El Guabo	8,55	Tulcán	6,71	Babahoyo	4,89	3,79
Reinforcing steel	Quevedo	3,16	Cuenca	2,91	Milagro	2,91	2,20
Filling	Cascales	6,58	Huaquillas	6,02	Latacunga	5,78	4,10
Filling and painting	Quevedo	12,69	Cuenca	9,98	Babahoyo	9,07	8,61
Formwork	Cuenca	26,48	Huaquillas	23,83	Salcedo	20,35	14,44
Plaster	Riobamba	23,13	Daule	17,99	Babahoyo	14,98	8,11
Manual excavation	Cuenca	19,25	Sucumbios	15,43	Quijos	14,26	9,92
Excavation machine	Milagro	10,15	Ambato	7,72	Quevedo	7,67	4,02
Cyclopean concrete	Rocafuerte	240,79	Ibarra	239,39	Riobamba	181,6	141,96
Plain concrete	Otavalo	686,55	Babahoyo	436,9	Milagro	431,28	219,73
Masonry	Cuenca	84,59	Saraguro	39,36	Huaquillas	38,57	19,16
Paint	Riobamba	27,47	El Guabo	13,25	Portoviejo	9,35	5,82
Epoxy paint	Cuenca	36,5	Rocafuerte	35,89	Daule	26	20,73

Table 3: Highest prices by type. SOCE (2024)

Regarding location, the heat map in Figure 3 shows the cities with the highest prices in red, the lowest in blue, and light green for cities with prices close to the national average. The highest prices are recorded in the cantons of Baba, Yantzaza, Ambato, Milagro, Portoviejo, Salcedo, Guayaquil, Daule, and Joya de los Sachas, which reflect relative prices of 120% to 165% above the minimum. INEC reports show that the cities with the highest basic basket prices are Quito, Manta, Cuenca, Loja, and Guayaquil. Although these two parameters are not directly related, they are indirectly linked, as the basic basket can influence labor, material, and transportation costs. It can also be seen that in cities such as Daule, Portoviejo, Salcedo, Milagro, and Joya de los Sachas, the price range on the color scale is between blue and red, while in cities such as Guayaquil, Tiwinza, Baba, Ambato, Ibarra, and Cascales, the price range is between green and blue. In the first group of cities, the prices offered span the entire national price spectrum, from the lowest to the highest, indicating that prices in these cities are highly divergent. In the second group, prices are in the lower half, reflecting less divergence, with the highest prices comparable to the national average. There is a third group of cities, such as Quito, Cuenca, and Riobamba, that appear in blue on the color scale, indicating that these cities offer the lowest prices in the country.

3.4. Unit price in relation to the year of execution

Unit prices evolved between 2019 and 2023, as shown in Figure 4, with prices falling in 2020 compared to the previous year for formwork, plastering, manual excavation, and machine excavation. This reduction in average prices reflects that the price analyses for these items do not comply with the rules established during the pandemic, such as reduced work capacity,

use of disinfectants and protective equipment to reduce the likelihood of infection, in addition to the global impact that caused an increase in the price of some construction raw materials.

According to the price indicators published by the Ecuadorian Institute of Statistics and Censuses (INEC, 2024), the variations in the materials with the greatest impact on the plastering and formwork categories reflect a decrease in 2020. In the case of cement, which represents 15% to 20% of the price of plastering, a decrease is observed in the second half of the year; and for wood, whose incidence in the formwork category is around 30%, a gradual decrease is observed since the beginning of the aforementioned year.

Looking at the evolution of cement prices between 2021 and 2023, the material shows a significant increase in the first quarter of 2022 and another in the last quarter of 2023. However, this growth is not evident in the evolution of plastering prices.

3.5. Unit price in relation to the type of work

The works studied are classified according to use into the following types:

1. Vehicle inspection center,
2. Sports complex,
3. Education,
4. Market,
5. Offices,
6. Flea market,
7. Residence,
8. Health,
9. Bus terminal and
10. Electrical substation.

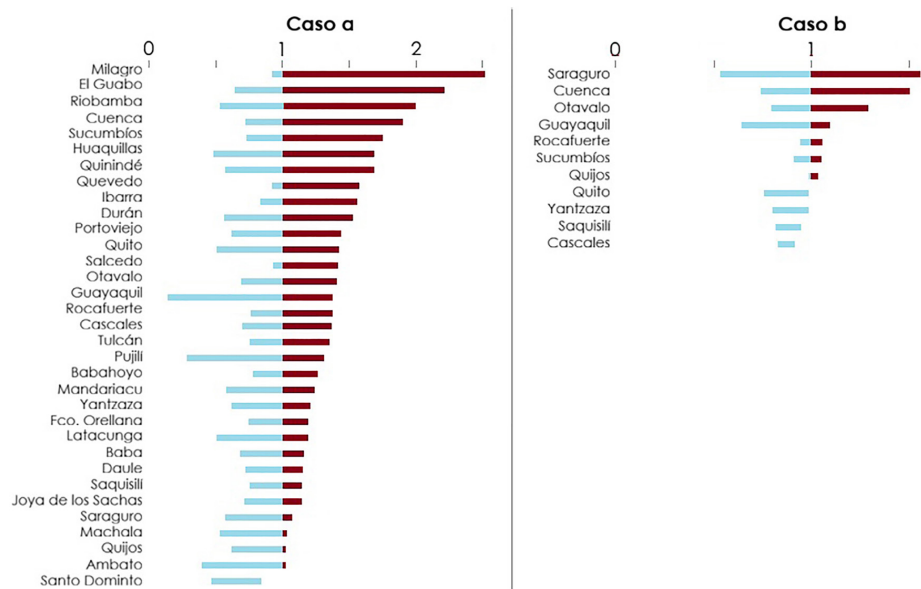


Figure 2: Price dispersion by city according to the NDN case a) 33%; case b) 60%. SOCE (2024)

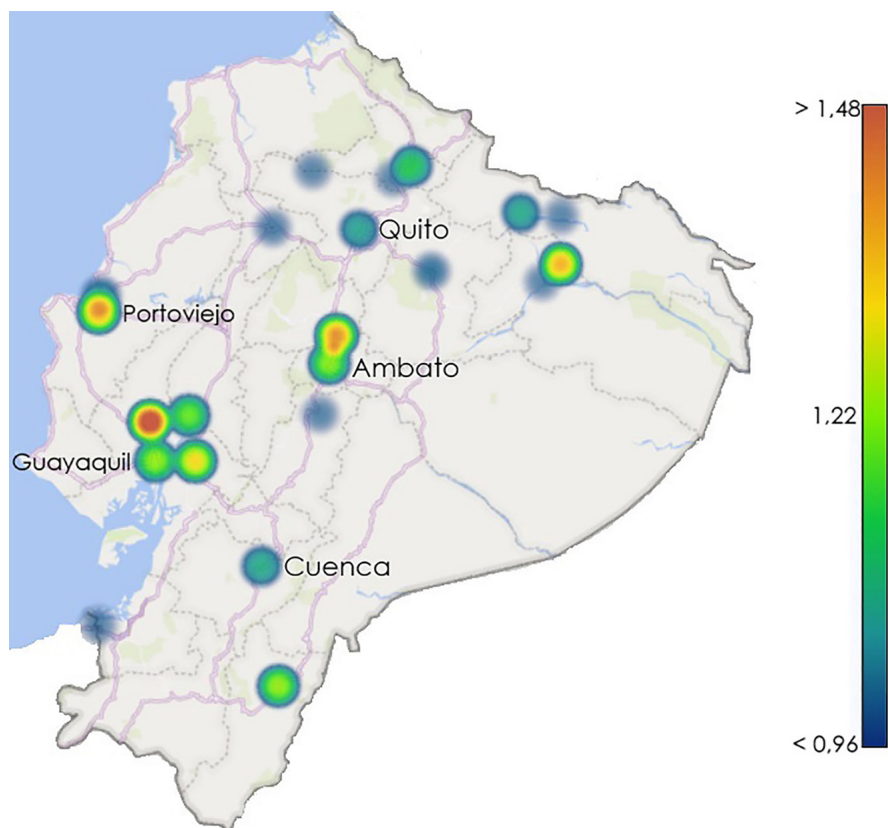


Figure 3: Average unit price per city. SOCE (2024)

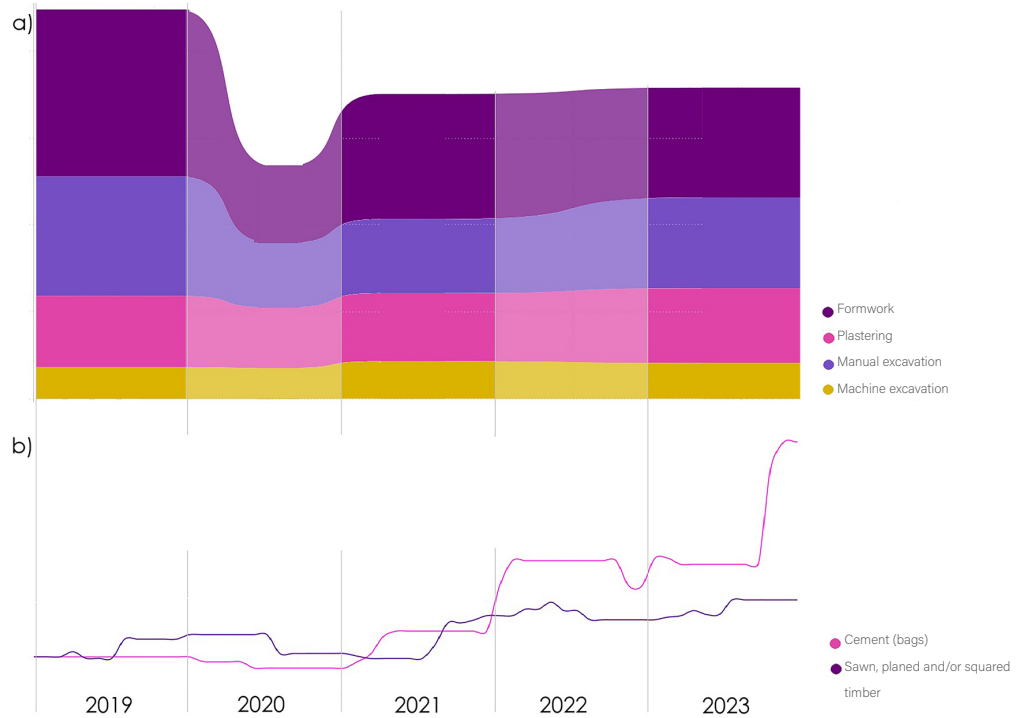


Figure 4: Evolution of costs over time. SOCE and INEC (2024)

For each type and category, the medians of the prices offered are calculated, and the percentage deviation of each median from the national average is then calculated (Equation 3).

$$\%M_{i,r} = \frac{M_{i,r}}{\bar{P}_r} \quad \text{equation 3}$$

$$\bar{P}_r = \frac{\sum_{j=1}^n M_{j,r}}{n} \quad \text{equation 4}$$

Where r is the category under analysis; i is the type analyzed; $\%M_{i,r}$ corresponds to the percentage of the median of type i with respect to the national average in the category under analysis; $M_{i,r}$ is the median price of type i in the category under analysis; and $\bar{P}_r$ is the average of the median prices of all types in the category under analysis.

Applying these equations yields Table 4 and Figure 5, which show that no typology follows a trend of concentrating prices based on the restrictions or characteristics of each typology, noting that the gaps are in the range of 30% to 70%, except works related to electrical substations and markets, which have gaps of 17% and 16%, respectively. In comparison, works related to health and residences have the highest gaps (71% and 68%).

Figure 5 shows an inverse relationship in the prices offered for plastering and masonry. This shows that in locations where masonry does not meet the desired aesthetic and/or geometric characteristics, plastering is required to correct these imperfections, leading to a consequent increase in prices.

4. Discussion and conclusions

To understand professionals' responses, it is necessary to state that quality is conformity with requirements that must be clear and not give rise to misunderstandings (Crosby, 1988). This same author defines detected non-conformity as an absence of quality. Furthermore, according to Duque (2005), "the determination of quality in services is based not on customers' perceptions of the service itself, but on how effective the organization is in meeting customer needs" (p. 76), the quality assessment of the name of an item is a function of the builder's perception of the benefits obtained when executing the item.

Therefore, the results obtained reflect the builders' dissatisfaction with the names of the items in terms of the clarity and completeness with which they define the task to be performed on site. It shows that 85% of builders, when estimating bid costs, have expectations that differ greatly from the results they

Type	Range % of median vs. national average		Gap (maximum-minimum)
	Minimum	Maximum	
Vehicle inspection center	96%	130%	34%
Sports complex	75%	124%	49%
Education	85%	123%	38%
Market	86%	103%	17%
Offices	90%	118%	28%
Street market	79%	120%	41%
Residence	77%	148%	71%
Health	94%	162%	68%
Land terminal	81%	111%	30%
Electrical substation	82%	98%	16%

Table 4: Price ratio by type of work compared to the national average. SOCE (2024)

obtain when executing the work; therefore, there is a latent need for improvement in this area of construction management (Zaquot et al., 2022).

An analysis of Figure 1 and Table 2 shows that those responsible for preparing construction budgets do not follow the Project Management Institute's recommendation that planned activities be described in a clear, specific, and precise manner.

Table 2 considers the factors that affect the cost of an item, including:

- The variation in indirect costs can range from 18% to 30%, as mentioned by Gavilanes and Romero (2023) and Vargas (2024);
- Labor wages in Ecuador have varied by 16% between 2019 and 2024, as evidenced in the annual publications of the Comptroller General of the State.
- The variation in wages between national averages varies by approximately 30% (EmpleoLatino, 2023);
- From the price analyses of the four items analyzed, the use of equipment accounts for approximately 15% to 20% of the direct cost.
- The variation in the prices of cement, steel rods, and aggregates in the country ranges from 17% to 20%. This range of price variation implies increases of 9,4% for items related to concrete, 14,7% for items related to reinforcing steel, and 15,43% for items related to masonry.

Adding up all these variations, in the worst-case scenario, the price variation between the lowest and highest prices would not exceed 19,93%. These price differences, resulting from an erroneous estimate of the work to be done, imply losses or overvalued profits for the builder, establishing the possibility of overestimated prices in some projects. No items with an NDN greater than 60% were found; however, given the trend, it is possible that the more detailed the item name, the smaller the price difference.

This discrepancy in the item details reveals that, if the aim is to optimize investment in construction costs, a viable alternative is to implement standards that allow items to be given names that better describe the characteristics of the work, avoiding them being implicit or subject to description within the technical specification, which constitutes another problem (Saldaña et al, 2025). This means it is not possible to adequately control the fair market price without first ensuring the item name is correct.

The result in Figure 3 contrasts with the INEC's findings regarding the most expensive cities in Ecuador, confirming that the estimated prices are not related to the location where the work is carried out, in accordance with the provisions of the body responsible for managing national statistics. This leads to uncertainties about the reality reflected in INEC publications, or, failing that, it can be observed that those responsible for estimating costs are not working in accordance with local reality, exposing builders to the risk of low profits or even losses in some cities and excess profits in others.

Firstly, the evolution of prices over time relative to the indices published by the INEC suggests they reflect variations in materials. However, they do not reflect reality in terms of labor productivity due to the necessary protocols that slow down work. On the other hand, it must be considered that the measures imposed by governments involved the acquisition of bio-protection equipment, temperature control, and changes in habits such as hand washing and disinfection of work areas (Papaqui Alba et al., 2021; Correa Rojas et al., 2022). Analyzing this last variable involves the concept of the project triple constraint: a change in one variable affects the others. This concept determines that a change in the execution time of a project directly affects the cost, due to increases in some indirect cost items, such as the permanence and salaries of technical and auxiliary construction personnel, leases or rentals, insurance premiums, social security contributions, among others (Gómez and Del Águila, 2020; Muñoz et al., 2023); In short, prices reflect the absence of a realistic analysis in the estimation of construction budgets.

This raises the question: were the quality of construction projects carried out during the pandemic affected by the absence of a cost analysis aligned with the realities of the moment?

The results in Table 4 reflect the diversity in the levels of finish or architectural details required in the designs for these types of projects. However, as the item is classified with a low NDN, this affects the values obtained, which, in conjunction with

the finding in section 3.1, suggest that the gaps should decrease as the NDN improves with the characteristics listed in section 2.2. On the other hand, for the types of activity, the largest gaps are in the prices for formwork, plastering, and painting. The latter two cases would corroborate what has already been explained regarding the level of demand for architectural designs, while in the case of formwork, the gap observed indicates that most cost analysts do not differentiate the structural elements to be formworked.

Figure 5 shows the close relationship between masonry and plastering items, which requires those responsible for cost planning to analyze the cost of plastering based on the reality of the material available in the area, not only in terms of the materials that make up the mortar, but also in terms of the characteristics of the masonry available in the location under analysis. A similar trend can be seen between the items of plastering with filling and painting, except in the Education category, where the gaps are similar.

It is concluded that the name of an item must correspond to the template in Table 1, since, based on the NDN, it tends to adjust to what would be called the fair price, reducing the likelihood that those involved in public procurement processes (public officials and bidders) will engage in practices that circumvent the legal norm, contravening the principles of quality, fair treatment, and opportunity declared in Ecuadorian public procurement legislation.

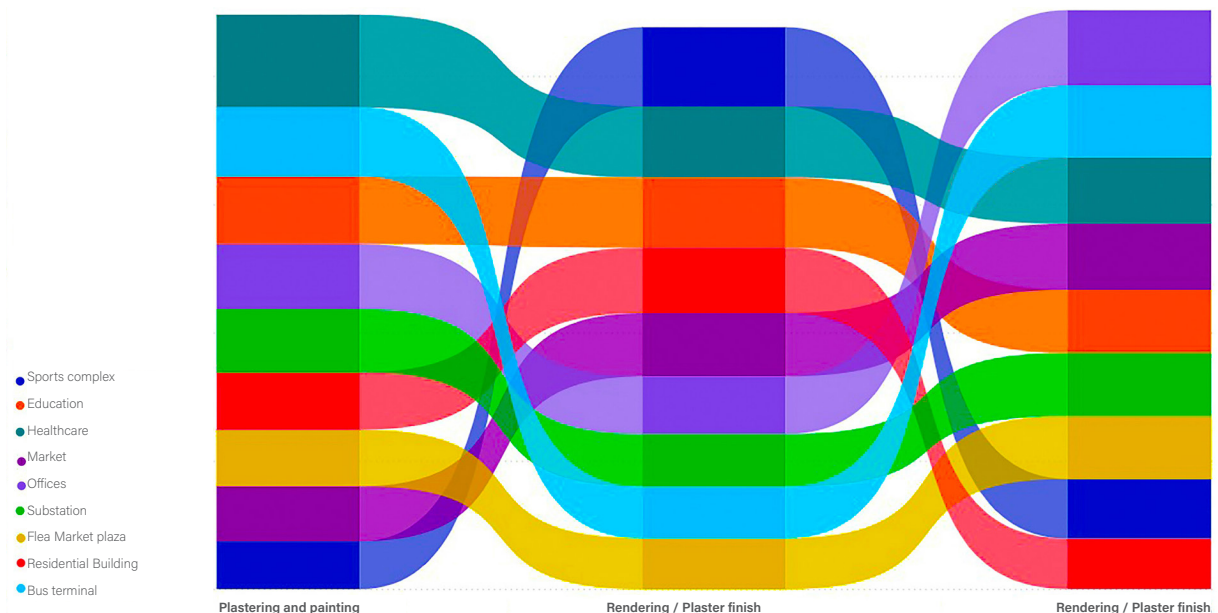


Figure 5: Average percentage range diagram by type of work versus national average. SOCE (2024)

It has been determined that public works actors recognize the shortcomings in the names of construction items, noting that these shortcomings lead to misinterpretations of the work to be performed and, as a result, to unrealistic prices based on the type, location, timing, and nature of the work, leading to a reduction in expected profits and even causing losses for the builder.

The estimated prices in different locations do not follow the pattern established by the National Institute of Statistics and Censuses, resulting in some cases where, in the same location, very dispersed prices are estimated for a specific category, with very high prices for one construction project and very low prices for another, compared to the national average. There are cases where prices differ despite the proximity of the projects, and in other cases, prices are lower than the national average in very remote locations, where prices would be expected to be higher due to transportation and resource costs. It has also been observed that prices differ across nearby locations, meaning that successful bidders obtain overvalued profits in some cases and undervalued profits in others within the same location.

In terms of timeliness, estimated prices are not updated in line with the material price indices published by INEC. A low NDN generates distortions that negatively affect the development of the work: alterations in market prices and, above all, a loss of consistency between the original project and its final implementation.

The findings of this research contribute, on the one hand, to a model guide for generating construction item names that yield more accurate and fair cost estimates. On the other hand, they provide technical arguments that make it easier for construction auditors to develop more efficient strategies to identify and assess the possibility of overpricing in bids, enforce transparency in public procurement, and reduce damage to the State.

5. Recommendations

It is important that the public administration, together with academia and professional associations of architects and engineers, work cooperatively to initiate a process to validate and refine existing databases and develop a standardized list of construction items that meets the requirements outlined in this document. On the other hand, it is essential that public procurement system operators and project designers, both consultants and in-house technicians, receive adequate training to enable them to estimate construction prices consistently.

For the construction stage, in addition to having specialists in different technical areas, it is suggested that there be personnel specialized in the field of construction costs so that the products delivered

by consultants have prices that are more in line with the reality of the environment, field conditions, and nature of the work, thus obtaining projects with efficient budgets, avoiding losses to the State, and considering fair profits for the builder.

It is recommended that academia establish construction price observatories, which would increase the database in both time and space and enable visualization of the behavior of estimated prices for items whose names comply with the requirements established in Table 1.

For future research, analyze:

1. How is price underestimation related to the quality of the work?
2. How poorly defined items influence both the quality of the work and the likelihood of execution errors.
3. Analyze cases where b is greater than 1 according to Figure 2, to identify external factors that influence price dispersion.

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Conflict of interest. The authors declares no conflicts of interest.

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