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Analysis of building behavior in construction industry and its relationship with its business performance for state contracting in Boyacá, Colombia

Hernández Carrillo, Carlos Gabriel*
Gutiérrez Junco, Oscar Javier**
Sarmiento Rojas, Jorge Andrés***

Abstract

Construction provides the infrastructure necessary for the progress of modern societies and responds favorably to global economic dynamics. This performance is conducted through business performance, when formulating and executing this type of projects in Colombia. However, Its productivity is low, despite its support as a leading stimulator of production in times of crisis. Therefore, this research analyzed the macroeconomic environment of the construction and building subsector, through the selection and characterization of companies in Boyacá, Colombia, together with the identification of their capacities, estimated by the financial and organizational statements required in public bids. This analysis exposes the dependent and volatile market, mainly supported by housing construction activity. In Colombia, there is a reduction in productivity and in Boyacá, 95.83% of sole proprietorships do not have conditions to participate in public procurement. Consequently, despite institutional efforts to encourage production by investment in the building subsector, the nature of the market and the organizational limitations hinder the development of the sector and the Colombian economy in times of crisis.

Keywords: Business performance; public procurement; companies; financial indicators; public tenders.

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* Magister en metalurgia y ciencia de los materiales. PhD (c) en en Ingeniería y ciencia de los materiales. Docente investigador Universidad Pedagógica y Tecnológica de Colombia. carlosgabriel.hernandez@uptc.edu.co. ORCID: https://orcid.org/0000-0001-9381-3649.

** PhD en Ingeniería y ciencia de los materiales. Docente investigador Universidad Pedagógica y Tecnológica de Colombia. oscarjavier.gutierrez@uptc.edu.co. ORCID: https://orcid.org/0000-0002-5748-5032

*** PhD en Gerencia de Proyectos. Docente investigador Universidad Pedagógica y Tecnológica de Colombia. Jorge.sarmiento02@uptc.edu.co. ORCID: https://orcid.org/0000-0002-4230-3304

Análisis del comportamiento edificador en la construcción y su relación con su desempeño empresarial para la contratación gubernamental en Boyacá, Colombia

Resumen

La construcción proporciona la infraestructura necesaria para el progreso de las sociedades modernas y responde favorablemente a la dinámica económica mundial. Este desempeño se canaliza por desempeño empresarial, al formular y ejecutar este tipo de proyectos en Colombia. Sin embargo, existe baja productividad pese a su apoyo como estimulador protagónico de la producción en épocas de crisis. Por ende, esta investigación analizó el entorno macroeconómico de la construcción y el subsector edificador, por la selección y caracterización de empresas en Boyacá, Colombia, junto con la identificación de sus capacidades, estimadas por los estados financieros y organizacionales exigidos en licitaciones públicas. Este análisis expone el dependiente y volátil mercado, soportado mayoritariamente por la actividad constructiva de vivienda. En Colombia este fenómeno ha disminuido su productividad y en Boyacá, el 95,83% de las empresas unipersonales no tiene las condiciones para participar en contratación pública. Por consiguiente, pese a los esfuerzos institucionales por incentivar la producción por inversión en el subsector edificador, la naturaleza del mercado y el limitante organizacional dificultan el desarrollo sectorial y la economía colombiana en época de crisis.

Palabras clave: Desempeño empresarial; contratación gubernamental; empresas; indicadores financieros; licitación pública.

1. Introduction

The business sector is the fundamental pillar of market economies, by sustaining policy decisions related to employment and implementation of substantive functions in the business structure. Likewise, business management is directly related to innovation, by implementing new productive activities in employment, trade and service formulations (Buele et al, 2019; Pozos & Acosta, 2016).

Therefore, their formation and permanence have been prioritized as fundamental units in economic development. Nevertheless, there is limited knowledge of entrepreneurial behavior, together with the susceptibilities and capacities to adapt to adverse economic events. In addition, the effects of policies focused on trade between nations influence their performance. Consequently, there is increasing competition and greater technological alternatives, in regulation and innovative procurement approaches (Bakhshi et al, 2016; Kermanshachi et al, 2020; Peñaloza et al, 2020).

Due to the above, changes in the intense competition and volatility of international markets have affected Colombian business performance, especially in construction sector, given its particular characteristics (labor instability, variability of economic capacities, capabilities in its management, etc.) and its high dependence on the public sector (Mesa et al, 2008). Therefore, construction is considered as one of the main planning indicators, due to the influence on the variations of the economic cycle (Córdova & Alberto, 2018; Departamento Administrativo Nacional de Estadística [DANE], 2019).

However, it is common for government entities in emerging countries like Colombia to stimulate economic growth in recessionary times, by investing in infrastructure construction. These policies increase production, standard revenues and generate multiplier effects in the stock of productive public capital (Ji et al, 2019; Ramey, 2020). Additionally, public spending stimulates short-term demand and long-term supply, which increases output and generates higher long-term investments of public capital (Ramey, 2020).

As a result, building investment policies produce sustained, mild growth, which boosts economies based on the extraction of raw materials and energizes other economic sectors. International Monetary Fund (2019) predicts that low-income developing countries will need to create jobs and improve their public infrastructure to meet the needs of their rapidly expanding and urbanizing populations.

In addition, the business muscle that sustains the construction activity must adapt to the new requirements of the environment for greater participation in sector activities, together with the generation of solutions to technical problems that affect markets. Therefore, the identification of entrepreneurial capabilities in public procurement allows establishing distinctive productivity characteristics, by determining the organizational potential to stimulate and stabilize the economy (Franco & Urbano, 2019).

Hence, this research evaluated the dynamics of this subsector and the entrepreneurial behavior, through the analysis of financial and organizational indicators as enabling requirements for the participation in public bids by legally constituted companies located in Boyacá. These indicators establish the minimum conditions according to the financial and organizational capacities of each company and allow evaluating the offers of bidders with the necessary conditions to comply with the development of this type of projects

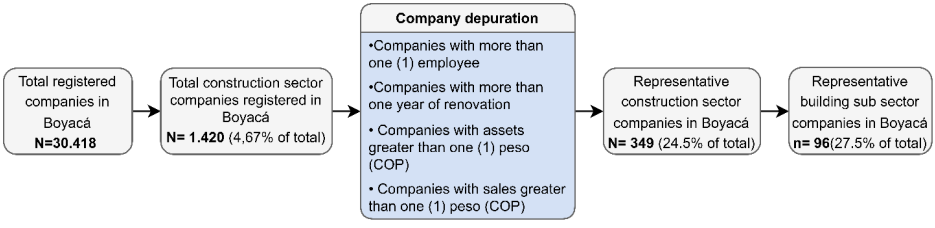
This evaluation allows the analysis of the organizational performance of the construction sector and the formulation of appropriate strategies for its understanding, diagnosis and business and institutional strengthening, together with the identification of support for the construction activity for the generation of employment, promotion and development.

2. Methodology

As illustrated in diagram 1, the chambers of commerce of Boyacá at the end of 2019 registered a total of 1420 companies engaged in construction. Subsequent to the filtering and selection of companies that meet the selection criteria (n= 349), 27.51% are engaged in building construction, corresponding to n= 96 companies, which make up

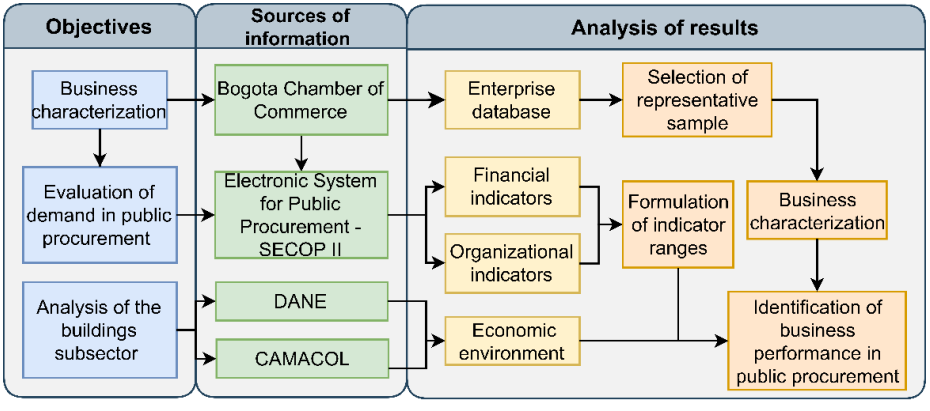
the sample for the evaluation of their capacities. In addition, are estimated the business capabilities together with an evaluation of the economic environment through the Economic Indicators of Construction (IEAC) of the National Administrative Department of Statistics (DANE). Likewise, the requirements of public entities were evaluated to identify the enabling requirements in public procurement. Diagram 2 illustrates the summary of the methodological approach.

Diagram 1
Procedure for selection of representative business sample



Source: Own elaboration (2022).

Diagram 2
Summary of the methodological approach



Source: Own elaboration (2022).

2.1. Evaluation of building construction performance: Analysis of the production of building construction

Through the IEAC's Value Added in the Construction Branch (VAC) studies, the historical behavior of the construction subsectors up to the end of 2019 was compiled and evaluated. These economic sub-activities were defined in the latest update of the International Standard Industrial Classification (ISIC) (Departamento Administrativo Nacional de Estadística [DANE], 2012). Table 1 shows the classification of the economic subsectors evaluated.

Table 1
Evaluation and classification of subsectors that conform the construction activity in Colombia

DANE classification			
IEAC	**Main activity (ISIC)**		**Sub activity (ISIC)**
Value Added in Construction Branch (VAC)	Fourth revision adapted for Colombia (ISIC Rev. 4 B.C.), 2020 in 20 groupings	Construction (F)	Construction of residential (constructions that provide a residential service to households) and non-residential buildings (construction of buildings for economic, industrial and service activities, among other non-residential activities) (F41)
			Construction of roads and railroads, public service projects and other civil engineering works (F42)
			Specialized activities for the construction of buildings and civil engineering (F43)

Source: Own elaboration (2022).

2.2 Evaluation of the construction activity through the census of buildings and construction licenses

DANE designed and implemented the Building Census (CEED), as a statistical operation to determine the state of construction of buildings. Therefore, the CEED, constituted with 20 coverage areas, including the city of Tunja, represents the information of Boyacá. In addition, the Department's Construction Licensing Statistics (ELIC) were used and a representative annual value was established by the average of quarterly reports. Table 2 shows the variables that make up these indicators.

Table 2
Factors that conform the construction of buildings in Colombia

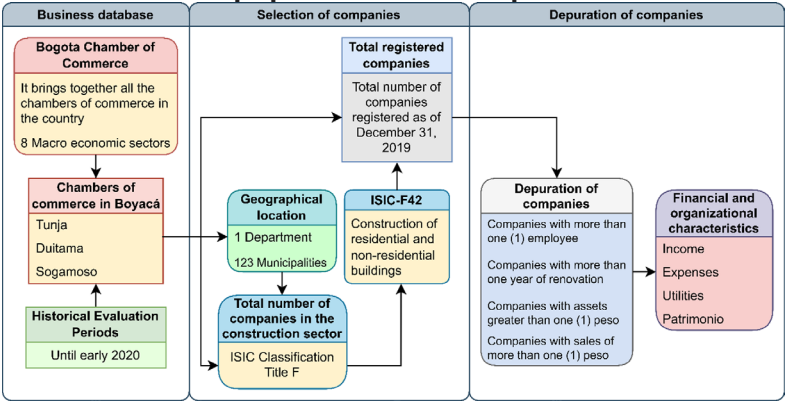
Census of buildings (CEED)		Construction License (ELIC)	
Type of building		Type of building	
Status of building (m^2)		Area approved for construction (m^2)	
Completed building		Vivienda	Total
Buildings in progress	New building		Social Interest Housing (SIH)
	Still in progress		No SIH
	Restart process	Others (Industry, Office, Warehouse, Commerce, Hotel, Education, Hospital, Public Administration, Religious, Social)	
	Total process		
Paralyzed or inactive buildings	New building		
	Still in progress		
	Total paralyzed	Total	

Source: Own elaboration (2022).

2.3. Evaluation of business characteristics of the building sub-sector

Depuration and representative selection of the companies is illustrated in the Diagram 3.

Diagram 3
Procedures and criteria for inclusion or exclusion of the study population and sample



Source: Own elaboration (2022).

The characterization of building construction companies, whose activity converges in the department of Boyacá, was carried out through the database of building construction companies, commercially supplied by the CCB, which compiles all regional and local chambers in Colombia.

This aggregation and its scope are constituted by Decree 1074 of 2015 (Ministerio de comercio industria y Turismo, 2015). Likewise, the information provided is certified and validated as indicated by Law 1266 of 2008 (Congreso de la República de Colombia, 2008).

2.3. Analysis of business performance in public contracting

• Selection of qualifying indicators in the public procurement process

Based on the Manual for Determining and Verifying Qualifying Requirements in Colombian Procurement Processes (República de Colombia, 2014), as a requirement to establish the minimum conditions that reflect the aptitude of a bidder to comply with the object of the contract. Therefore, the qualifying financial and organizational indicators were used in these processes, shown in Table 3.

Table 3
Financial indicators to establish entrepreneurial capacity to take on projects

Capability	Index	Ratio/formula	Definition
Financial	Liquidity	$\frac{Current\ Assets}{Current\ Liabilities}$	Ability to meet short-term obligations
	Indebtedness	$\frac{Total\ Liabilities}{Total\ Assets}$	Degree of indebtedness in the financing structure (liabilities and equity)
	Interest coverage ratio	$\frac{Operating\ Profit}{Interest\ Expense}$	Ability to meet financial obligations
Organizational	Return on equity	$\frac{Operating\ income}{Equity}$	Capacity to generate operating income for each peso invested in equity
	Return on assets	$\frac{Operating\ income}{Total\ Assets}$	Capacity to generate operating income for each peso invested in the asset

Note: indicators formulated in the Manual for the Determination and Verification of Qualifying Requirements in Colombian Contracting Processes.
Source: Own elaboration (2022).

- **Selection of representative samples to establish a range of financial indicators**

The quantitative valuations of the minimum financial indicators for participation in the contracting process are freely selected by the public entities according to the object of the contract, value, complexity, term, form of payment and risk associated with the process. The valuation of these indicators changes according to the public contract offered. Therefore, were evaluated the financial and organizational indicators in 40 public procurement processes for the construction of buildings in Boyacá (2017-2019), through the "*Sistema Electrónico Para la Constatación Pública*" (SECOP II), as a digital means for the management of public tenders with the Colombian State.

Subsequently, confidence intervals (CI) were used as statistics to generate an upper and a lower limit from the financial and organizational indicators of the sample of public contracts for building construction. For this purpose, a normal distribution with degrees of freedom $(N-1)$ was used instead of basing CIs on critical values of the standard normal distribution. Therefore, the probability (P) that the fixed parameter μ (population mean) is found in two numbers $L(x)$ and $U(x)$, of the form:

$$P(L(x) \leq \mu \leq \mathrm{U(x)}) = (1-\alpha)$$

(Equation 1)

Where the fixed parameter or sample mean is contained in a random interval is , where is the type I error rate and is the confidence level coverage. This, would be included within the 95% ranges of the CIs of the mean, calculated from repeatedly sampled data with a 95% probability. By formulating the CI with this confidence, from the mean to the statistical results, it is possible to obtain the magnitude of the treatment effect (Kelley, 2007).

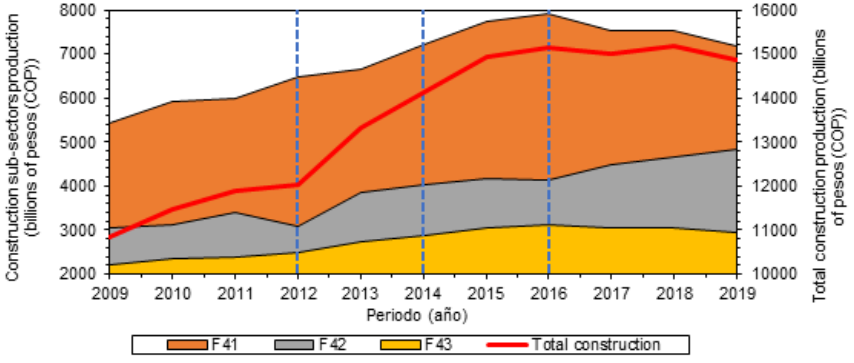
This is similar to the p-value > 0,05, at the 5% significance level. However, statistical results using CIs instead of p-values are more reliable, since CIs indicate the expected size of the effect (Gutiérrez Pulido & de la Vara Salazar, 2013).

This allowed the formulation of CIs for each indicator and the subsequent comparison with each business unit that made up the selected sample. These statistics and the descriptive ones were formulated in the free software R and their diagramming in Microsoft Excel.

3. Behavior of the production of building construction. Results

Evaluating the historical behavior of construction production by its sub-activities, the influence of national and international economic variations is notorious. Graphic 1 shows this behavior.

Graphic 1
Historical behavior of production in Colombia



Source: Own elaboration (2022).

Graphic 1 shows that construction in Colombia is led by the building subsector with approximately 50,9% and standard deviation of ± 1,5%, followed by the civil works and activities subsector with 28,7% ± 1,7% and 20,3% ± 0,30% respectively in the last ten years. Then, the building subsector is conceived as core activity that energizes an active real estate market. In addition, the sector is strongly influenced by state investment for the construction of buildings and civil works through the private sector (Córdova & Alberto, 2018; Stupnikova & Sukhadolets, 2019).

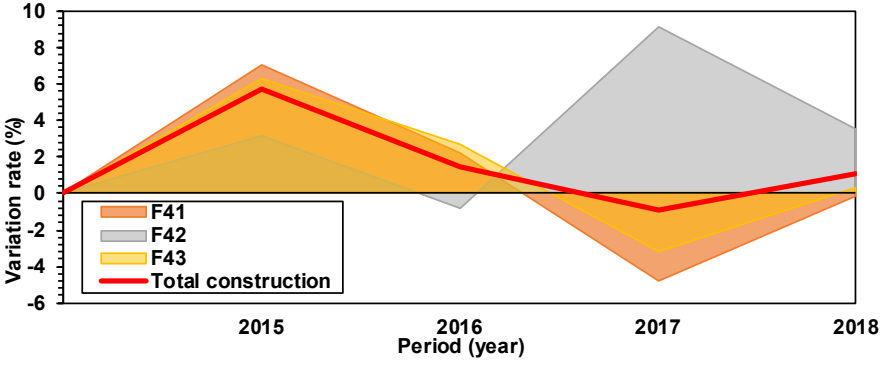
Therefore, there is consistency with historical variations in construction production and economic development. Furthermore, these production behaviors are related to strategic natural resource export policies (RNE), which generated increases of up to 20% in the Nation's revenues at their peak in 2013 (Guzmán-Finol & Estrada, 2016). In addition, thanks to the creation of the General Royalties System (SGR) through Law 1530 of 2012 (Congreso de la República de Colombia, 2012), it was possible the administration, decentralization and transfer of these profits, called it was possible investment resources in civil works, which generated increase in the productivity of the sector (Guzmán-Finol & Estrada, 2016; Marina & Arévalo, 2015; Restrepo, 2017). In addition, subsidiary housing policies generated a steady increase in productivity in the construction sub-sector.

However, as a result of the fall in international oil prices in 2014, the deficit and public debt increased, due to fiscal support, following changes in national production focused on hydrocarbon exploitation, whose peak in 2013 reached 20% of national income. Therefore, construction activity declined drastically between 2015 and 2016 (Melo Becerra, 2017). Consequently, as a result of the financial declines generated, companies dedicated to supporting the various processes that make up the construction sector in Colombia have experienced

changes in their productivity, due to the impact on their economic activity, reducing public investment levels (Ríos-Ocampo & Olaya, 2017).

The above produced a reduction in national production and affected the construction of buildings, which reached up to a reduction of 4.8% in 2017, illustrated in graphic 2. These changes are consistent with the deficit in public coffers, currency devaluation, uncertainties in economic development, reduction of investments and purchasing power.

Graphic 2
Rate of change in construction production and subsectors post-crisis 2014



Source: Own elaboration (2022).

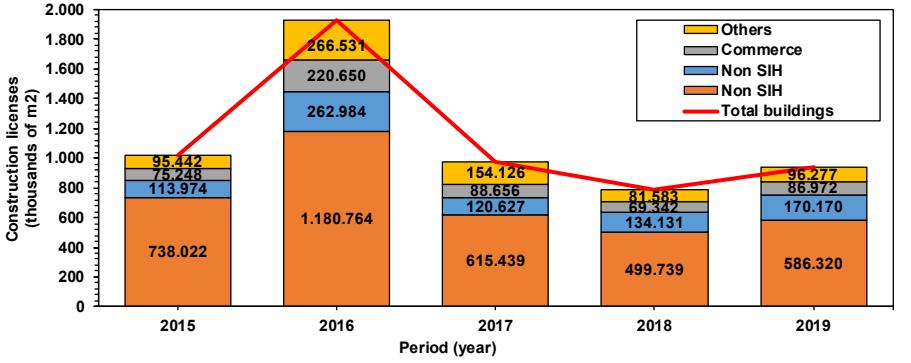
In addition, Graphic 2 illustrates the stimulus in construction through investment in civil works, which generated a productivity increase of 9.12%. This reflects the state mechanism to increase production, standard income and generate multiplier effects in the stock of productive public capital in recessionary contexts (Ji et al, 2019; Ramey, 2020). However, despite this improvement to civil works construction, the downward trend in the sector has not been mitigated, due to the declining behavior in building construction. The latter is formulated as an indicator of construction activity, which is sustained by private initiative and commercial demand (Moreno et al, 2014).

3.1. Analysis of the behavior of the building sector in Boyacá

- **Evaluation of licensing for building construction**

The dynamics of building construction in Boyacá, evaluated by ELIC, shows a behavior consistent with the variations in economic dynamics with the construction supply of buildings, illustrated in Graphic 3.

Graphic 3
Historical behavior of construction licenses in Boyacá

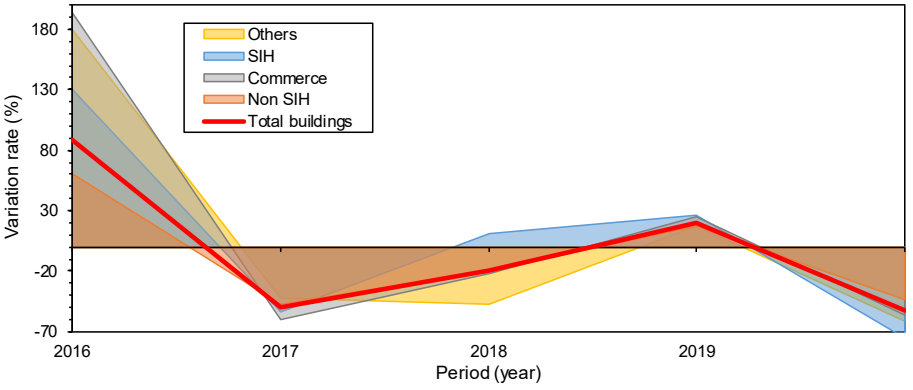


Source: Own elaboration (2022).

Graphic 3 shows the notable changes in the supply of buildings as a result of the economic crises that affected Colombian exports after 2014 and that affected construction activity after 2016. In addition, housing construction has historically led the supply with 78.91% ± 4.66% and in small proportion commercial and other buildings have assumed 9.07% ± 1.81% and 11.30% ± 3.40% respectively.

Research conducted by Hernández-Carrillo et al (2021) shows that state intervention has increased the supply up to 55% in the construction of low-income housing (VIS). However, despite government intervention, this sector has not recovered its productivity, due to non-SIV housing has represented up to 75% of the demand and its deceleration is caused by an increase in mortgage interest rates, the reduction of supplies and in the employment opportunity generated by housing construction (Sarmiento-Rojas et al, 2020). Graphic 4 illustrates these behaviors.

Graphic 4
Variation rate of construction licenses for buildings in Boyacá



Source: Own elaboration (2022).

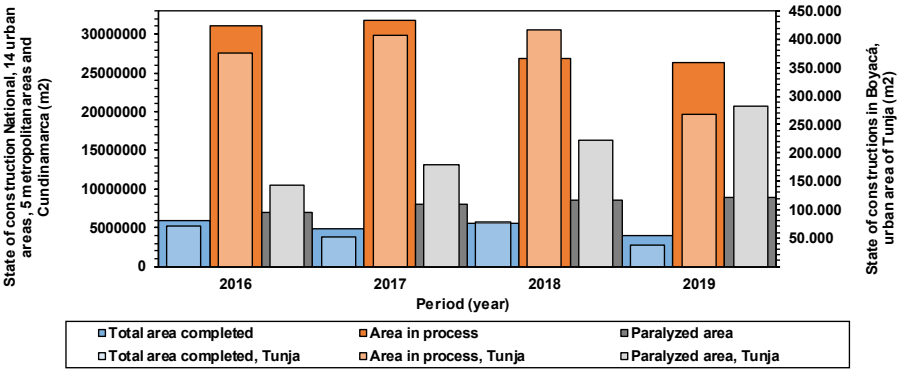
Economic variations have impacted the commercial development of the built sector by reducing licenses to -49.3% at the end of 2016. In addition, it is observed that building construction has stagnated by keeping its recovery rate steady since 2018. Also, since 2019 the growth values by each type of construction have remained relatively similar between 21.9% ± 7.9% (t-student distribution with 95% reliability). However, the growth has been lower than the values previously achieved in 2016.

The slowdown originated by changes in international economic events has directly affected the free market and housing marketing. This subsector the particular characteristics of housing, which differentiate it from most investment assets, considered as a mixed good that can be of consumption and provide service flows (Ortiz et al, 2019). Jointly, housing markets adjust to economic events that slowly involve transaction costs, considerable in terms of search and negotiation (Duran Vanegas, 2016; Glaeser & Nathanson, 2014).

• Analysis of the state of construction works in the building sector in Boyacá

Through the status of the works, the variations in the building activity and indirectly the business performance were identified. Since the evaluation of the changes in production allows identifying the behavior of the building activity, due to the uncertainties caused in large part by the commercial disputes between foreign powers (especially between the United States and China) and their effect on the reduction of investment (Cámara Colombiana de la Construcción-CAMACOL, 2020). Graphic 5 illustrates these behaviors.

Graphic 5
Behavior of the state of buildings in Boyacá and Colombia

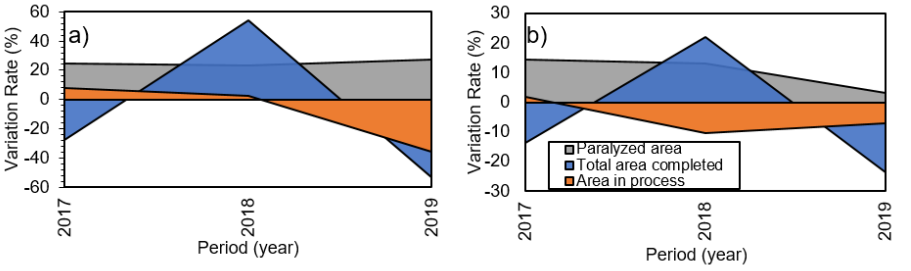


Source: Own elaboration (2022).

The panorama of the state of construction in Colombia is consistent with the variations in Boyacá. There are notable changes in the supply of buildings due to the economic crises that affected Colombian trade between 2012 and 2016. Graphic 6 exposes the dynamism of the building supply through construction in progress with approximately 60% of participation in Boyacá, similar to the national behavior close to 68%. However, the reduction in Boyacá is 10% higher.

Likewise, completed constructions have been reduced by 39%, which is 27% lower than the national reduction (12%); this reflects a building stagnation. In addition, the paralyzed areas in Boyacá reached an increase of 124%, 2,8% higher than the national performance, which exposes a deceleration in building production in the Nation and is accentuated in Boyacá. The above is related to department economic activity changes, which traditionally was sustained by the agricultural sector. However, production policies were oriented towards mining, industry, construction and commerce. Therefore, due to the fall in international oil prices in 2014, production difficulties were accentuated in this department (Melo, 2017). These variations are illustrated in Graphic 6.

Graphic 6
Variation rate in building construction by area.
a). Variation rate in Boyacá. b) National variation rate



Source: Own elaboration (2022).

Graphic 6 shows the variations in the status of building works in the representative sample of Boyacá and the nation, illustrating a downward trend in building activity. The reduction of area under construction has been reduced by up to 35% in Boyacá, which is 4.8 times higher than the national reduction of 7%. Likewise, the variations in the area completed are accentuated in comparison in the work states evaluated by CEED in 2018. (Sarmiento-Rojas et al, 2020) established the effect of public policies in boosting building activity in VIS construction, as a strategy to increase production in times of crisis.

However, economic crises generated by volatility in the markets have increased the value of paralyzed buildings (Ríos-Ocampo & Olaya, 2017). In Boyacá, the growth rate is constant as of 2016 and corresponds to 25.3% ± 5.3%. In contrast, the paralyzed works in the Nation reflect a recovery starting in 2018, reduced to a relatively constant growth rate between 14.2% and 13.1% approximately. The above exposes the current building panorama and the little impact of institutional policies to encourage its supply. Therefore, in coherence with the housing supply, the business sector, accustomed to the market behavior, has tended to be reduced as follows.

3.2. Business characteristics of the building sector in Boyaca

- **Selection of representative companies in the department of Boyacá**

After filtering the companies as shown in Diagram 1 and Diagram 3, of the total number of companies meeting the selection criteria (n= 349), 27.51% are companies engaged in building construction (n=96 companies). Of the remaining percentage, 41.55% are companies dedicated to civil works (F42) and 30.95% to specialized activities (F43). The above indicates the consistency and the effect of the economic crises on the building subsector (Cámara Colombiana

de la Construcción [CAMACOL], 2019; Corficolombiana, 2019).

For this reason, a greater impact is exposed in the decrease of companies that support this building subsector in coherence with the changes evaluated in the supply and demand in the construction of Non-VIS housing, which is governed by the free market. Likewise, the other subsectors of the construction activity have been supported to a greater extent by state investment, which partially sustains the production of the construction sector at present (Corficolombiana, 2019; Hernández-Carrillo et al, 2021).

- **Evaluation of the financial characteristics of construction companies in Boyacá**

Business size is considered a relevant factor to identify organizational capabilities and business processes with customers, suppliers and the market. The above influences the improvement of productivity and adaptation in the environment (Esparza & Reyes, 2014; Martinez, 2017). When evaluating the total number of companies according to organizational size based on Decree 957 of 2019, micro enterprises with 85.41% and small enterprises with 10.41% dominate the business size. Medium and large enterprises in total comprise 3.1% and 1.0% respectively. The MiPymes group represents 98.9% of companies in building construction and is consistent with 99.5% of the Colombian business park (Franco & Urbano, 2019; Hernández-Carrillo et al, 2021).

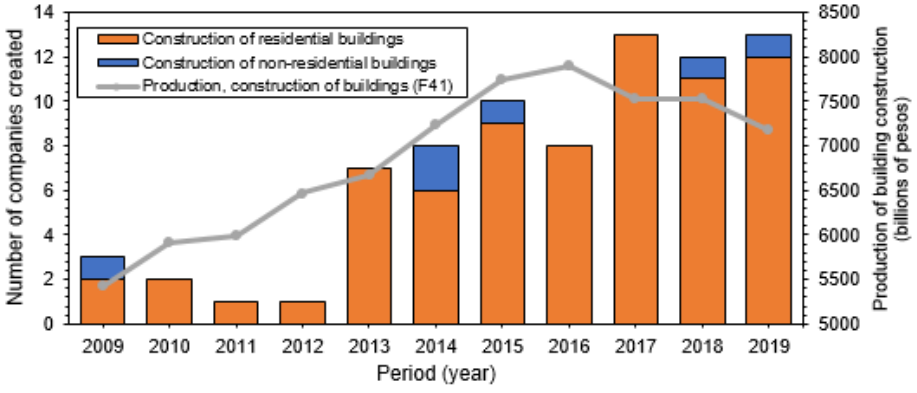
While the organizational structure of Micro, Small and Medium Enterprises (MSMEs) is characterized by a simple structure less amount of bureaucracy to respond to rapid response and adaptation capabilities to change or the market. In addition, there are limitations in obtaining own resources, little access to sources of financing and little access in the diversity of economic resources produces the attainment of employees with low qualification, short term managerial approach and little developed in internal capabilities (Franco & Urbano, 2019).

These shortcomings hinder management with government entities. In addition, it affects the formulation of marketing strategy according to the new paradigms of globalization. Therefore, the companies of the building subsector as well as the Colombian business park respond to the market with scarce organizational capacities that do not allow detecting and assimilating external knowledge. Therefore, they are prone to economic policies and external phenomena (Dini & Stumpo, 2020; Franco Ángel & Urbano, 2019).

- **Changes and effects of the economic environment on organizations in the building activity**

The above analyses illustrate the changes generated in the different macroeconomic variations resulting from the behavior of global markets in the Colombian economy and construction. Graphic 7 shows the creation dates of the business sample in Boyacá and evaluates the influence of these variables on organizational behavior.

Graphic 7
Historical behavior of the companies that make up the building subsector



Source: Own elaboration (2022).

The historical behavior of the incorporation of companies is consistent with the variations generated in the markets. Likewise, their supply is related to the effects of trade liberalization, which represented an increase in private investment and greater international capital mobility with accessible exchange rates that allowed for the supply of a greater variety of financial money market and capital market instruments.

The above generated a diversification of portfolios for investment and financing, as a result of policies in line with greater commercial participation in international markets. Therefore, exports, especially those derived from raw materials, extracted from the subsoil generated a productivity boom that increased the incorporation of companies 6 times higher since 2012 due to the global demand for raw materials (Kalmanovitz Krauter et al, 2017). According to Hernandez & Platero (2015), the mining-energy rent and foreign investment allowed expanding capital formation, which has generated a greater proliferation of companies and construction activities than those obtained in the past.

With the growth of markets, Government intervention in the construction of non-residential buildings () allowed the creation of new companies in this activity to boost the economy in times of economic slump. Figure 8 illustrates the creation of companies from 2009 (after the great recession of 2008), 2014 and 2015 (related to the oil crises) and after 2016. The above

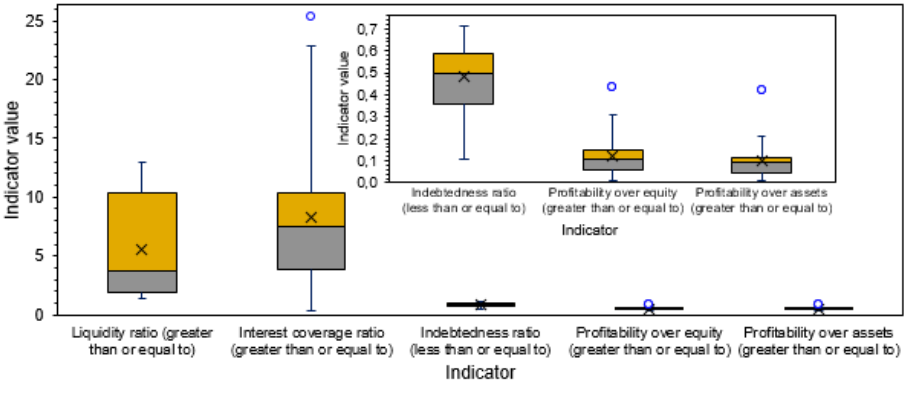
shows that free trade policies have affected the Colombian economy and have generated a greater dependence on international market changes (Nájar Martínez, 2006), especially in the housing construction activity, due to the reduction in investment levels, caused by global phenomena and the influence on exports of raw materials, together with the commercialization of products in the Colombian economy, since housing construction is a protagonist in this sector and is transversal to all economic activities (Hernández-Carrillo et al, 2021; Ríos-Ocampo & Olaya, 2017; Sarmiento-Rojas et al, 2020)

3.3. Results of the financial capacities of the companies for the construction of buildings in Boyacá

- **Evaluation of financial statements in construction sector organizations**

The financial statements are part of the qualifying requirements to select the companies that would potentially fulfill the competencies in the construction projects formulated by the Colombian Government. These values are variable, since they depend on the specific needs formulated by the public entity. Graphic 8 illustrates the variations of the indicators proposed in the public bids evaluated.

Graphic 8
Box plot of the financial and organizational indicators in the public bids evaluated

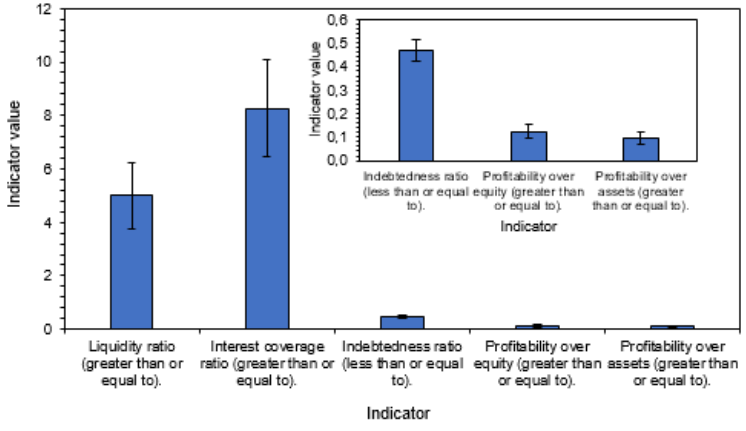


Source: Own elaboration (2022).

When analyzing the indicators of the selected sample of public bids in Boyacá (n=40), the following indicators were analyzed, it is shown that the financial indicators have a greater breadth of financial capabilities. Thus, is observed the opposite case in the organizational indicators, in which greater specificity is required, as a guarantee of the capacities to support the risk of the project based on the organization's assets or equity.

Therefore, these indicators are compared with the financial information reported by the companies evaluated, since these values are a reference for the analysis of financial indicators (Navarro, 2017; República de Colombia, 2014). Graphic 9 exposes the confidence ranges of financial and organizational indicators as enabling requirements for public procurement processes in Boyacá for building construction projects.

Graphic 9
Financial indicators and confidence ranges



Source: Own elaboration (2022).

Graphic 9 reflects the variation in enabling requirements and greater flexibility in financial capabilities, when compared to the organization's equity capabilities. This is related to policies that tend to require a greater amount of assets than the organization's equity capabilities. These characteristics influence the generation of profitability, which indirectly evaluates the company's solidity in the market.

On the contrary, the financial capacities have a greater flexibility, they can be supported by entities that temporarily grant the resources required by the organization, which partially or totally support the finances of the project and generate reliability for National Government. The purpose of this is to provide a constant flow of resources to

support the construction project or object of the contract. Therefore, it is observed that these measures, if correctly chosen, provide an aggregate view of the performance of an organization (Kotane et al, 2012).

- **Evaluation of the business performance of the building construction sector in the state contracting of the department of Boyacá**

The results of the evaluation of the financial and organizational statements as qualifying requirements made it possible to identify the number of companies that could participate in public procurement for the construction of buildings and the capacity to have a broad portfolio for business permanence through their participation in construction projects financed by the State and its institutions. These are the main driver of construction activities for economic development. Therefore, the results of the joint valuation are shown in Table 4.

Table 4
Number of companies that comply with the requirements according to the established ranges of values of financial indicators

Capacity	indicator	Mean	Confidence interval (CI) of biddings	Number of companies			Complies (%)	Does not comply (%)
				≥ CI*	<CI	IND**		
Financial	Liquidity ratio	5,12	± 1,25	10	16	70	83,33	16,67
	Indebtedness ratio	0,47	± 0,05	16	80	0	83,33	16,67
	Interest coverage ratio	8,25	± 1,81	2	23	71	76,04	23,96
Organizational	Profitability over equity	0.13	± 0,04	9	75	12	9,38	90,63
	Profitability over assets	0,10	± 0,03	4	92	0	4,17	95,83

* Was used t-student distribution with a sample of 40 bids (p-value<0.05).
**IND=Indetermination

Source: Own elaboration (2022).

Although, that companies have a greater possibility of satisfying public procurement requirements through their financial capacities, only a small portion have defined numerical ranges, in contrast to a larger number with indeterminate values (current liabilities and zero interest expenses). The above has been established in multiple clarifying addenda of public bids, that mathematically the division of any number greater than zero by zero tends to infinity (∞) and by having current assets. The bidder complies with the

indicator since it exceeds any positive sum reflecting the same by not having liabilities or debts to its credit.

This behavior reflects that a large number of companies do not have a notable financial history, and illustrates the lack of participation and expertise in the financial market. This is related to the financial constraints of micro and small enterprises, These are related to the organizational structures of MSMEs and their limited access to sources of financing and a diversity of economic resources (Franco & Urbano, 2019). Therefore, the range of organizations that comply with these indicators varies on average 80.9% ± 10.4% (confidence range with a t-student distribution and 95% reliability). Therefore, the financial indicators do not reflect the capabilities of the companies to take on National Government construction projects.

Since the financial indicators are evaluated jointly, if the lowest value of one is not within the established reliability ranges, the enabling conditions for the public contracting process would not be generated. Table 4 shows that the companies evaluated have greater deficiencies in their organizational capacities, since they do not have equity that generates operational profit from their equity.

Consequently, at least 95.83% of the companies for the construction of buildings do not have the capacity to generate operational profits for each peso invested in equity or assets. These requirements are consistent with the guarantees required for the provision of services, which requires several specificities that may increase the risk in the satisfactory completion of these projects compared to other sectors. Therefore, organizational capabilities generate a guarantee to protect the resources invested in building construction (Guinard-Hernández, 2017; Horta & Camanho, 2013).

Subsequently, the entrepreneurial characteristics in building construction expose the shortcomings in the arrangement of assets, rights and obligations. In addition, the low profitability of the companies is a negative factor that prevents reliability and generates greater risk for the entity that grants resources for the formulation of State construction projects. Likewise, the consolidation and growth of the organizations is limited and is subject to the management and growth of other companies with greater robustness, scope and permanence.

This prevents direct access to sources of financing and limits the development of organizational structures to participate directly in the markets, due to the lack of resources and skills needed to manage construction projects on their own (Howlett & Migone, 2013). Therefore, it is possible to infer that the entrepreneurial behavior of the building sector has mostly been arranged as a collaborative means to other organizations to solve problems for which external sources of knowledge are needed (Miles, 2005).

However, the legal figures of temporary unions and consortiums have been formulated as a group of companies to participate in public bids, due to the difficulties in supporting the requirements of individual companies. However, these figures limit the autonomy and independence of the organization. In addition, the difficulties in appearing in a judicial process have been discussed, due to the lack of legal status for each of its members. Therefore, in these methods, it is necessary to appear individually before the judicial process (Álvarez, 2012).

4. Conclusions

This research identifies the preponderant role of the building activity on the construction sector in Colombia, together with the identification of the variations caused in its production, originated by the national economic events, linked to the international dynamics, which have directly affected the market and the commercialization of housing as the main construction activity. Therefore, the current panorama of construction in Colombia tends to stagnation, in coherence with the behaviors identified in Boyacá, which are consistent with the dynamics of construction in Colombia. Consequently, due to the behavior of housing construction, mostly supported by the private sector, the nature and capacity of MSMEs as the majority business group in Boyacá and Colombia reflects a low direct participation in public construction projects, which is consistent with the reduced capacity to generate operating profits. These limitations affect the growth of economic activity, despite government efforts to encourage its production through the construction of civil works and, to a lesser extent, buildings. Thus, these business incapacities prevent direct access to sources of financing and limit organizational development. Which reduces their scope of participation and permanence in the market, mainly due to the lack of resources and skills needed to manage construction projects that support the development of the sector and the Colombian economy. Hence, it is necessary to formulate policies to encourage private sector demand for buildings, focused on SIV housing, together with the organizational development of companies for greater permanence and support in managing construction projects that sustain their development and the growth of the Colombian economy.

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