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PROFIT RATE AND PROFIT PERSISTENCE IN THE NORWEGIAN CONSTRUCTION INDUSTRY - A SECTOR WITH DIFFERENT SEGMENTS, STRONG COMPETITION AND MANY SMALL COMPANIES

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Abstract

There exist numerous published articles that examine the level of profit persistence across various industries. Such analyses prove highly valuable in acquiring a deeper understanding of the market. This paper investigates how important business-specific factors are for businesses involved in construction industry. This sector is characterized by its high capital intensity and sensitivity to economic cycles. To investigate its dynamics, researchers commonly employ the dynamic panel data approach along with the Generalized Method of Moments (GMM) estimator, a widely used econometric technique. The approach is to estimate to what degree firms can make a profit and outperform the market. We split the sample of Norwegian construction firms from 2006 to 2019 by three criteria: segment, size, and debt. With a comprehensive dataset encompassing information from over 40,000 companies spanning a period of 14 years, there exists a solid foundation for generating accurate estimates. The finding is that the degree of profit persistence (PoP) is considerable in this sector and especially among large companies. The long-term profit rate is around 6 percent. There was a noticeable decline in activity during the financial crisis. The building segment and highly indebted enterprises faced the greatest challenges during that period.

Keywords: Construction Industry, GMM, Dynamic Analyses, Profit Persistence, Financial Crises

JEL Classification: D40, D22, D52

1. Introduction

The profit level for a firm in the construction industry depends on many factors, such as cost control, pricing strategy, management, innovation, and market conditions. A key question is if a firm can maintain profit persistence over time or not. Many articles about this issue have been published based on the theoretical analysis of Mueller (1986, 1990). An important result is that the assumptions in neoclassical microeconomics that market forces will cause profits not to

persist and disappear in the long term have not been met (Bhangu, 2020; Jang and Park, 2011). Moreover, there are significant sector-specific differences.

Several analyses have been conducted for Norwegian companies. For the bakery sector and the restaurant industry, there is a low rate of profit and a low degree of PoP (Opstad and Valenta, 2022a, 2022b; Opstad *et al.* 2022a). For the tourism sector (campsites), the level of PoP is significantly higher than for the restaurant and bakery sectors (Opstad *et al.* 2021).

In this article, we will study in more detail the construction sector. The market is quite similar in many countries. It is a quite capital-intensive sector and with a skilful use of subcontractors. Furthermore, the market consists of many enterprises that are spread out geographically and with varied sizes. Therefore, there is significant competition in the market. The sector consists of different segments, such as construction, buildings, and infrastructure. Based on data from 2006 to 2019 and including 41,835 companies, we want to gain insight into this industry. How does the way the sector works relate to microeconomic theory? Are there economies of scale, what is the degree of profit persistence, and what is the level of long-term profit? Such knowledge is useful for the authorities, for the sector itself and for those who conduct economic analyses of markets. A high rate of profit and above normal profits over several years is of interest for policy makers since it implies the market is not working to allocate resources effectively. The purpose of this article is to gain more insight into these aspects. To date, no published article has specifically examined the construction sector in Norway. Therefore, acquiring knowledge about the functioning of this segment is particularly valuable for authorities as they formulate various strategies aimed at establishing a well-functioning market.

Companies operating in technological and knowledge-based enterprises are using modern technologies to improve their results. This may explain why such companies tend to have higher PoP compared to less knowledge-based industries (Mitropoulos, 2014). Bhangu (2020) finds a high degree of PoP in the materials sectors. The explanation is probably that firms in this sector have access to limited raw materials that cannot be replaced. Without access, you cannot produce. This limits the competition and results in a high degree of PoP. Other sectors with a high level of PoP are pharmaceutical companies, enterprises that are innovative and idea-based, and among high-technology firms. Even if businesses in a sector have a high profit rate, the PoP does not need to be high. Opstad *et al.* (2022b) report high profits in salmon farming, but with a great variation and low degree of PoP due to risk factors such as disease, fish death and more. In labor-intensive industries such as service sectors with simple technology and high competition, the tendency is low profits and low rate of PoP (Gshwandtner and Hirsch, 2018; Opstad and Valenta, 2022a). According to the analysis of Opstad and Valenta (2022a), higher profits in the restaurant sector led to start-ups with a time lag of two years. The consequences of this are that the profits decline. With small barriers to entry, simple technology and know-how, not capital-intensive production, it is difficult to achieve high profitability and secure it over several years. It is a well-functioning market, and this leads to many companies going bankrupt and having to leave the market.

According to Ive and Gruneberg (2000), the companies in the construction industry are motivated by profit, but the adaptation is often not the one that brings maximum profit. Ball *et al.* (2000) have studied the construction sector in England. They find that the rate of profit is quite low and stable around 3 percent. There are some economies of scale and that may explain why larger companies have higher profits. It is a highly competitive sector with varying market situations and high input costs. Therefore, it is difficult to achieve high profits over several years. Skitmore *et al.* (2006) suggest pricing in line with the classical economics' understanding of the market is most dominant in the UK (i.e., supply equals demand).

Empirical research gives a strong support to the assumption of PoP within the EU but with variation among the different countries (Eklund and Lappi, 2019). According to Gshwandtner and Lambson (2002), a high degree of profit persistence is an indicator of a misallocation of resources. Eklund and Lappi (2019) report a significantly higher PoP for the construction sector than for sectors such as manufacturing, agriculture, and services. Some possible explanations may be that the construction industry has economies of scale, and many companies are in a monopoly situation and are exposed to little competition. This is in line with Bartoloni and

Baussola (2009) who report the presence of only a few competing firms may be an important reason why businesses achieve high profit persistence.

The article follows a structured outline, starting with an introduction that provides an overview of the topic. It then proceeds to present several hypotheses based on economic theory. The concept of profit persistence is subsequently addressed, followed by the presentation of descriptive data. In the subsequent section, the findings are thoroughly discussed in relation to the various hypotheses proposed earlier. The article concludes by summarizing the key findings and offering suggestions for future research directions.

2. Hypothesis development

Many published articles show there are different levels of profit persistence depending on the industry. This is related to the extent to which the classical economic theory of the market works and how easy it is for newcomers to establish and survive in the market. Profitability plays a vital role in the survival of businesses. The average profit within an industry is often seen as the norm in terms of competition. When there is a high level of profit persistence, it indicates that certain firms are consistently generating significant profits over an extended period. However, this also raises concerns about potential market inefficiencies, as suggested by Gómez-Limón *et al.* (2023). The construction sector is quite capital intensive and requires some degree of know-how. On this basis, it is assumed that there is some degree of PoP. This is the basis of hypothesis 1:

H_1: Profit persistence exists within the building and construction industry in Norway.

Various studies, such as Ariffin *et al.* (2017), have demonstrated the presence of economies of scale within the building and construction industry. According to Ariffin *et al.* (2016), this phenomenon can be attributed to several factors, including the necessity for advanced and costly machinery, as well as the expertise required in this sector. It is assumed that this is also reflected in the building and construction sector in Norway. In this analysis, the sector is divided into different segments like building, infrastructure, and specialized enterprises (such as architectural firms, plumbing firms and more). Our assumption is that profit persistence differs between these groups. Therefore, the following hypothesis is postulated:

H_2: The degree of profit persistence depends on economies of scale and the type of enterprise.

Carson and Abbott (2012) highlight that the building and construction industry is highly sensitive to economic cycles. During downturns, productivity tends to be low in this sector. Economic crises pose significant challenges for businesses, especially if they result in higher interest rates. Agiomirgianakis *et al.* (2013) point out that companies with high levels of debt are particularly vulnerable in such circumstances, as the increased interest costs can significantly impact their financial stability. During the financial crisis (2008), market interest rates were high, and activity declined in many sectors. The construction sector experienced substantial adverse effects during the financial crisis, as highlighted by Erol and Unal (2015). The industry was significantly impacted by the crisis, resulting in various challenges and disruptions. Our assumption is the impact was greatest for the building sector since it includes to less degree projects based on public funding and hence, is more cyclically sensitive. Furthermore, it is assumed that highly indebted enterprises encountered problems and that this affected their long-term equilibrium. This gives rise to the following hypothesis:

H_3: Financial crisis shocks will have different effects on enterprises with different levels of debt and will also affect their long-term equilibrium differently.

3. Materials and methods

3.1. Research instrument

PoP constitutes a core aspect of microeconomics, proposing that as the traditional market economy functions more effectively, it becomes increasingly challenging to maintain high profit rates over extended periods. Mueller (1986) introduced the deviation of the profit rate and its autoregressive process, which can be represented as:

$$\pi_{it} = \alpha_i + \lambda\pi_{it-1} + \varepsilon_{it} \quad (1)$$

Here, π_{it} denotes the deviation of firm i's profit rate from the industry average at time t. Equation 1 enables us to estimate the profit persistence (λ) using dynamic panel data methods. The error term εit is likely to exhibit feedback bias if Ordinary Least Squares (OLS) is employed for estimating the equation, which is why the system GMM estimator, developed by Arellono and Bover (1995) and Blundell and Bond (1998), is preferred. The autoregressive parameter λ conveys the correlation between a firm's previous year's profit rate (deviation) and its current year's profit rate. In the event of a profitability shock making a firm more or less profitable than the industry average, λ gauges the rate at which the profit rate reverts to the industry mean. This autoregressive parameter can be interpreted as reflecting a firm's ability to sustain high profits or its struggle to enhance profitability to match the industry average.

Firms exhibit various characteristics that influence profitability rates, which we term firm-specific factors. Some of these factors are mutable, while others remain constant. The impact of firm-specific factors can be assessed by examining their influence on annual changes in profitability. One approach to estimate the autoregressive parameter describing year-on-year profit rates involves utilizing dynamic panel data models.

To account for the effects of the financial crisis, the subsequent model is employed:

$$\pi_{it} = \alpha_i + \lambda\pi_{it-1} + B_i F_i + \varepsilon_{it} \quad (2)$$

Here, Bi represents a parameter and Fi is a dummy variable (Fi = 1 for the year 2008, and 0 otherwise). Additionally, each segment is categorized based on debt levels. Profit rate persistence (deviations) is thus perceived as the resilience of profit rate disparities among firms, and the estimate can be construed as the significance of firm-specific factors. If a firm's profitability bears no correlation to its profitability in the subsequent year, the autoregressive parameter equals zero. If past profitability entirely predicts future profitability, λ is equivalent to unity. Opstad *et al. (*2021) provide a more comprehensive explanation of this procedure. The long-run steady-state equilibrium of the profit rate is expressed as:

$$\hat{P}_i = \hat{\alpha_i} / 1 - \hat{\lambda}_i. \quad (3)$$

For firm i to prevail in the long run, $\hat{P}_i$ must be positive, necessitating profitable operations. The parameters are estimated by applying dynamic panel data methods. Most estimations utilize a general method of moments equations for estimating the autoregressive parameter, with the System-GMM estimator being the most reliable (Hirsch and Gschwandtner, 2013). A maximum likelihood estimator is also available, addressing the feedback bias issue without instruments (such as GMM) but through simultaneous equation modeling (Valenta *et al.* 2021). This paper employs the System-GMM, facilitating comparisons with findings in existing literature.

3.2. Data and descriptive statistics

The data are obtained from the Norwegian public register. It includes more than 40,000 companies in the period 2006–2019. Wahlstrøm (2022) has compiled the data thoroughly. The descriptive statistics are divided into different segments. By dividing the firms into small, medium, large, and huge, a baseline for further analysis is established. Table 1 describes 7 variables within

the 8 categories. Total observations and firms are also in the table. Discrepancies are due to missing data.

In the first column are the means and standard deviations of the whole construction sector. The average firm in construction had almost 1.2 million Euro in revenue. There is a substantial variation, where huge firms have a mean revenue of more than 14.0 mill Euro. The average rate of profit is 7 percent, but the standard deviation is more than twice of that.

Dividing firms in construction by size gives further insight into the sector. A third of all firms are very small, with yearly revenues averaging 1.1 million, or 110 thousand Euro, with a 70 thousand Euro standard deviation. These firms earn most in relation to their size, compared to medium, large, and very large firms, but this segment also has the widest spread in profit rates. Medium sized firms in construction are older, less efficient, and less indebted than small firms, but also less efficient, less indebted, and less profitable than the large construction companies.

Table 1. Descriptive statistics: development for the average companies in the period 2006-2019

	(1) Construction All	(2) Building	(3) Infrastructure	(4) Specialized	(5) Small	(6) Medium	(7) Large	(8) Huge
Revenue	1.2 M € (3.0 M €)	1.4 M € (3.5 M €)	2.9 M € (6.1 M €)	0.9 M € (2.3 M €)	0.1 M € (0.07 M €)	0.5 M € (0.9 M €)	4.0 M € (5.1 M €)	14.1 M € (8.4 M €)
Profit Rate	7.0%	7.8%	7.6%	6.3%	8.3%	5.7%	6.8%	7.8%
	(18.9%)	(21.8%)	(17.8%)	(16.0%)	(25.0%)	(14.3%)	(12.6%)	(13.1%)
Growth Rate	26.1%	28.8%	25.2%	24.1%	29.4%	26.4%	21.7%	9.4%
	(50.8%)	(57.6%)	(44.25)	(45.1%)	(60.7%)	(46.7%)	(42.1%)	(32.3%)
Debt Rate	43.4%	48.0%	46.9%	39.2%	47.4%	40.2%	41.8%	54.4%
Age	9.06 Years	7.8 Years	12.7 Years	10.0 Years	5.8 Years	9.3 Years	13.8 Years	12.9 Years
Risk of Bankruptcy	12.7%	13.4%	9.4%	12.3%	12.3%	14.8%	10.1%	1.9%
Number of Firms	41,835	18,842	884	22,109	16,149	15,285	10,401	1,201

Note: Standard deviation in parenthesis. The profit rate is calculated as (revenue - costs)/revenue. Debt rate as debt/revenue. Risk of Bankruptcy: Share of companies that have gone bankrupt. Small: Revenue < 850,000, Medium: 850,000 <Revenue < 4,500,000, Large: 4,500,000 < Revenue < 22,000,000, Huge: 22,000,000 < Revenue

It is unclear whether having a high mean with substantial high variation in the rate of profit is better or worse than having less profitable, but more stable streams of excess income. Small, medium, and large firms file for bankruptcy at approximately the same rate. The probability of bankruptcy is more than two percentage points higher for medium firms than for the smaller firms, while the smaller firms are two percentage points more likely to file for bankruptcy than the large firms.

4. Results and discussion

4.1. The degree of profit persistence (Hypothesis 1)

The data from Table 2 show that the profit rate for firms in the construction industry is substantial. The profit margin in the construction sector in Norway ranges from 5 to 8 percent, which is relatively high compared to other industries. For instance, the profit margin in the restaurant industry is approximately 3.5 percent (Opstad and Valenta, 2022a), while in the bakery industry, it is around 2.0 percent (Opstad and Valenta, 2022b). Furthermore, the firms in construction have also higher estimated long run equilibria than restaurants (2.7%) and bakeries (2.8%) in Norway. The estimates are slightly around a mean profitability of 6% for the construction sector (Table 2). This supports the barrier to entry theory. In sectors with higher barriers to entry, there are larger and fewer firms. The construction industry requires a substantial level of investment in equipment

and machinery. The sector depends also on professionally qualified labor. Competition can be just as fierce with or without high barriers of entry, but lower barriers to entry are likely to cause fiercer competition. This is not the case here, as restaurants are more able to distinguish themselves than firms in construction. A lot of construction projects are limited to regional constructions firms. Several projects involve complex engineering and are based on long-term contracts. These factors may explain why the construction sector has higher long run earnings than restaurants. Hypothesis 1 is confirmed.

Gómez-Limón *et al.* (2023) highlight the wide variation in profit persistence (PoP) across different sectors and countries. Hirsch and Gschwandtner (2013) provide specific values for the food industry in five European countries, reporting PoP ranging from 0.1 to 0.3. In general, the construction industry tends to exhibit higher PoP values. Eklund and Lappi (2019) estimate the average PoP parameter for the construction industry across the EU to be 0.38. However, the data presented in the study only partially confirm this trend. For large enterprises, the PoP value is estimated to be 0.379, while for all enterprises, it is estimated to be 0.167 (Table 2). This is significantly lower than the average value observed in EU countries. One possible explanation for this discrepancy could be the presence of scattered settlements, long distances, and a larger number of small local actors, as opposed to the EU where dominant large companies are more prevalent.

Table 2. Regression model by segment

	(1) All R. Profit	(2) Small R. Profit	(3) Medium R. Profit	(4) Large R. Profit	(5) Largest R. Profit	(6) Building R. Profit	(7) Special R. Profit
L1. R. Profit (PoP)	0.167 (0.003)	0.168 (0.006)	0.156 (0.005)	0.213 (0.005)	0.379 (0.014)	0.189 (0.005)	0.144 (0.004)
Constant	0.050 (0.000)	0.058 (0.001)	0.043 (0.001)	0.045 (0.000)	0.031 (0.001)	0.048 (0.001)	0.051 (0.000)
Long Run Rate of Profit	6.0%	7.0%	5.1%	5.7%	5.0%	5.9%	6.0%
Observations	196,006	55,628	70,229	57,684	7,355	73,388	117,352
Number of firms	35,733	14,334	14,688	7,474	930	16,020	18,903

Note: Standard deviation in parentheses. The profit rate is calculated as (revenue - costs)/revenue Small: Revenue < 850,000, Medium: 850,000 <Revenue < 4,500,000, Large: 4,500,000 < Revenue < 22,000,000, Largest: 22,000,000 < Revenue

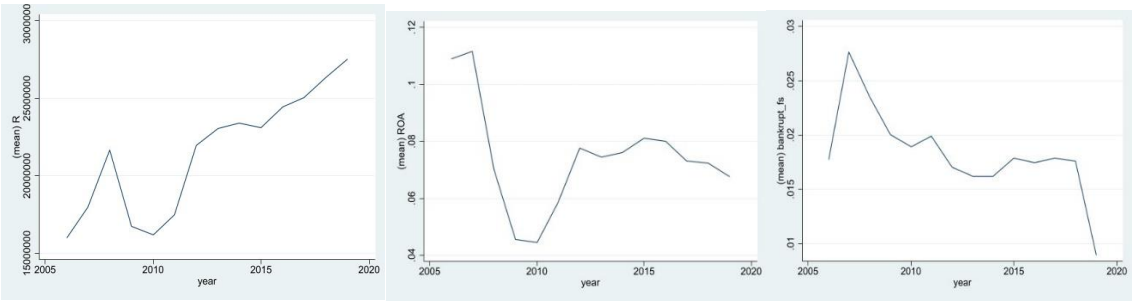
4.2. Variation in PoP depending on the segment and size (Hypothesis 2)

The largest companies distinguish themselves by having considerable higher PoP compared to the other companies. The value of the largest companies is at the same level as the EU average (Eklund and Lappi, 2019). One possible explanation is that competition is less here, and the big dominant ones can maintain a high profitability over a longer period. But long-term profits are at the same level or slightly below those of the other firms. Apart from these observations, there are only minor differences, and little evidence suggesting economies of scale for the smaller companies. It is also worth noting that the growth rate for the largest firms is substantially lower than that for their smaller counterparts (Table 1). Moreover, the mean profit for these companies is at the same level as the rest of the sector. These companies can achieve stable profits above average over a long period of time while production is stable.

The two segments, Buildings and Specialized, show little difference compared to all the companies in terms of PoP and profit rates (see Table 2). Therefore, we can conclude that hypothesis 2 is only partially confirmed. Only the largest companies stand out significantly compared to the rest.

4.3. Financial crises (Hypothesis 3)

Construction industry is sensitive to economic fluctuations, with demands often increasing during periods of economic growth and declining during recessions (Ball, 2014). According to Goldeng and Bygballe (2013), the financial crises in 2008-2009 hit hard the construction industry. Furthermore, the sector has experienced greater growth than the rest of the industry in the period 1996 to 2011.



a) Revenue **b) Profit** **c) Bankruptcy**

Figure 1. The development of revenue, profit and bankruptcy (yearly percentage of the firms leaving the market) for the sector for the period 2006 to 2019

The financial crises had a substantial impact on the construction industry. There was a considerable drop in revenue and profit (Figure 1). At the same time, many firms went bankrupt and exited the sector. One reason for this impact was the high interest rate in 2008 (Table 3). According to the provided information from Table 3, during the financial crisis, market interest rates in Norway increased. Prior to 2007 and after 2009, the interest rate remained below 5 percent. However, in 2007 and 2008, it rose to 6.65 percent and 7.28 percent, respectively. This aligns with the findings of Erol and Unal (2015) that the financial crisis had a negative impact on the construction sector. The higher interest rates during the crisis likely contributed to the challenges faced by the industry during that period.

Table 3. Market interest rate in percent

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Interest rate	4.02	4.70	6.65	7.28	4.28	4.61	5.03	4.72	4.74	4.36	3.55	3.49	3.41	3.51	4.00

Source: SSB (2021)

The companies most affected by an increase in interest rates are those with low equity and high debt). All companies with high debt in this study have a long-term negative profit. Therefore, companies with high debt are struggling to survive. Table 4 shows an interesting finding related to the financial crisis (2007-2008). The negative impact was greatest within the building segment. The impact of the financial crisis gives a value of the coefficient of -0.04 and the relationship is strongly significant. The model specification includes variables related to high and low levels of debt and their relationship to the studied phenomenon. Table 4 displays the results of the analysis, distinguishing between enterprises with high and low levels of debt. It suggests that the financial crisis has a specific impact on high-debt enterprises. This indicates that the financial crisis disproportionately affects companies with higher debt levels compared to those with lower debt. The distinction in the table provides insights into the differential effects of the crisis based on debt levels. As anticipated and consistent with previous findings (Erol and Unal, 2015), highly indebted enterprises experienced the most significant impact on profits during the financial crisis due to the elevated interest rates compared to the normal rates. It is important to note, as highlighted in Table 4, that highly indebted companies across all segments exhibit negative long-term profits. This suggests that these companies may face difficulties in sustaining their operations in the long run. The combination of high indebtedness and adverse financial

conditions during the crisis likely contributed to their challenges in achieving profitability and long-term viability.

For companies with low debt rate, the financial crisis has a negative impact on the rate of profit for the building segment. For the specialization segment with low debt the effect is also significant, but the relationship is positive. Hypothesis 3 is confirmed.

Table 4. Regression model with dummy variable for the financial crises in 2006 and the segment divided into high and low debt

	(1)	(2)	(3)	(1)	(2)	(3)
	Buildings	Infra-structure	Special.	Buildings	Construction	Special.
VARIABLES	High Debt	High Debt	High Debt	Low Debt	Low Debt	Low Debt
	R. Profit	R. Profit	R. Profit	R. Profit	R. Profit	R. Profit
L1. R. Profit (PoP)	0.094***	-0.178***	0.117***	0.093***	0.079***	0.116***
	(0.008)	(0.039)	(0.013)	(0.006)	(0.020)	(0.005)
Financial crises (2008)	-0.040***	-0.022	-0.007	-0.009***	0.005	0.017***
	(0.005)	(0.033)	(0.010)	(0.003)	(0.012)	(0.003)
Constant	-0.016***	-0.036***	-0.031***	0.069***	0.096***	0.103***
	(0.001)	(0.008)	(0.002)	(0.001)	(0.004)	(0.001)
Long Run	Negative	Negative	Negative	7.6 %	10.4 %	11.7 %
Rate of Profit	26,276	634	9,733	51,652	3,621	70,753
Number of firms	9,062	224	3,561	14,650	760	15,447

Note: See model specification in relation 2 and 3. The table presents the distinction between enterprises with high and low debt. The financial crisis is having a particular effect on high-debt debt. Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

One likely reason for the difference between the two segments, building and construction, is that building is far more cyclically sensitive. The financial crisis and the high market interest rate (see Table 3) probably led to many clients to either cancel or postpone their projects. The infrastructure segment (roads, etc.) is largely financed by the public sector. They are less cyclically sensitive. To the extent there is a public countercyclical policy, the result may be an increase in activity in this field.

5. Conclusion

The major contribution of this paper is to apply the theory of profit persistence to the construction industry in Norway. This provides useful knowledge for the industry and for the authorities. The level of the persistence of profit (PoP) indicates that the assumptions in traditional microeconomics are not met for this sector. The construction industry differs from the other sectors like bakery and restaurant. The findings suggest that there is some degree of economies of scale or limited competition in this sector. The largest companies are more stable and achieve higher profits.

The financial crisis in 2008 led to less activity and lower profits. For the building segment and highly indebted enterprises, this created considerable challenges. The data is this study is from only one country. Even though there are some similarities to how the construction industry works in other countries, one must be careful about transferring these findings to other countries. Furthermore, we do not have available data for other control variables that may influence the findings. When data are available, it is interesting to analyze the effect of Covid-19, following by higher interest rates and inflation, has had for this sector.

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