Profitability in Construction: How Does Building Renovation Business Fare Compared to New Building Business

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Abstract

In recent decades, energy-efficiency improvements and aging dwelling stocks have grown the renovation need in many countries. This research compares the profitability of building renovation companies and companies specialising in new construction using financial statement analysis and analysis of variance. Profitability is assessed through EBITDA and return on assets (ROA). Debt to equity (D/E) ratio as solvency measure supports the analysis. The findings show micro and small companies in the new building sector have a statistically significant advantage in EBITDA over renovation in same size groups; projects in the renovation sector appear to be more complex, especially in terms of design, causing cost overruns. The more cyclical nature of new construction, however, equalises EBITDA differences over time. Medium-size companies overall had the lowest EBITDA following the 2008-2009 financial crisis. ROA were generally higher for renovation sector highlighting the more capital-intensive nature of new construction; unsold apartments and land for future projects hold capital, which results in higher D/E ratios. D/E ratios also revealed that both sectors have faced the COVID-19 pandemic less indebted compared to the 2008-2009 financial crisis. Since both sectors' profitability has been decreasing during the research period (2005-2019), actions are needed especially in the renovation sector, which has an increasingly important role in developed societies.

Keywords: profitability; building renovation business; new building business; construction industry; solvency

Introduction

The construction industry is a vital part of the societies. The industry, all over the world, creates the environment for people to work and live (Choy 2011). The purpose of construction is defined as the building of connections, spaces and areas (Vainio 2011). If the construction industry is important in terms of environment, importance is also related strongly to economic development of all countries. As the construction industry spreads in many basic sectors, the industry affects socio-economic development (Cyril & Singla 2020). The construction industry impacts, for example, major consumers of services and supplies, such as raw materials and electrical equipment (Murillo et al. 2019). That's why the influence of the construction industry extends to overall economies and can also be seen in GDP level; already Turin (1978) proposed that the output of construction industry correlates with national income per capita, and Bon (1992) released a theory, known as the Bon curve, presenting the relation of GDP and economic development of countries. At the global level, the construction industry's share of GDP is about 12% and at the EU level 10% (Bertino et al. 2021; Murillo et al. 2019).

This paper focuses on the construction industry and more specifically, profitability of a significant sector, the building renovation business. The building renovation business has achieved a world of attention in developed societies like Europe. One significant reason is the huge increase in new building construction right after the Second World War; these buildings have started to need renovation. Pre-war dwelling stock in many European countries has been estimated to be 20-40% of the current total dwelling stock (Meijer et al. 2009). In addition, a newer dwelling stock, for example 1970-1980 buildings, have also started to need renovation (Finnish Association of Civil Engineers RIL 2019). The other reason for the increase of the renovation business worldwide has been to decrease CO_2 emissions. Significant cuts can be achieved via energy-efficient renovations (Jensen & Maslesa 2015). It is also possible that

some growth will follow Covid-19 pandemic; for example, offices can be modified to respond to new needs of employees or transformed totally to other uses (Tanrivermis 2020).

The term renovation in the construction industry is used, for example, in statistics to distinguish between work on existing buildings and new construction. The renovation is an umbrella term for rebuilding, modernisation and upgrading (Vainio 2011). Another definition for the wide range of renovation activities is RMI: repair, maintenance and improvement (Killip et al. 2018). Since profitability is the key element in the study, it is said to be a typical measure amongst the financial indicators and defined as "a positive difference between revenue and cost" (Cyril & Singla 2020). Profitability is one of the best indicators to address a company's capability to expand the business, pay dividends and increase stakeholder's equity (Škuflić et al. 2018). When expanding the profitability concept, relative profitability is a term that shows that profitability can be affected not only by profits and revenue, but also by adjusting the amount of assets in the balance sheet (Marttonen 2013).

The construction industry in general is said to be a fiercely competitive, cyclical and project-related business with thin margins (Bilal et al. 2019; Horta et al. 2013). There are various factors explaining the thin margins. One significant factor is the competitive market all over the world. Already decades ago, Kangari (1988) stated that the theory of competition explains thin profit margins in the construction industry. The theory states that increasing competition between existing players causes lower profit margins, higher risk factors and even negative profits. The other factor is that the construction industry consists mostly of small players who compromise profit margins to be able to fill their order books and maintain cashflow (Wolski and Zaleczna 2017). Both factors partially follow the feature that, compared to many other industries, there is a low threshold for entering the construction markets (de Valence 2007).

Even though the contractors have high technical skills, many do not possess business acumen or accounting experience to run a successful business (Killingsworth & Mehany 2018). Single projects may be successful, but it does not always follow that the business is profitable. Instead of focusing only on the project level, companies also need to focus on the corporate level and matters such as increasing turnover and profitability (Tripathi & Jha 2018). Otherwise, limited profit margins hinder construction companies' ability to expand and there is a potential risk that companies will not succeed (Killingsworth & Mehany 2018). Actually, failure rates for construction companies are on a high level compared to other industries (Killingsworth & Mehany 2018). For example, due to the uncertain nature of the industry, undercapitalisation and poor cash flow are common reasons for failures in the construction industry (Horta & Camanho 2013).

The building renovation business has been researched much less than new construction business (Vainio 2011) and this study will narrow that research gap. The study analyses companies' performance over 15 years in profitability supported by solvency. The purpose is to find out how profitable the building renovation business is compared to the construction of new buildings. The study answers the research questions:

1. What are the profitability differences in terms of EBITDA and ROA between the building renovation business and the new building business?
2. How has the profitability of both sectors developed over 15 years and what were the effects of the 2008-2009 financial crisis?

The research data in the study is based on Finnish companies. The construction industry's share of the Finnish economy has been quite stable at five to six percent of GDP during the last 20 years (CFCI 2018). The share of the renovation business in the Finnish construction industry has increased from 1980s' 30% to today's almost 50% meaning that the

renovation business has an even more remarkable role in Finland's economy (Statistics Finland 2019). Actually, pre-war dwelling stock in Finland has been estimated to be only 10% (Meijer et al. 2009). Based mostly on that, Finland's renovation need at the moment is estimated to be 10% of the total EUR 500 billion value of built properties in Finland and the renovation boost is already going on and more increase is expected (Finnish Association of Civil Engineers RIL 2019). The huge building renovation need underlines the importance to research profitability of the building renovation companies; there must be well-run companies who will be able to tackle the challenge.

Literature review

Reliable information about renovation activities in Europe is limited (Murillo et al. 2019). The same issue is found in Finland: The Confederation of Finnish Construction Industries RT (2020) noted that information about Finnish building renovation companies' profitability is not on a good level. This fact, together with some international project level studies (Reyes & Mansfield 2001; Shehu et al. 2014) suggesting that building renovation projects are riskier and more complex compared to new construction, increases the interest to research the profitability of building renovation companies. In addition, building renovation as a business has been questioned on the Finnish level in recent years because a few significant contractors had many unprofitable projects with significant impacts on overall profits (Mölsä 2019).

Overall, the scientific discussion has mostly been from a project development and energy savings perspective or focused more on the construction industry generally than on the renovation companies (Vainio 2011). Even though the profitability of the renovation companies seems to be rarely studied, the following publications (Table 1) show an example that the profitability of the construction industry in general has been examined extensively.

Table 1. Reviewed publications with a similar profitability perspective

Author	Publication	Research method	Examined ratios	Timeframe	Country	Sample size
Ahonen et al. (2020)	The competitiveness of the construction industry and the quality of construction in Finland	Theme interviews Literature research	EBITDA	2000-2017	Finland	41 616 (latest year)
Christopoulos et al. (2016)	Investigation of the relative efficiency for the Greek listed firms of the construction sector based on two DEA approaches for the period 2006–2012	Data envelopment analysis (DEA)	ROA Turnover Profit margin	2006-2012	Greek	18
Cyril & Singla (2020)	Comparative analysis of profitability of real estate, industrial construction and infrastructure: evidence from India	Correlation analysis Regression analysis	ROA ROIC	2003–2017	India	67
Škuflić et al. (2018)	Determinants of construction sector profitability in Croatia	Generalized method of moments (GMM)	Profits, solvency and size of the firm (as wider determinants)	2003-2014	Croatia	8678
Wassie (2020)	Impacts of capital structure: profitability of construction companies in Ethiopia	Regression analysis	ROA D/E LTD/TA	2011-2015	Ethiopia	30
Wolski & Załęczna (2017)	Changing activity in the construction sector in selected states 2003-2012	Correlation analysis	Profit margin EBITDA ROA	2003-2012	Czech Republic, Poland, Slovakia, Hungary, Spain and Ireland	130 800

Abbreviations:
ROA = Return on Assets
ROIC = Return on Invested Capital
D/E = Debt to Equity ratio
LTD/TA = Long Term Debt to Total Assets
EBITDA = Earnings Before Interest, Taxes, Depreciation and Amortisation

Cyril & Singla (2020) presents that inside the construction industry there are different kinds of challenges and profitability differences depending of the sector. Their study focuses on comparing profitability differences via return on assets (ROA) and return on invested capital

(ROIC). The research shows that, in the Indian construction industry, the industrial sector is the most profitable, followed by real estate and the infrastructure sector is the least profitable. The authors recommend researching the profitability in various sectors also in other countries; this is an important factor considering this Finnish research. If the sectors in the construction industry are significant, so is the role of the public sector as an investor. Christopoulos et al. (2016) researched Greek construction companies' efficiency, especially during the 2009 debt crisis. The study addressed that, when the recession stopped all the public expenditure programs, companies' financial ratios, such as ROA, turnover and net profit margins were hit negatively. In addition, the study underlined that most of the companies were not able to manage their assets and liabilities effectively.

Many studies underline that there are various determinants affecting profitability of the construction companies. Škuflić, et al. (2018) examined the profitability determinants of construction companies in Croatia. The firm determinants included, for example, profitability, solvency and size of the firm. The conclusion of the research shows that the growth of sales and profitability have a positive correlation and larger firms enjoy an advantage of economies of scale and scope. Hence, the research shows that market concentration, measured by Herfindahl-Hirschman index, correlates positively with profitability, as do the total sales of the company. On the other hand, Cyril and Singla (2020) mentioned in their research that construction companies in North America, Europe and East Asia do not benefit from their size. The same effect is seen in Finland. Ahonen et al. (2020) presents that smaller companies have better profitability compared to larger ones in the Finnish construction industry.

Wassie (2020) researched effects of a capital structure on the profitability of the construction firms in Ethiopia. That is an important factor in the sense that this Finnish study also notices debt to equity ratio's influence on profitability. The study of Wassie (2020) shows that both positive and negative correlations between profitability and equity ratio have been

studied. However, Wassie (2020) observed that companies with higher debts are more likely to decline. When measuring debt to equity and long-term debt to total assets, positive correlation with ROA can be detected. As a conclusion, Wassie (2020) states that to be able to increase profitability, construction companies need to pay extra attention to create an optimal capital structure. Thus, companies cannot ignore the relevance of significant control variables like growth and capital adequacy.

For expanding the profitability determinants, GDP and market situations play a significant role. Wolski and Zaleczna (2017) researched construction sectors activities and compared the activities to financial ratios. They detected that, in general, the 2008-2009 financial crisis affected companies by reducing value, liquidity and profitability. However, there were differences between countries; companies of the Visegrad Group (Czechia, Hungary, Poland and Slovakia) countries avoided negative profits while companies in Spain and Ireland were hit by significant declines in profits. There were significant differences also depending on the size of the company. Wolski and Zleczna (2017) noticed that small and medium size companies seem to be more sensitive to economic cycles. During a downturn, large and very large companies performed better than small companies. The finding is important especially in the sense that the construction sector in many countries mostly consists of small companies (Wolski and Zaleczna 2017; Oesterreich & Teuteberg 2016).

At the Finnish level, Ahonen et al. (2020) researched the competitiveness of the construction industry in Finland. Throughout the 21st century (2000-2017) profitability has clearly declined in the overall Finnish construction industry. Profitability, measured by operating margin, was 7.3 percent in 2017. Compared to Sweden, Austria and Denmark, construction industries acting in the same climate conditions, Finland turned out to be the least profitable.

Research Design

Based on the wide investigation for the research, most of the construction companies do work in both fields, building renovation and new building business, with some distribution and financial ratios are usually not separated. Therefore, a comprehensive selecting process was needed for this study to be able to carefully select only companies specialising in either building renovation (BR) or new building business (NB). Figure 1 presents the main stages of how the company selection process and research design in total was carried out in this study.

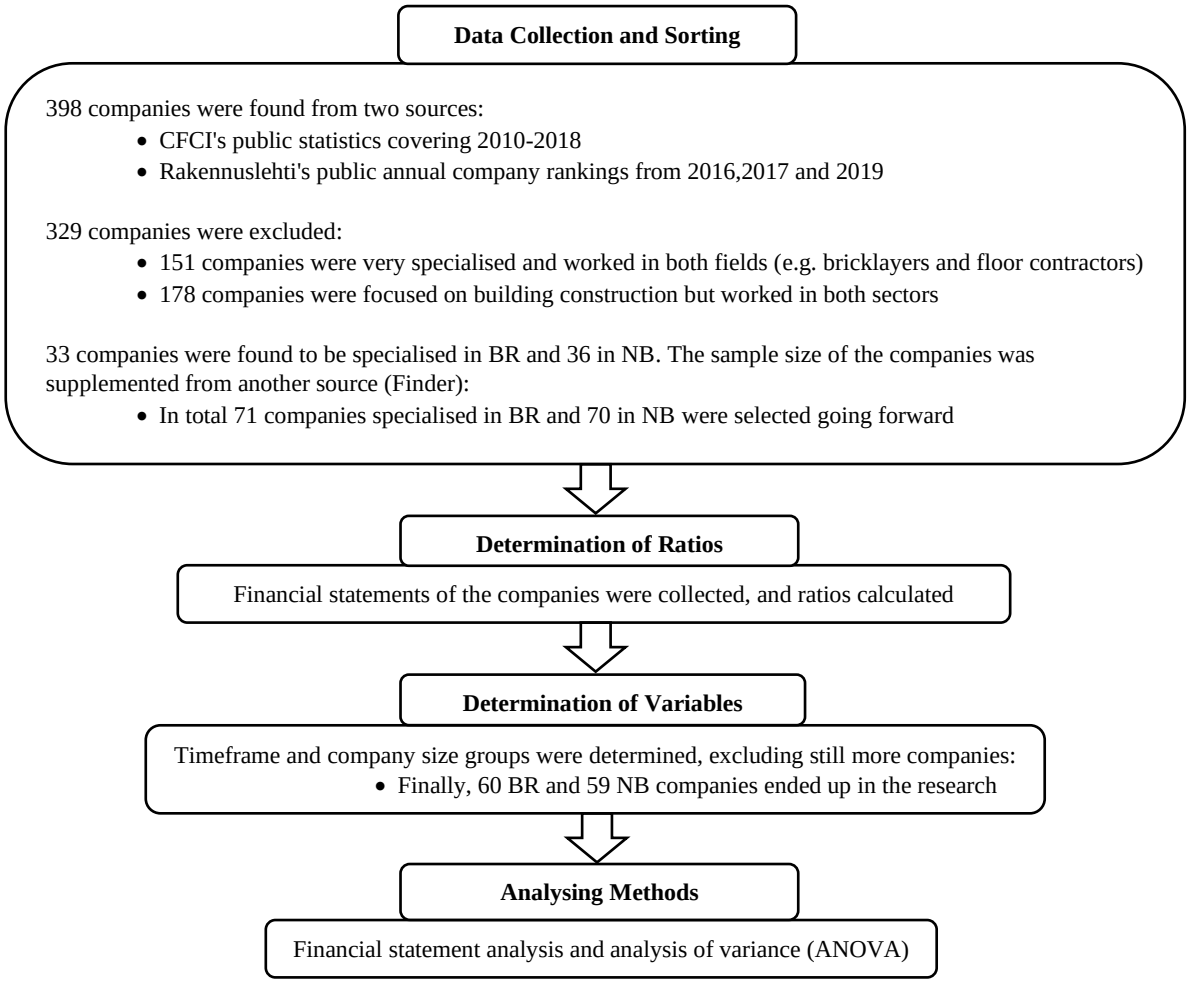

Figure 1. Main stages of the company selecting process and research design in total

Data Collection and Sorting

The Finnish construction industry includes 10 000 companies that focus full-time on the construction business (CFCI 2018). Since the number is enormous and many of the companies are very small (NAOF 2014), two main sources for the company selection process were utilized. These two sources, The Confederation of Finnish Construction Industry RT (CFCI) statistics and Rakennuslehti's annual publication on companies' ratios, were considered to represent the most important players in the building construction sector. CFCI is the joint interest organisation representing the entire construction sector in Finland, including building construction (CFCI 2021). The second source, Rakennuslehti, is a Finnish construction trade journal owned by many associations related to Finnish construction, including CFCI (Rakennuslehti 2021). The members of the associations, as well as other professionals of construction industry, form the journal's readership. However, because Rakennuslehti's public top rankings covered only three years and public statistics of CFCI did not involve all the member companies (approximately 500 member companies in the latest years) and some companies are not part of the organisation, the company groups were supplemented via Finder. Finder is a general and public Finnish company search service owned by Fonecta (Fonecta 2021).

As there is no actual data about companies specialised only in BR or NB, a company selection process was carried out by applying a systematic observation. The systematic observation is a collection method where already existing data is observed to be able to find factors determined beforehand (Vilkka 2007). In this study, the factors were observed from company web pages; public service offerings, reference lists and clear promotions of either specialisation in renovations or new construction. Some uncertain cases were double-checked from companies by phone.

Determination of Ratios

Since profitability is the key approach of this research, two profitability ratios were chosen to research: Earnings before interest, taxes, depreciation and amortisation (EBITDA) margin and Return on assets (ROA). Solvency also relates closely to profitability by describing a company's ability to finance its long-term operations (San & Heng 2011); debt to equity ratio (D/E) indicates solvency in this study. One factor in choosing these ratios is the ability to compare with previous studies, some of which are presented in Table 1. The data (financial statements of the companies) for calculating financial ratios is collected from Finnish Patent and Registration office (PRH). The data are available to the public for a fee, but for research use, it is possible to get free of charge. However, according to PRH guidelines, the identifiable company information received free of charge for research use, as in this study, cannot be published.

All the chosen ratios are presented in Table 2. The table also explains how the ratios have been calculated in this study based on the Committee for corporate analysis (2009).

Table 2. Ratios and calculation methods

Ratio	Perspective	Calculation method
EBITDA Margin	Profitability	$\frac{EBITDA}{(Turnover + other\ operating\ incomes)} * 100\%$
Return on Assets (ROA)	Profitability	$\frac{(Net\ profit + \ Financial\ expenses + Taxes)}{Average\ adjusted\ balance\ sheet\ in\ accounting\ period} * 100\%$
Debt/Equity (D/E)	Solvency	$\frac{(Interest - Bearing\ liabilities)}{Capital\ and\ reserves}$

EBITDA margin, as a profitability ratio, was chosen for the study because it is said to be a good ratio for describing a company's financial performance and effectiveness in terms of cash flows (Folster et al. 2015). As an important factor for this Finnish study, Stumpp (2000) states that EBITDA margin is a good profitability ratio for comparing companies operating in the

same sector. EBITDA margin displays profitability from the sales point of view (Neerza & Tripathi 2019). ROA has been chosen for this study as the other profitability ratio because it presents how efficient a company's management is at using its assets to generate earnings. ROA is a measure that is not affected by a company's tax management policy, creating validity for evaluation between companies. ROA is not the best ratio if the researched sector includes revaluations. Based on the investigation for this research, these cases seem to be rare in the construction industry. (Committee for corporate analysis 2009)

Debt to equity ratio (D/E) instead tells about a company's leverage and it is also a ratio related to risk measurement. Greater D/E creates possibilities for high returns but it also can increase the risk if D/E is too high and causes problems, for example, to pay interest and principal payments (Lewis 1993). There is no one answer for what D/E ratio should be, but it should be high enough in terms of returns for owners and not too much to avoid risks considering the ratio (Lewis 1993). D/E ratio's effects on profitability have been presented in many studies. For example, Cyril & Singla (2020) presented that in the construction industry, a company's risk to fail is more likely when having both low profits and high amount of debt.

Determination of Variables

As Magee (1996) stated decades ago, financial ratios themselves are not always significant, but together with other factors, such as time period, they can demonstrate important trends and warning signals. The timeframe for this research is 15 years (2005-2019) including different economic situations, such as the 2008-2009 global financial crisis and the recovery. To deepen the analysis and understanding of the results, companies have been divided into three categories adjusting the European Commission's definition about small and medium-sized companies (EC 2003). The size categories are presented in Table 3.

Table 3. Companies' size categories

Company size	**Criteria**
Medium	Revenue ≤ m€ 50 or balance sheet total ≤ m€ 43
Small	Revenue ≤ m€ 10 or balance sheet total ≤ m€ 10
Micro	Revenue ≤ m€ 2 or balance sheet total ≤ m€ 2

The companies have been divided into the size categories by their mean turnover or mean balance sheet total during the research timeframe (2005-2019); the companies were placed in the category where they met one or both minimums. As most of the size categories were eventually determined based on revenue, the mean values of each companies' research period were seen the most suitable in terms of categorising companies' size groups; as micro and small companies, which form a major part of this study, do not often use the percentage of completion method as revenue recognition method (CFCI, 2011), their annual revenues can vary slightly. This factor, together with cyclic and project-related features of the construction business were the reasons to use mean values as the size category determinants. Thus, staff headcount requirements of the European Commission's definition were not seen appropriate to be followed because of the long timeframe of the study and the reason that the construction industry is highly dependent on subcontractors; the reliable information is hard to get and define (Yoke-Lian et al. 2012).

The size categories can be seen as appropriate since small and medium-sized companies represent 99% of all businesses in the EU (EC 2003) and the same distribution can be observed in the structure of the construction industry in Finland; the branch consists of micro, small and medium-sized companies and there are not many large companies (Ahonen et al. 2020). In that sense and based on Rakennuslehti's annual ranking publications about the Finnish construction companies' ratios (Rakennuslehti 2020), the number of companies in this research represents the majority of all medium-sized companies that focus purely on the new building or renovation business. The small companies make up the largest category.

Even though more companies specialised in only BR or NB business were detected than is included in the research (Figure 1), the selected 119 companies were estimated to be the most suitable ones to include in the research. The excluded companies had, for example, too short operating period or the companies were involved in mergers or acquisitions during the research timeframe or did not meet company size categories. Some companies included in the research also did not have operations in the total research timeframe, but enough that the statistical evaluation was analytically meaningful. Therefore, the study eventually includes an archival research from 63-119 companies per year. Each accounting period of each company in the study is considered as a unique data point in the analysis; the total amount of datapoints in the study is 1484.

Analysing Methods

Two methods were chosen for analysing the research data in the study: financial statement analysis and analysis of variance (ANOVA). Financial statement analysis in general is used to evaluate companies' economic state by utilising financial statements and calculated ratios (Robinson et al. 2010). The method typically reviews companies' profitability, financing and economic operating condition and its strength is comparability; the method's value increases when evaluating different companies in the same timeframe (Kallunki 2014).

ANOVA analysis was chosen to deepen the financial statement analysis and to be able to find statistically significant differences from the researched sectors. ANOVA is testing mean values between the researched groups and as done as one-way ANOVA, analysis includes one independent variable and one dependent variable. The starting point for the analysis is the null hypothesis assuming that means of the researched groups are equal. If this hypothesis can be rejected based on the results of the ANOVA, these groups differ from each other. To be able to find these differences, some comparison method needs to be used; Tukey-Kramer HSD is the method used in this study. F-test and its p-value can also be linked into the ANOVA. If the

p-value is smaller than 0.05 or even 0.01, researched groups differ statistically significantly from each other. To indicate statistical difference, F-value should always be greater than one and often noticeably greater. In this study, ANOVA is done as one-way analysis separately for the dependent profitability variables: EBITDA and ROA. As a support for the profitability results analysis, D/E was also tested by ANOVA as a dependent variable. In all ANOVA analysis the independent variables were construction sector (renovation or new construction) and the size of the company. (Turner & Thayer 2001)

Findings and Discussion

State and Development of the Sectors

Figure 2 describes – with curves, trend lines and confidence intervals – the development of the profitability in both sectors during the 15-year period (2005-2019). A trend in total for both EBITDA and ROA medians has been decreasing during the researched timeframe. The result

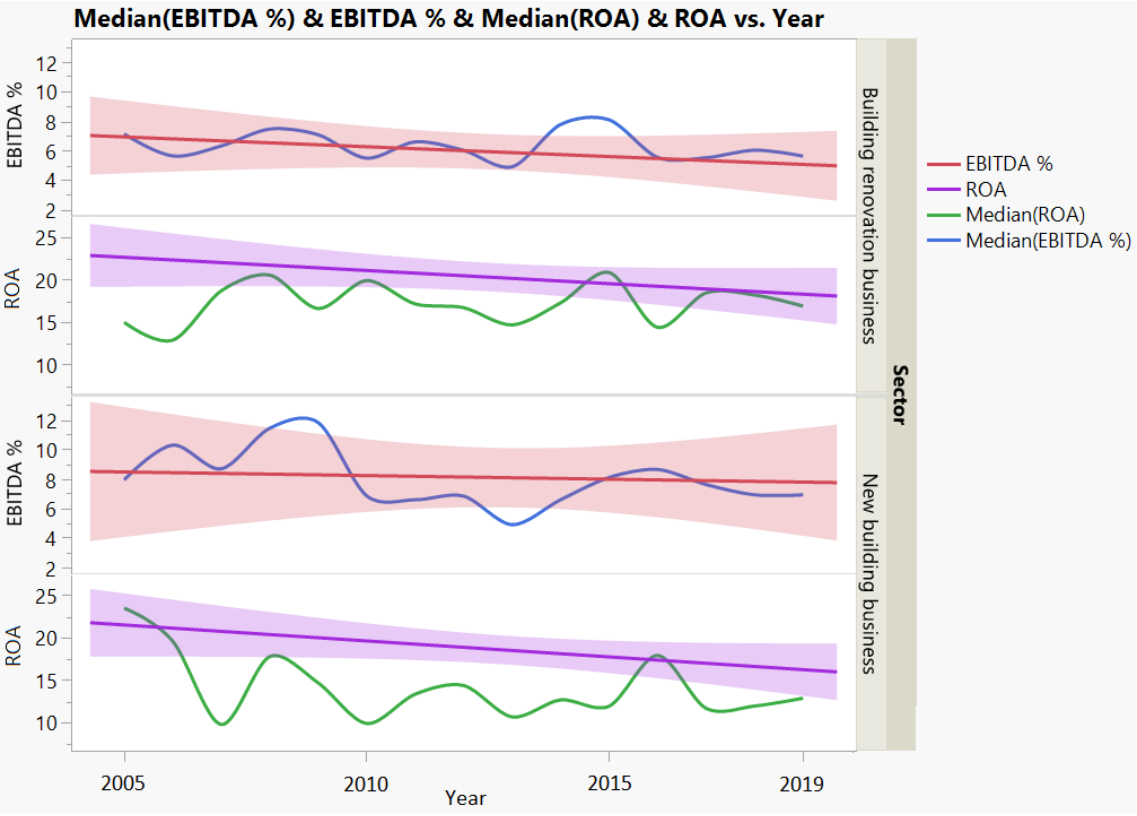

Figure 2. The development of EBITDA and ROA in both sectors in 2005-2019

is in line with the study of Ahonen et al. (2020), that addressed the profitability decline throughout the 21st century in the overall Finnish construction industry. The study of Ahonen et al. presented that the 2008-2009 financial crisis, crisis of Nokia (company), closure of paper mills and the decreased Russian export were some significant reasons behind the decline.

Figure 2 also reveals that a downward trend in the NB business in EBITDA margin has not been as significant as for BR business. However, the BR business measured by EBITDA margin has performed more evenly during the researched timeframe; a signal of better stability is a standard deviation being 16.9 for the BR companies and 27.2 for the NB companies. Even though the standard deviation difference between BR and NB sectors is the key issue, relatively high standard deviations confirm the fact that typically there is variance in EBITDA margins among companies in the same industry over time (Alcade et al. 2012). These standard deviations still also reflect the nature of the construction industry: in many cases, single projects can have a lot of impact on a company's financial performance (Wilkinson et al. 2012; Butković & Mihić 2019).

In Figure 2, the clearest peak in the development of the BR business can be detected in 2014; EBITDA median increased from the level of 5.9% in 2013 to the level of 8.0% in 2014, decreasing then again to the level of 6.5% in 2015. The one significant reason behind the 2014 result is an exceptionally large government expenditure program for the renovation works (Ministry of the Environment 2014; Pajakkala 2014). The observation is in line with Christopoulos et al. (2016) who presented that the public expenditure programs support companies' financial ratios, e.g. net profit margins.

When reviewing ROA, it quite clearly follows EBITDA margins in both sectors. In fact, a positive correlation between ratios is detected by using Spearman's rank correlation coefficient; 0.81 for the BR companies and 0.72 for the NB companies. Spearman's rank correlation coefficient can be in a range from −1 to +1; the closer to +1, the higher the relation

between the two factors and vice versa towards -1 (Thirumalai et al. 2017). The review for standard deviation for ROA appears nearly the same for both sectors (BR 23.9 and NB 23.0).

Figure 3 describes 15-year development of the EBITDA and ROA in both sectors considering company sizes. When including the sizes in the review, considerable annual variety can be detected. ROA still follows EBITDA margins quite clearly. A peak year of 2012 for micro NB companies is particularly conspicuous. A clear reason for the peak was not found despite the comprehensive interviews with the micro NB companies' executives (2021), CFCI (2021) and The Housing Finance and Development Centre of Finland (2021).

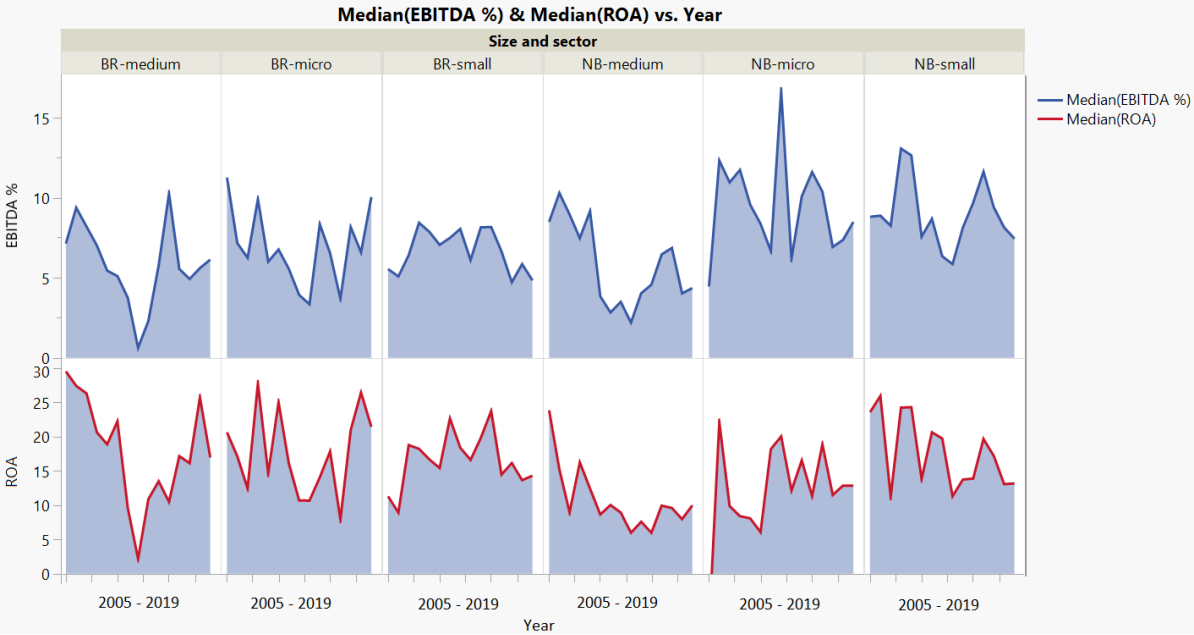

Figure. 3. EBITDA and ROA development by sectors and companies in 2005-2019

In both, Figure 2 and Figure 3, a prominent period is the 2008-2009 financial crisis which seems to have a significant impact on the profitability trend lines, especially for the NB business. The figures reveal that the crisis hit the NB companies slightly harder; including all company sizes and when reviewing median EBITDA margin, a rapid decline from a level over 10% to the level of 5-7% can be detected in the NB business. A closer review of financial crisis-related EBITDA median changes in Table 4 provides interesting details on how hard, when and how long the financial crisis has been hit in various size groups and both sectors.

Table 4. Financial crisis-related EBITDA median changes by sectors and company sizes

Company size	BR companies			NB companies		
	n	Downturn period	EBITDA decrease (p.p.)	n	Downturn period	EBITDA decrease (p.p.)
Total	45-52	2009-2010	-2.0	40-49	2009-2011	-5.2
Medium	7	2009-2012	-6.4	14-11	2010-2011	-6.4
Small	31-28	2009-2010	-1.3	25-20	2009-2010	-5.5
Micro	13-10	2009	-3.9	10-8	2009-2011	-5.0

Table 4 shows the downturn related to the financial crisis, defined to start when EBITDA margin started to decrease; the crisis hit all the size groups and sectors in 2009, except the medium-sized NB companies that were hit one year later. Based on the financial statement analysis, the reason behind the later hit for the medium-sized NB companies are the larger and longer lasting projects compared to the other size groups in the NB sector and BR sector in general. The end of acute crisis is marked when EBITDA has started to increase again.

As Table 4 reveals, EBITDA medians decreased -6.4 p.p. in four years for the medium-sized BR companies and also -6.4 p.p in two years for the medium-sized NB companies. The result is in line with Ahonen et al. (2020) who presented that larger Finnish construction companies got a harder hit in the 2008-2009 financial crisis compared to smaller companies. However, contrary to that Wolski and Zleczna (2017) presented that small companies seem to be more sensitive to economic cycles. In this Finnish study, the NB sector's small and micro companies also underperformed during the crisis, but small and micro companies in the BR sector performed the best in terms of EBITDA margin; the result reflects the fact that BR business is more stable compared to the NB business easing the BR companies to keep the work and cash flow solid (Usanov et al. 2013). However, when analysing the financial crisis related downturns overall, it is important to notice that even though the NB sector in total got a harder hit in the crisis, the general level of the EBITDA medians still stayed on a higher level in all size groups compared to the BR sector.

The review of the sectors' performance before and right after the financial crisis provide a topical point of view considering the ongoing Covid-19 pandemic. As the profitability trend foreshadow (Figure 2), both sectors have faced the ongoing Covid-19 pandemic with lower profitability levels compared to 2008, the time just before the financial crisis hit the Finnish construction industry. EBITDA and ROA ratios are important, but when facing crises, long-term profitability via solvency (median D/E ratios in figure 4) provide an insightful perspective highlighting the entry levels into the financial crisis and the ongoing pandemic. Because D/E ratios in the construction industry in general reflect economic activities on the market (Al-Malkawi & Pillai 2013), the figure also shows the construction business cycles; the data about business cycles are taken from Euroconstruct's Finnish network member Forecon Oy.

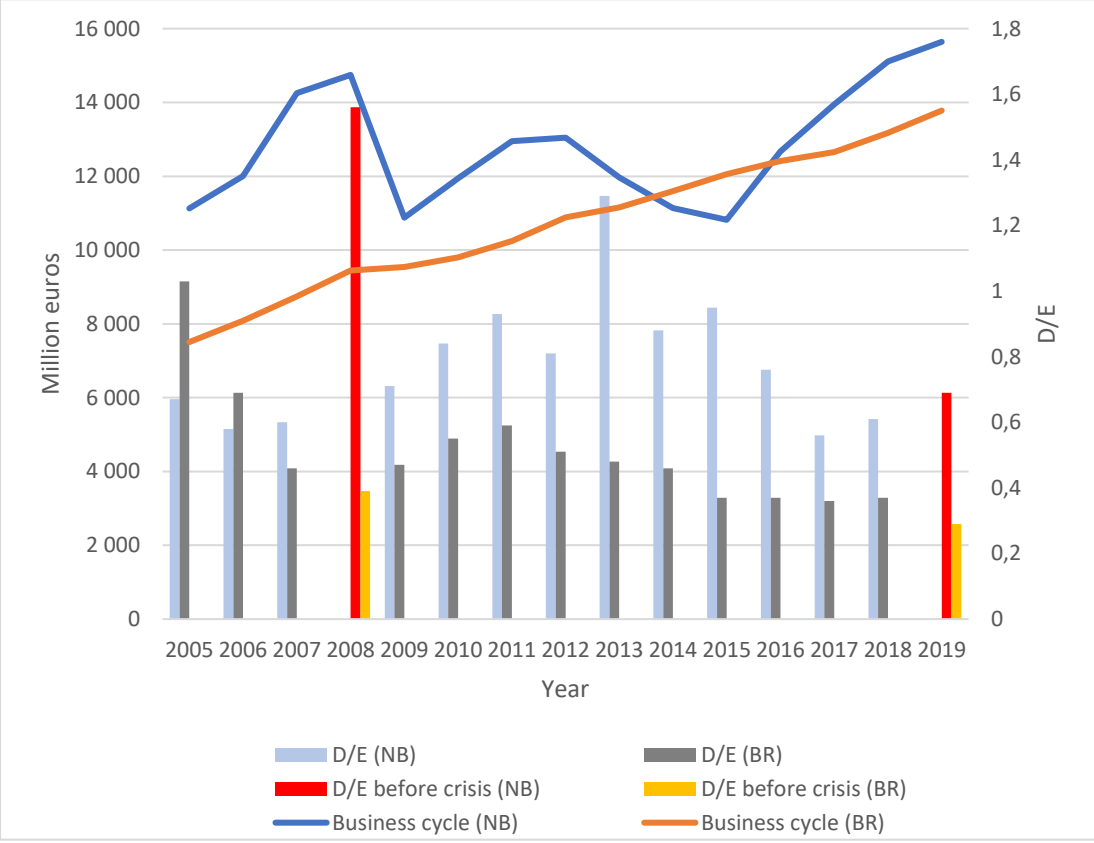

Figure 4. D/E levels and construction business cycles

Just before the financial crisis NB sectors' D/E levels were on a high level (1.56) considering the total timeframe and compared to the BR sector (0.39); BR sectors' D/E levels

have been quite stable since 2005, even though the sectors' activity has grown significantly. It is typical that when NB business is booming, companies meet a high demand by financing projects by debt instead of own equity (Al-Malkawi & Pillai 2013); however, the NB sector's D/E in this study was unusually high in 2008.

As the most significant observation, both sectors - and especially the NB sector's - D/E levels (NB 0.69 and BR 0.29) just before the Covid-19 pandemic (2019) show that the sectors have faced the ongoing crisis with lower D/E levels compared to the financial crisis. Pre-financial crisis datapoints for the BR companies were 45 and 38 for the NB companies; pre-Covid-19 datapoints for the BR companies were 55 and 50 for the NB companies. One reason behind the lower D/E levels before the Covid-19 pandemic can be banks' tighter lending policy followed by the new regulations after the 2008-2009 financial crisis (Wille et al. 2017). However, the lower D/E levels before the Covid-19 pandemic are a very good signal in the sense that high D/E ratios and crisis together can predispose failures and even bankruptcies (Wassie 2020; Wolski and Zaleczna 2017; Al-Malkawi & Pillai 2013). Secondly, it is shown that D/E ratios in the NB business have started to decrease during and right after crises (Sri Utami 2017); that can be partially seen in Figure 4 in terms of the financial crisis. The decrease is typical because of certain factors common to crises. These factors include a lack of long-term financing because of the slowing market, increasing interest rates or banks not being willing to finance the sector because of general economic uncertainties (Al-Malkawi & Pillai 2013).

However, the eventual effects of the Covid-19 pandemic for the construction industry are still partially unknown (Tanrivermis 2020) and the topic is important in terms of future research. So far, discussions and academic literature have stated that long-term effects of the Covid-19 pandemic can boost the renovation sector, as especially premises need to be modified more adaptable or even transformed to other uses (Bereitschaft & Scheller 2020; Tanrivermis

2020). In turn, new construction can suffer from the assumed feature that premises will be built only on carefully selected areas in the future (Lättilä 2021). In the near future, the most significant effects will follow the exceptionally large stimulus packages all over the world (Ajami 2020). These packages can benefit the construction industry in general, but Europe, for example, has targeted the package to support energy-efficient renovations (EC 2021).

Profitability Comparison Using ANOVA

ANOVA provides a statistical analysis of EBITDA margins and ROA as well as the significance of the companies' size to profitability. Before the ANOVA, exceptionally high or low datapoints (outliers) have been sorted out from the research data; outliers can distort variances and decrease reliability of data analysis (Osborne & Overbay 2004). The outliers were observed, for example, in the situations where companies were just starting their operations. The outliers have been presented in Table 5. In this research, interquantile range

Table 5. Detected outliers by using interquartile range

Ratio	n	Tail Quantile	k-value	Detected Outliers
EBITDA	1484	0.3	2.0	75
ROA	1483	0.25	2.5	20
D/E	1482	0.25	2.0	147

has been used to increase the reliability of the ANOVA tests. For tail quantiles first and third quantiles (0.25 value in the analysis) were sought to use as determinants; statistics defines interquartile range to be the third quartile subtracted from the first quartile (Ahmad 2012). For k-values functional values were determined based on Tukey's test. Tukey's test defines k-values as k = 1.5 indicates an outlier and k = 3.0 indicates that the outlier is very far from the mean values (Tukey 1977). However, as each ratio for ANOVA has its own data set and characteristics, lightly varying values were used in tail quantiles and k-values in order to use the most representative data in the analysis. Eventually, for all the ANOVA analysis, the

following tests were also done to ensure the reliability of each data set and analysis: Welch's and Brown-Forsythe's tests were done to confirm the equality of means and Levene's, Bartlett's and O'Brien's test were done to confirm the assumption of homogeneity. All tests indicated reliability ($p < 0.01$) for the ANOVA analysis.

The group comparisons of statistically significant differences between the researched groups in EBITDA means were done by using Tukey-Kramer HSD; the test uses conservative studentized range being therefore a statistically very reliable method (Hilton & Armstrong 2006). F-test result was 13.6 which together with p-values lower or nearby 0.01 indicate the significant difference between the groups presented in Table 6. The groups not connected by the same letter have a statistically significant difference. ANOVA analysis for EBITDA shows

Table 6. ANOVA analysis for EBITDA margins

F-ratio		**Prob > F**	
13.6		<0.0001	
Group comparisons of significant differences		**Difference**	**p-value**
NB small - BR medium		3.41	<0.0001
NB small - NB medium		3.39	<0.0001
NB micro - BR medium		3.17	0.0007
NB micro - NB medium		3.16	<0.0001
NB small - BR small		2.62	<0.0001
NB small - BR micro		2.51	0.0001
NB micro - BR small		2.39	0.0011
NB micro - BR micro		2.28	0.0131
Group	**Mean**	**Tukey-Kramer HSD: connecting letters**	
NB small	9.38	A	
NB micro	9.15	A	
BR micro	6.87	B	
BR small	6.76	B	
NB medium	5.99	B	
BR medium	5.98	B	

that small and micro companies' EBITDA means in the NB business are higher and differ statistically significantly from the BR companies and medium-sized NB companies. The lowest average means including both sectors are indicated for the medium-sized companies and the result is in line with the studies of Cyril and Singla (2020) and Ahonen et al. (2020); all address that larger companies do not benefit from their size and smaller companies have better profitability in the construction industry. Overall, the EBITDA results are quite typical: in the

Finnish level Ahonen et al. (2020) detected similar EBITDA values of the construction industry in general (7.3), still pointing out that Sweden and Denmark have slightly better values and in Austria EBITDA has been even over 10%.

If excluding the medium-size companies, the NB companies have performed better compared to the BR companies. Bilal et al. (2019) presented similar findings at a project level. Also, at a project level, some reasons are addressed to explain the issues in the BR business. Even though there usually is historical data about the renovated buildings, BR projects face more problems in design compared to NB projects (Ali 2010). The problems in design are usually connected with matching up the design to existing buildings – data of existing buildings can be very old or do not correspond to how it is realised. Thus, e.g. existing structures can be inaccessible in terms of surveys. Therefore, it is presented that compared to NB projects, BR projects are more complex and face more surprises and delays causing cost overruns and more variation to profit margin (Shehu et al. 2014; Skitmore et al. 1990). The complexity of BR projects can be detected not only in design but in work processes; the work processes in new construction are more standardised (Executives' interviews 2021; Babalola et al. 2019). In addition, regulation in terms of old buildings' modification as well as poor contractual practises can be factors behind a slightly lower EBITDA margins for BR companies (Conejos et al. 2016; Zolkafli et al. 2012).

The group comparisons of statistically significant differences for ROA means were done also by using Tukey-Kramer HSD; the evaluation, based on p-values lower or nearby 0.01 and the F-test result 7.3, for the groups with significant differences is presented in Table 7.

Table 7. ANOVA analysis for ROA

F-ratio		**Prob > F**	
7.3		<0.0001	
Group comparisons of significant differences		**Difference**	**p-value**
BR medium - NB medium		9.17	0.0006
NB small - NB medium		8.53	<0.0001
BR micro - NB medium		7.78	0.0010
BR small - NB medium		7.00	0.0003
BR medium - NB micro		6.79	0.0440
NB small - NB micro		6.15	0.0121
Group	**Mean**	**Tukey-Kramer HSD: connecting letters**	
BR medium	21.54	A	
NB small	20.90	A	
BR micro	20.15	A B	
BR small	19.37	A B	
NB micro	14.75	B C	
NB medium	12.37	C	

ANOVA for ROA indicates balanced levels (Committee for corporate analysis 2009) for both sectors and all company sizes. When comparing the values also to other countries, the results seem strong in total; Gallizo et al. (2014) detected 6-8% ROA values in the construction industry in Belgium, France, Italy, Spain, Sweden and UK. However, the results are not fully comparable as Gallizo et al. did not specify company sizes, had a different timeframe (1999-2007) and included companies from the construction industry in general, not contractors focused solely on building construction; company size among other factors can affect ROA rates (Dogan 2013). In fact, it proved difficult to find comparable studies about ROA, especially in terms of contractors focusing on either NB or BR sector. The feature highlights this study's uniqueness and research potential, for example, in other countries.

A deeper review of ROA results in this study indicates a significant statistic difference and the highest ROA means for the medium-sized BR companies. A narrow difference compared to other BR size groups can partially be explained throughout the financial statement analysis; compared to other BR size groups, medium-sized BR companies use even more subcontractors causing lighter balance sheets and therefore a slightly lower ROA. If excluding small NB companies, having the second highest ROA, NB companies otherwise had the lowest ROA ratios in total. As this study reviewed businesses at a company level, ROA as a ratio

nicely highlights differences in nature between NB and BR businesses. As balance sheets of the BR companies are quite light and consist mostly of current assets, NB companies' balance sheets are heavier due to unsold apartments and land for future projects. That difference can partially explain weaker ROA ratios for micro and medium-sized NB companies. Thus, the difference shows that NB business is more capital-intensive and financing has a more significant role for the NB companies than the BR companies. The more capital-intensive nature of the NB business seems also to be one of the reasons why NB business is more cyclical than BR business; lending usually tightens during a crisis (Cowling et al. 2012; Kaklauskas et al. 2009) what in turn can highlight the significance of possible fiscal stimulus packages which, for example, Christopoulos et al. (2016) addressed to be significant in terms of construction companies' performance. In the sense that NB business is more cyclical, it is not a surprise that, in general, many contractors do both sectors, likely to keep cycles more balanced.

ANOVA for the D/E ratio statistically confirmed the significance of the financing for the NB business. NB companies' D/E ratios (1.0-1.2) considering all size groups were higher compared to BR companies (0.6-0.7). By using Tukey-Kramer HSD, F-test result was 24.0 and p-values were lower than 0.01 indicating the significant difference between the researched groups. As earlier studies comparing D/E ratios between BR and NB companies were not found, the study of Cyril & Singla (2020) suggests that results are reasonable; 0.88 D/E ratio for the building construction sector in total was detected in their study.

Summary and Conclusions

This study sought to answer two research questions: what the profitability differences between the building renovation and the new building business are and how the profitability of both sectors has developed over 15 years considering the effects of the 2008-2009 financial crisis.

The analyses for EBITDA revealed that the profitability trend for the sectors has been decreasing in 2005-2019 and therefore actions are needed to find ways to improve profitability

in both sectors. The negative effects of the 2008-2009 financial crisis are visible, especially for medium-sized companies that have the lowest EBITDA ratios in both sectors. Still, it is important to notice that excluding medium-sized companies, the general levels of EBITDA ratios are on a higher level for the NB sector, but the more cyclical nature of the NB business equalises the profitability differences between the sectors over time. The reasons behind BR companies' slightly lower EBITDA ratios can be summarised as more complex projects, especially in terms of design and inefficient work processes; the processes are more standardised in the NB sector. Strict regulations over old buildings combined to poor contractual practices as well cause delays and cost overruns in the BR sector.

The results of ROA and D/E highlight a more capital-intensive – and therefore more cyclical – nature of the NB business; unsold apartments and land for future projects hold capital, which results in weaker ROA ratios and higher D/E ratios for the NB sector. However, the D/E review positively revealed that actually both sectors have faced the ongoing Covid-19 pandemic less indebted compared to the 2008-2009 financial crisis.

As scientific contribution, the findings of the study provide an overview and a base for further research of the unresearched area – profitability of the BR companies. The practical implications of the study can be targeted separately for the researched sectors. The lower EBITDA ratios in the BR sector confirm the detected issues that business operators should pay extra attention to design and contracts. In the NB sector this research helps business operators to see the need to focus on stronger capital intensity in the sector in order to perform in the best possible way in economic cycles.

Since one of the key elements of the study was to research companies specialised in only either the BR business or the NB business, some significant construction companies have been excluded from the study; these companies do both sectors and financial statistics are not well enough separated. That limitation creates the opportunity for future research: the research

data in the study is based on Finnish companies, but the approach is relevant to review in an international context. As this study reviewed construction cycles from the global perspective throughout the 2008-2009 financial crisis, analysis of other high and low cycles would also be useful, at least at a national level. In addition, analyses could be deepened to figure out how other factors than only company size effect profitability. For example, how the type and extent of renovation work effect on companies' profitability. The deepened analyses could reveal concrete ways of doing business in a more profitable manner. Finally, as the research provided a mostly D/E-emphasised summary of the sectors' entry levels considering the ongoing Covid-19 pandemic, the crisis and its still partially unknown effects are worthy of research more broadly. As presented, the long-term effects – including the stimulus packages – of the Covid-19 pandemic can boost the BR sector.

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No potential conflict of interest was reported by the authors.

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