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EFFECTS OF GOODWILL IMPAIRMENTS ON GROUPS' FINANCIAL POSITION AND PERFORMANCE: THE CASE OF THE LARGE CROATIAN GROUPS

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Abstract

The objective of this study is to investigate whether goodwill impairments significantly affect the financial performance and financial position of large Croatian groups. The sample comprises 152 large Croatian groups and 1,405 observations from 2010 to 2021. All groups included in the sample prepared and disclosed consolidated annual financial statements in 2020. Three research questions are examined using exploratory panel data analysis. The results indicate that goodwill impairments have no statistically significant effect on profitability or changes in total assets. The findings also show that groups reporting goodwill do not have higher profitability ratios than groups without goodwill. Overall, the

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results suggest that goodwill impairments have no statistically significant effect on the financial position or performance of large Croatian groups.

Keywords: goodwill, acquisitions, goodwill impairments, profitability, return on assets

1. INTRODUCTION

Mergers and acquisitions represent the fastest and most attractive way of increasing existing or penetrating new markets, widening the palette of goods and services, bypassing unfavourable regulations of different countries or easing international trade. Thus, to indulge in such transactions, companies must have adequate financial stability, business performance, and sufficient funds to carry out a merger or acquisition. In that context, an important role has its equity and debt structure and realised earnings as a fuse of going concern.

As a result of business combinations, companies recognise goodwill in their consolidated financial statements as an asset representing future economic benefits resulting from other assets acquired in a business combination that are not individually identified and separately recognised. Hence, the goodwill recognised as assets is a positive difference between the fair value of a consideration transferred and the fair value of acquired net assets. Unlike the bargain purchase, where the acquirer pays less for a higher value of net assets and recognises gain in the income statements in the acquisition year, in the case of recognising goodwill, the acquirer expects that the acquired assets will result in higher profits in future periods. Furthermore, the companies are obliged to test goodwill acquired in a business combination for impairment annually and determine if the carrying amount of the cash-generating unit exceeds its recoverable amount. In that case, the entity shall recognise the impairment loss; otherwise, the goodwill allocated to that unit will not be impaired. Thus, the impairment is carried out as a reduction of the carrying amount of any goodwill allocated to the cash-generating unit. Therefore, the research problem of this paper is goodwill impairments and the group's financial performance. Considering that those impairments represent unrealised future economic benefits from the acquired net assets, it is logical that they would impact financial results negatively. On the other hand, where impairment does not occur, the effects should be visible in increased financial results.

In the accounting context, under IFRS 3, goodwill represents the future economic benefits arising from other assets acquired in a business combination that are not individually identifiable and separately recognised (IFRS Foundation, 2020). Since the goodwill thus recognised does not generate independent cash flows, cannot be independently transferred, and cannot be directly measured, its accounting nature and treatment remain a subject of debate among academics and practitioners (EFRAG, 2016).

Since there are different approaches to the goodwill impairment test among financial reporting standards, the European Financial Reporting and

Advisory Group (EFRAG) conducted a study on the amount and trend of goodwill and goodwill impairment among listed companies in the European Union to collect data to be used "for facilitating the discussion of goodwill accounting by providing evidence of how goodwill and goodwill impairments have developed over time" (EFRAG, 2016, p. 6). A study of 328 European companies between 2005 and 2014 found that goodwill increased by 43% during that period and that a small number of companies accounted for a large share of goodwill. Moreover, the study found that goodwill accounts for about 3.7% of total assets, and goodwill impairments averaged 2.7% (EFRAG, 2016).

This paper aims to contribute to the findings of EFRAG's study and the findings of similar previous studies that were systemized in the following chapter. Existing research primarily focuses on large, developed markets, while the significance of acquisitions for large groups in transition countries remains underexplored. In addition, the context of the Croatian economy provides specific analytical value, as the research period covers the years after Croatia acceded to the European Union in July 2013, marked by the harmonisation of the regulatory framework, significant market opening, and an intensification of M&A activity. Such an environment offers unique conditions for researching M&A and goodwill amid significant institutional changes. Since the carrying amount of goodwill and goodwill impairment loss may significantly affect the financial position and performance of those entities that were acquirers in the business combinations, understanding these effects is not only important for the management and boards of these entities, but also for external auditors, investors and regulators when making decisions based on financial statements about the evaluation of the informational value of the expressed goodwill as a signal of future financial performance. This paper contributes to the existing literature by providing empirical evidence on the effects of goodwill impairment on the financial position and business performance in the context of a transition economy, with special reference to institutional changes related to accession to the European Union. Thus, the main purpose of this paper is to investigate whether the recognition of goodwill impairment affects the financial position and performance of large groups in Croatia.

The rest of the paper is structured as follows. Chapter two provides an overview of previous research related to the assessment of financial position and business performance in relation to acquisitions and goodwill disclosure. Chapter three describes the methodology and elaborates on the sample used. Chapter four presents and discusses the results of the analysis for each research question. Chapter five presents the research conclusions, theoretical and practical implications, limitations, and directions for future research.

2. LITERATURE REVIEW

2.1. Goodwill impairment and financial position

The direct relationship between goodwill impairment and changes in total assets, as a research question, has not been the subject of systematic empirical

research to date, making this research notably relevant. Although Iatridis & Senftlechner (2014) primarily investigated the relationship between the cost of capital and goodwill on the example of Austrian regions, they used the asset impairment variable as the ratio of impairment expenses to total assets, thereby directly linking these two categories through the intensity of write-offs. They used the indicator as the dependent variable in their regression model. They found a statistically significant relationship between the goodwill impairment-to-total assets ratio and the goodwill-to-total assets ratio, suggesting that the level of goodwill before impairment relative to total assets is a significant predictor of future cash flow uncertainty. Paugam et al. (2015) also scale the intensity of goodwill impairment using total assets, thereby placing total assets as the basis for measuring the magnitude and significance of impairment. In addition, they use the natural logarithm of total assets as a control variable for firm size. In this sense, the authors conclude that the absolute size of assets is an important factor that correlates with reporting decisions and subsequent results of business combinations. Deng (2025) also uses the natural logarithm of total assets as a control variable in his regression model and confirms the significance of asset size on the probability of recognising goodwill impairment. On the other hand, Abdul-Majid (2020) in his study of 192 firm-year observations of companies listed on Bursa Malaysia, found that companies with impaired goodwill have a higher share of goodwill in total assets than companies without impaired goodwill. The author uses total assets as a framework for understanding the balance sheet structure and testing whether the size of the goodwill asset position affects managerial discretion in recognising losses. In the context of discretionary management decisions, He et al. (2021) found that the probability of obtaining a modified opinion in the financial statement audits is higher the larger the amount of goodwill impairment is. The common denominator of the aforementioned studies is that total assets serve as an analytical framework for understanding the relative importance of goodwill and its impairments; however, none of the authors directly tested whether goodwill impairment is a statistically significant determinant of changes in total assets, which is precisely the question addressed in this study. When considering the impact of individual asset types, other than goodwill, on profitability, it is important to note that there are mixed results here, too. For example, Buljat, Skledar Ćorluka and Bilal Zorić (2026) investigated the relationship between individual components of net working capital and the profitability of Croatian companies in the period from 2016 to 2023 and found that accounts receivable management represents the most significant component of working capital for improving profitability. This finding, combined with the results of this study showing that changes in accounts receivable are one of the most significant predictors of changes in total assets, suggests that operating asset components dominate the dynamics of total assets of Croatian companies – while goodwill and its impairment remain marginal in this context. Furthermore, it signals that the profitability of the company is determent by multiple factors, not exclusively as a result fo M&A.

2.2. Goodwill and profitability

The M&A process typically involves significant in-depth cost-benefit analyses, in which the acquirer's willingness to pay a premium price for the target company is typically motivated by the realisation of increased future economic benefits. Although this is not necessarily the primary reason for acquiring other companies, most research examines the relationship between reported goodwill and the acquirer's business profitability. For example, Kathan (2025) found that leveraged buyouts (LBOs) that result in long-term goodwill recognition improve competitors' operational efficiency within the same industry. Xiao & Liu (2016) investigated the impact of merger goodwill on the profitability of companies. The authors analysed information industry companies from Shanghai and Shenzhen from 2008 to 2012. As dependent variable, the authors used return on total assets (ROA), and independent variables are goodwill scaled by total assets (GW), fixed assets scaled by total assets (FA), intangible assets scaled by total assets (IA), and dummy variable where companies with goodwill were marked with 1. The authors found a positive relationship between the proportion of goodwill and return on total assets, and they concluded that an increase in goodwill proportion could improve profitability (Xiao & Liu, 2016, p. 755). On the other hand, Chauvin & Hirschey (1994) found no strong statistically significant relationship between goodwill and profitability. The authors analysed 2,693 Compustat companies with at least $100 million in market capitalisation for 1989-1991. Authors found that goodwill has a generally positive and statistically significant effect on the company's market value for the nonmanufacturing sector but not for manufacturing companies (Chauvin & Hirschey, 1994, p. 176). However, "a modest positive but statistically insignificant relation exists between goodwill and profitability" (Chauvin & Hirschey, 1994, p. 176). In a study of the banking sector, Adhikari et al. (2023) analyse return on equity (ROE) and find that profitability does not automatically improve after goodwill is reflected on the balance sheet through M&A transactions. Poramapojn & Wiboonchutikula (2023) also found no statistically significant association. Authors examined factors determining goodwill value and its effect on a company's future performance. They analysed 100 Thailand M&A deals from 2008 to 2019, of which 61 had positive goodwill, and 39 had zero goodwill. The authors' results include an estimation of the core goodwill and abnormal goodwill impact on the future ROA. They did not find statistically significant effects on the acquirer's future performance in the first three years after acquisition (Poramapojn & Wiboonchutikula, 2023, p. 14). On the other hand, Gao et al. (2023) hypothesised that high-premium M&A goodwill with performance commitments negatively impacts the company's profitability, which cannot be seen during the M&A process. The authors gathered data from 143 companies listed on GEM between 2013 and 2015 to conduct the research. They calculated return on equity (ROE) to indicate companies' profitability. "ROE can measure the efficiency of capital use and reflect the capability of an enterprise to obtain net income with their equity capital." (Gao et al., 2023, p. 1469). By applying an appropriate regression model, authors confirmed the hypothesis, i.e., "a significant negative correlation can be seen between GW and ROE in t at 1% level, indicating that the M&A

goodwill generated by high-premiums has a significant negative impact on the profitability in the current period t" (Gao et al., 2023, p. 1472). The result is also statistically significant for future periods (following four years), where the authors concluded that negative effects become more significant after the performance commitment period and that the impact on profitability is long-term (Gao et al., 2023, p. 1474). In addition, Tomas Žiković, Arbula Blecich and Vranješ (2024), who analysed the influence of internal and external determinants on the profitability of 181 large and listed companies in Western Europe by applying regression analysis, determined that more profitable companies are characterised by lower indebtedness and a higher share of fixed assets in total assets, which is also relevant in the context of M&A that is realised by borrowing, which can negatively affect profitability. Therefore, the positive effects of acquisitions on profitability may be marginalised by financing expenses, especially in conditions of high leverage that accompany premium acquisitions with recorded goodwill. However, Pechlivanidis et al. (2022) evaluated the predictive ability of goodwill and other intangible assets to forecast corporate profitability. Using the sample of 67 Greek-listed companies, which applied IFRS as a financial reporting framework from 2005 to 2018, they tested the performance of the LSTM model (long short-term memory networks) in predicting corporate profitability. Results of the research showed that model trained with goodwill, other intangible assets, stockholders' equity, leverage, size, and other assets achieves better root mean squared error (RMSE) values for all the calculated outputs (Pechlivanidis et al., 2022, p. 69). "Thus, the results of our model suggest that goodwill and other intangible assets indeed contribute to the effectiveness of our LSTM prediction model." (Pechlivanidis et al., 2022, p. 69). Nevertheless, in the context of the role of management structures in shaping financial performance, Žmuk and Bradaš (2026) found a statistically significant positive relationship between formal compliance with the Corporate Governance Code and ROA in a sample of 46 Croatian listed companies, but without a significant relationship with market value. Since the ESGOV index measures formal compliance rather than actual governance quality, the authors conclude that the findings point to associations rather than causation. Analogously, in this paper we question whether the statement of goodwill, which is a formal accounting consequence of the acquisition strategy, is a reliable signal of future profitability or just a reflection of a management decision whose effect does not have to materialise in a measurable improvement of financial performance. Related to this, a review of previous research on the relationship between reported goodwill and acquirer profitability reveals heterogeneous findings with no clear consensus. While Xiao & Liu (2016) document a positive relationship between the share of goodwill and ROA, Gao et al. (2023) find a significant negative effect for high-premium acquisitions. Chauvin & Hirschey (1994), Adhikari et al. (2023), and Poramapojn & Wiboonchutikula (2023) do not find a statistically significant relationship in the short term. Poramapojn & Wiboonchutikula (2023) also show that the direction and intensity of the effect depend on the nature of goodwill and the target company's characteristics, suggesting that goodwill is not a homogeneous category. This

contextual dependence justifies research in the specific environment of Croatian large groups, where institutional and market conditions may generate patterns that differ from those observed in developed capital markets.

2.3. Goodwill impairment and profitability

In addition to the question of whether reported goodwill is a signal of future profitability, it is particularly relevant to investigate how goodwill impairment affects the profitability of the acquirer – and whether this effect is conditioned by managerial discretion in recognising impairment. Thus, the authors that analysed the influence of corporate governance on disclosing goodwill as KAM also investigated the effects of profitability to disclosing goodwill as KAM in audited financial statements of a company. The authors confirmed a negative relationship and concluded that "auditors are less likely to disclose an impairment of goodwill as a KAM in companies with higher profitability" (Gonçalves et al., 2023, p. 9). This finding has an important implication from the aspect of the agency problem – the management of more profitable companies is exposed to less audit oversight related to goodwill impairment, because it does not report it as KAM, which potentially leaves it with more room for discretionary deferral of the recognition of impairment and thus protects reported profitability. Additionally, Šodan, Perica and Ćurković (2023), who investigated the impact of agency conflicts in owner-manager-creditor relationships on the quality of financial reporting in a sample of large, medium-sized and small companies from Croatia, Serbia and Slovenia, found that the level of financial leverage significantly reduces the quality of earnings, while the type of ownership has no statistically significant effect. This finding is conceptually close to the issue of managerial discretion in testing goodwill for impairment. In the context of high leverage, managers are under additional pressure that may encourage the opportunistic use of accounting discretion to protect reported financial results, which, in the case of goodwill, manifests itself as a delay in recognising impairment.

Kabir & Rahman (2016) found that the likelihood of goodwill impairment loss is associated negatively with pre-impairment income, regardless of the strength of corporate governance. Furthermore, the "likelihood of impairment loss is associated with sales growth, change in cash flow, book-to-market ratio and GDP growth rate only in the stronger governance sub-sample" (Kabir & Rahman, 2016, p. 34). Finally, the authors concluded that the goodwill impairment losses are higher in the first year of a CEO's tenure; thus, they "highlight the need for boards (including the audit committee) and for auditors to pay more attention to the opportunistic use of accounting discretion in assessing goodwill impairment" (Kabir & Rahman, 2016, p. 34). Poramapojn & Wiboonchutikula (2023), found that, when including control variables (size, growth perspective, fixed assets turnover, and lagged profitability), "core goodwill in interaction with its inherent strengths has a significantly positive effect on its profitability in all three periods following an acquisition. In contrast, abnormal goodwill in interaction with a

target's size has a significant negative impact in the first two years but thereafter has no effect. The findings imply that good growth prospects are required for an acquirer to fully exploit the earnings power of goodwill." (Poramapojn & Wiboonchutikula, 2023, p. 15) These results are consistent with those of Just et al. (2023), who, using panel regression on a sample of 2,660 transactions, found that the change in goodwill (premium paid) is strongly negatively related to future ROA and ROE indicators two years after the transaction. Gao et al. (2023) also confirm the negative association. Finally, Deng (2025) finds that managers often use discretionary power to avoid goodwill impairment during periods when profitability is already under pressure, a finding that is further corrected by CEOs' accounting competence.

3. METHODOLOGY AND SAMPLE

To date, numerous researchers have extensively studied the effect of goodwill on diverse dimensions of a company's business operations. The authors have obtained conflicting outcomes when investigating the impact of recognising goodwill on financial performance, i.e., the company's profitability. The primary objective of this paper is to examine whether the occurrence of goodwill impairments impacts the decrease in the financial performance and overall asset value of large Croatian groups. In this sense, the research includes three research questions:

- RQ1: Is there a connection between goodwill impairment and changes in total assets of large Croatian groups?
- RQ2: Does the profitability of those large Croatian groups that have goodwill reported in the balance sheet differ from those that do not?
- RQ3: Is there a connection between goodwill impairment and the actual profitability of large Croatian groups?

By conducting an exploratory analysis through which we will analyse the impact and significance of goodwill impairment on the financial position and financial performance of large groups in Croatia, this study contributes to the results of existing research, especially in the context of a transitional economy that has not been the subject of a systematic analysis of this issue so far.

Following IAS 36 *Impairment of Assets*, entities must conduct goodwill impairment tests annually. Thus, "an impairment loss shall be recognised for a cash-generating unit (the smallest group of cash-generating units to which goodwill or a corporate asset has been allocated) if, and only if, the recoverable amount of the unit (group of units) is less than the carrying amount of the unit (group of units)." (IFRS Foundation, 2013, para. 104). In case when the recoverable amount is higher, the entity does not record any changes in its books. In that context, we assume that if a goodwill changes between two periods (dGW) are positive for entities in the sample, there was a case of a new acquisition. If the difference is negative, goodwill impairment occurs (1).

$$dGW+ \rightarrow acqusition$$
$$dGW- \rightarrow goodwill\ impairment \quad (1)$$

The assumption we used consistently throughout the analysis of the research questions, including the first research question (RQ1), which examined the connection between goodwill impairment and changes in total assets. To carry out the analysis, we filtered the sample to exclude observations with positive goodwill differences between the two periods. We analysed only those observations with negative goodwill changes. Mathematically, there is a clear connection between the impairment of goodwill and the decrease in the value of total assets, since the impairment simultaneously generates an expense in the profit and loss account that is reflected in the decrease in the book value of the asset. An open question, however, is how strong this relationship is relative to other factors that shape the change in total assets. In this sense, changes in total assets (dTA) are mathematically determined by changes in fixed assets (dFA) and changes in current assets (dCA), which can be written as (2):

$$dTA = f(dFA, dCA) \quad (2)$$

Furthermore, we have decomposed asset types to obtain more robust results and used them as control variables. Those variables are changes in tangible assets (dTanA), changes in inventories (dINV), changes in account receivables (dAR), changes in cash (dCash), and changes in accruals (dAVR). The function can be expressed as follows (3):

$$dTA = f(dGW-, dTanA, dINV, dAR, dCash, dAVR) \quad (3)$$

In case when entity buys another company at a higher price than fair value of its net assets, it is assumed that it expects some future economic benefits in the form of higher income resulting in higher profit. Given the premise, we investigated whether profitability rates differ between large Croatian groups that report goodwill in their financial statements and those that do not (RQ2). As a starting point for comparison, we determined the average profitability of the sample. We examined whether the profitability rates of groups with reported goodwill (GW > 0) and groups without reported goodwill (GW = 0) deviate from this average value.

We measure profitability by applying return on equity (ROE) and different return on total assets (ROA) indicators. This can be expressed as follows (4):

$$GW > 0 \rightarrow profitability > average\ profitability$$
$$GW = 0 \rightarrow profitability < average\ profitability \quad (4)$$

TO conduct the research, we created appropriate dummy variables. Observations with expressed goodwill we coded with one, and observations in which goodwill is zero, code zero was assigned. Furthermore, if the profitability indicator for a certain observation was above average, code one was assigned, and if it was below average value, code zero was assigned.

Finally, given that goodwill impairment, in addition to reducing assets, also results in losses that directly affect profitability, we investigated whether there is a noticeable relationship between goodwill impairment and the profitability of large Croatian groups.

The profitability of entities is measured by return on total assets (ROA), which is calculated as the ratio of earnings before interest after taxes (NetPr + IE) and total assets (TA) (5):

$$ROA = \frac{NetPR+IE}{TA} \quad (5)$$

Thus, the relationship between profitability and goodwill can be expressed as (6):

$$ROA = f(dGW-) \quad (6)$$

To conduct the research, we obtained data for large Croatian groups from the Financial agency (official Croatian agency responsible for establishing, maintaining, and managing the registry and collecting data from annual financial statements). During the observed period from 2010 to 2021 there was in total 321 large groups in Croatia (criteria for the group size are defined by the Accounting Law). Significant proportion of groups was classified as large group for just one observed period (17%), or for two periods (11%). Considering that we observed changes between years, to obtain more robust results we removed all entities for which we did not have available data for at least six years. The continuity of years of operation is important for the calculation of lagged variables. Final sample covered by the research includes 152 groups making 1,405 observations. Thus, gathered data makes panel data or longitudinal data, i.e., dataset which includes both cross-sectional (*id*) and time-series (*t*) dimensions. In our sample, panel data includes large groups (id) where i = 1, …, N, N = 152, and year (t) where t =1, …, T, T = 12.

When comparing total turnover (EU code 12110), defined as the total accrued incomes from market sales of goods or services to third parties, except for deductible VAT, where incomes classified as financial, other, and extraordinary ones are excluded (Croatian Bureau of Statistics, 2026), to the sum of sales revenues of groups covered by the sample, it can be seen that groups in the sample make between 22 and 36 percent (depending on the observed year) of total turnover at the country level (Table 1). Considering those results, it can be concluded that analysed groups, indeed, makes significant part of Croatian economy. Finally, comparing to total revenues, which includes financial and other revenues, sales revenues make over 90% of total revenues.

Table 1 Annual turnover of enterprises at national level and chosen indicators for sample, observed by years (amounts in millions of EUR)

Year	Turnover (Structural Business Statistics)	Sale (groups in the sample)	Proportion of sale in turnover	Total revenues (groups in the sample)	Proportion of sales in total revenues
2010	75,500	20,495	0.272	22,311	0.919
2011	76,437	22,246	0.291	24,160	0.921
2012	75,100	23,341	0.311	25,326	0.922
2013	75,315	24,542	0.326	26,867	0.914
2014	75,551	25,343	0.335	27,707	0.915
2015	78,488	28,426	0.362	31,266	0.909
2016	81,137	20,798	0.256	23,351	0.891
2017	86,488	26,635	0.308	29,258	0.910
2018	92,363	27,303	0.296	29,795	0.916
2019	95,262	21,851	0.229	23,723	0.921
2020	87,088	19,445	0.223	21,314	0.912

Source: Authors' calculation

Analysed groups on average employed 1,803 employees, had average value of total assets 310.17 million EUR, generated total revenues on average 205.09 million EUR, and on average they were profitable with an average net profit of 3.63 million EUR (Table 2).

Table 2 Average and median value of number of employees, total assets, total revenues, and net profit for the groups included in the final sample (152), observed by year (amounts in millions of EUR, except employees' number)

Year	Employees number		Total assets		Total revenues		Net profit	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2010	2,048	830	335.40	123.27	223.11	84.90	5.87	0.98
2011	2,071	723	337.09	120.27	232.31	96.25	5.96	1.03
2012	1,978	773	321.80	122.88	226.12	89.63	1.66	0.67
2013	1,742	735	288.11	114.49	200.50	73.48	3.17	1.28
2014	1,835	702	299.16	112.06	192.41	69.29	2.58	1.40
2015	1,772	726	299.62	113.09	207.06	71.19	6.55	1.40
2016	1,451	655	274.10	119.58	166.79	77.45	5.51	2.02
2017	1,899	715	309.65	125.64	215.13	83.79	-7.94	2.31
2018	1,911	703	307.05	106.78	220.70	83.95	6.27	2.35
2019	1,639	745	314.77	108.06	201.04	93.43	8.28	2.83
2020	1,583	744	319.61	103.63	183.74	85.56	2.66	2.98
2021	1,968	744	537.52	112.23	205.13	114.35	6.15	5.38
Total	1,803	730	310.17	114.86	205.09	83.10	3.63	1.63

Source: Authors' calculation

Taking all into account, we consider that chosen sample is appropriate and representative to make conclusions regarding the impact of goodwill on groups solvency and profitability. As mentioned earlier, the data is in panel form, thus we analysed it by applying appropriate panel data models.

Using panel data, instead of one-dimensional data, allows a data analysis for the same sample at various points in time which results in more accurate estimators and test statistics with increased power (Wooldridge, 2010, p. 427). Data collection for this study was conducted in the first half of 2022, when a significant number of large Croatian groups had not yet published consolidated financial statements for the 2021 financial year, resulting in incomplete data for the last year of the observation period. Considering that many groups were not classified as large during the entire 12-year period (2010–2021) and that many groups had not published financial statements for 2021 at the time of data collection, our data constitute an unbalanced panel. Although an extension of the sample to more recent years would be possible, such an extension would require the re-collection and processing of data for all large groups to maintain consistency and comparability throughout the observation period, necessitating the re-performing of the full analysis. In addition, according to the Institute of Mergers, Acquisitions & Alliances, the number of completed acquisitions decreased globally and in Europe after 2021, so we believe that expanding the period under consideration would not yield significantly different results (Institute for Mergers, 2025). Thus, we retained the period 2010–2021 as a methodologically coherent and internally consistent time frame for the analysis. Thus, unavailable data is treated as missing (NA), and T is allowed to be different across observations where time is denoted as $\{t_{i1}, \ldots, t_{iTi}\}$. Finally, data is long data considering that number of groups (N) is larger than number of time periods (T), i.e., N>T. Groups in the sample are denoted with i and years with t. Although, panel data can be analysed by using dynamic or static models, and assuming linear or non-linear relationships, most authors use static models and assume linear relationship between dependent and independent variables (Farhan et al., 2020; Fenyves et al., 2019; Gupta et al., 2020; Hristova et al., 2020; Koku, 2011; Leahy, 2012; Lim & Rokhim, 2020; Mohammadzadeh et al., 2013). Respecting that, general form of panel data model can be written as (7):

$$y_{it} = g(x_{it}, \varepsilon_{it}, \alpha_i; \theta) \tag{7}$$

where y_{it} represents dependent variable and x_{it} is a vector of explanatory variables for group i and year t, α_i is an unobserved explanatory variable, ε_{it} are errors, and θ is the vector of parameters to be estimated by the chosen approach (Honoré & Lewbel, 2002).

As well as most authors, we also assume linearity between observed variables, thus, model respecting linearity written with included error (ε_{it}) is as follows (8):

$$y_{it} = \beta_0 + x_{it}\beta_i + \alpha_i + \varepsilon_{it} \tag{8}$$

where, by definition, $E(u_{it} \mid x_{it}, \alpha_i) = 0$, and ε_{it} represents idiosyncratic errors or idiosyncratic disturbances because these change across t as well as across i (Wooldridge, 2010, p. 285).

When analysing panel data, researchers usually apply pooled ordinary least square (OLS) model in which time is dummy variable, fixed effects (FE) model, or random effects (RE) model depending on results of heteroscedasticity and auto-correlation tests and analysis purpose.

Each model involves specific methods for estimating unobserved effects as differencing or time-demeaning and include different assumptions. The OLS model might seem too rigid as it maintains the same value for β throughout every period. Additionally, it requires homoscedastic errors (constant error variance for all observations) and prohibits first-order correlation (Wooldridge, 2010, p. 191).

When analysing data with fixed- or random-effects models, a key distinction is how they handle unobserved effects (α_i) for N observations and T periods. Fixed effects allow correlation between these unobserved effects (α_i) and the vector of explanatory variables (x_{it}), while random effects assume independence between them. This means that $Cov(x_{it}, \alpha_i)=0$ *for* $t=1,2,\ldots,T$ (Baltagi, 2005; Wooldridge, 2010). Researchers often debate which model to use in their research. The fixed-effect model is typically used when the research objective is to investigate a specific sample of data (n) without concluding about the overall population. On the other hand, the random-effect model is appropriate when generalising conclusions related to a population (Arellano et al., 2004; Hsiao, 2014; Sherron & Allen, 2000). According to Sherron & Allen (2000), a fixed-effects model is appropriate when dealing with a large sample, whereas a random-effects model is better suited for a smaller sample. The primary distinction between the two models is how they treat effects (α_i) as either fixed or random. No differences exist in cases where N is constant, and T is extensive. However, when T is limited and N is significant, there may be differences in the parameter estimates (Hsiao, 2014, p. 48). "In fact, when only a few observations are available for different individuals over time, it is exceptionally important to make the best use of the lesser amount of information over time for the efficient estimation of the common behavioral relationship." (Hsiao, 2014, p. 48) A fixed-effects model would be appropriate based on our analysis of the high proportion of covered large groups during the observed period. However, we conducted tests to ensure we chose the best model based on methodological aspects and data characteristics.

4. RESEARCH RESULTS AND DISCUSSION

As earlier elaborated, as a first step of the analysis, we cleaned the obtained data by excluding all groups for which we had data for less than six years. Additionally, by creating lagged variables, we will manage data for at least five years for all groups included in the sample. Of 321 groups classified as large within the observed period (2010-2021), the final sample contains 152 or 47.35% of groups. Data excluded from further analysis comprise 23.64% of observations, i.e., we deleted 435 observations.

An important issue in the financial reporting process for management and external auditors is the yearly testing of goodwill for impairment. The question is if goodwill needs to be impaired between two periods. In accordance with IAS 36, if the carrying amount of the cash generating unit exceeds the recoverable amount of the unit, the entity shall recognise the impairment loss, and in case when recoverable amount of the cash generating unit exceeds the carrying amount of the unit, the unit and the goodwill allocated to that unit shall be regarded as not impaired. Mathematically, from the financial position and performance aspects, impairing goodwill results in assets decrease and recording expenses which reduces financial result for the year. Although the consequences of goodwill impairment are clear at the level of an individual transaction, the question arises whether they are also visible in overall changes in the company's assets and financial performance. In this regard, we are questioning the size of the acquisitions carried out in relation to the total assets of the company – that is, the question is how strongly an individual acquisition shapes the change in the asset structure on the one hand, and to what extent the expected future economic benefits from that acquisition, measured by the achieved financial performance, are actually materialised on the other hand. Moreover, the target companies in acquisitions are often significantly smaller than the companies that take them over, which means that the goodwill generated usually constitutes only a modest share of the total assets of the acquiring group – even in situations where the amount of consideration transferred for the acquisition of the target company's identifiable net assets is in itself significant. In our sample, on average, goodwill makes 2.68% of total assets of the observations and the median is 0.95%. The greatest share of goodwill in total assets has a group with 29.71%, and 75% of observations have a share of goodwill in total assets less than 3.69% (Table 3). The obtained results are aligned with the research results of the European Financial Reporting and Advisory Group (EFRAG) by which goodwill makes approximately 3.7% of the total assets. The second fact is that, in stable business conditions, overall changes in the value of total assets of largest and most stable entities, usually are not enormous. Thus, median of change of total assets for observations in our sample without goodwill reported was 1.08%, for those with no difference in goodwill between years 0.06%, and for those with goodwill impairment -1.28% which suggest a potential association (RQ1).

Table 3 Proportion of goodwill in total assets for groups with goodwill impairment

	Percentile 05	Percentile 25	Percentile 75	Percentile 95	Percentile 99
pGWTA	0.0000	0.0017	0.0369	0.1032	0.1843

Source: Authors' calculation

To investigate if goodwill is impaired between two years, we calculated the difference of goodwill as $dGW = GW_t - GW_{(t-1)}$ where GW is goodwill in period *t* or period *(t-1)*. Additionally, to obtain better information value from the sample, we created a qualitative variable which includes information on goodwill status for all

observations. Thus, we can see that for 197 or 14.23% observation difference of goodwill is positive, which we assume that represents acquisition in *t* year ($GW_t > GW_{(t-1)}$). Furthermore, 192 or 13.67% of observations did not report a difference in goodwill value between two years (Table 4). Of a total of 1,253 observations (number of observations without first year observed), 219 of them note goodwill impairment. That makes 15.59% of observations in final sample, or 17.48%, without first-year observations.

Table 4 Frequencies of goodwill status for every observation in the final sample

Goodwill *status*	Count	%
Acquisition	197	14.23
First observed year for group	152	10.82
Goodwill impairment	219	15.59
No difference in goodwill between two periods	192	13.67
No goodwill reported	642	45.69
Missing year	3	0.21
TOTAL	1,405	100.00

Source: Authors' calculation

In the context of the first research question (RQ1), only observations that recorded a negative change in goodwill between consecutive periods ($dGW < 0$) were selected from the total sample, and these were analysed as an indicator of a reduction in goodwill in year *t*.

Thus, the sample for analysing how goodwill impairment affects the value of total assets includes 219 observations representing 79 groups. Almost 75% of groups impaired their goodwill value in three years, of which 25 groups or 31.65%, impaired goodwill in just one observed year, 16.46% in two years, and 26.58% in three years (Table 5). Only one group impaired goodwill in nine years and one in eight observed years.

Table 5 Structure of the groups by number of years in which they impaired goodwill

Number of years	Number of groups that impaired goodwill	%	Cumulative %
1	25	31.65	31.65
2	13	16.46	48.10
3	21	26.58	74.68
4	8	10.13	84.81
5	4	5.06	89.87
6	6	7.59	97.47
8	1	1.27	98.73
9	1	1.27	100.00
TOTAL	79	100.00	-

Source: Authors' calculation

The dependent variable in the regression model is a difference in total assets between two years (dTA). Next to negative value of goodwill change between years (-dGW), we calculated additional independent variables: difference in tangible assets (dTanA), difference in intangible assets without goodwill (dIntanA_wogw), difference in

inventories (dINV), difference in accounts receivable (dAR), difference in cash (dCASH), and difference in prepayments and accrued income (dPAI).

Table 6 Descriptive statistics of variables relevant for H1 (values in EUR)

	Count	Mean	Standard Deviation	Median	Minimum	Maximum
GW/TA	219	0.027	0.041	0.010	0.000	0.297
-dGW	219	-283,576	1,303,690	-35,332	-16,650,023	0
dTA	219	458,429	22,181,171	-98,646	-63,415,238	305,097,747
dFA	219	14,516,676	44,030,448	4,203,021	-13,012,455	561,753,316
dCA	219	99,128	7,185,299	-50,234	-28,061,242	73,984,444
dTanA	219	354,873	14,958,274	-56,369	-32,588,386	205,747,216
dIntanA_wogw	219	-308,622	9,517,049	-8,016	-109,828,146	61,257,358
dINV	219	192,186	3,454,474	0	-11,467,589	40,162,984
dAR	219	-400,574	2,414,231	-66,429	-19,059,802	12,172,203
dCASH	219	73,907	2,188,392	13,231	-15,624,810	24,573,405
dPAI	219	-67,723	538,774	-574	-4,724,435	3,852,476

Source: Authors' calculation

Descriptive statistics indicate that the average value of goodwill impairment (-dGW) for all observations was 284 thousand EUR with a standard deviation of 1.3 million EUR (Table 6). The most considerable single value of goodwill impairment was 16.65 million EUR. On average, goodwill makes 2.68% of total assets (GW/TA). Observed by the assets type, the most significant change between the two periods had fixed assets (dFA) which on average increased by 14.52 million EUR. Conversely, current assets had the lowest average increase of 99.13 thousand EUR. Contrary to that, accounts receivables (dAR) and intangible assets without goodwill included (dIntanA_wogw), on average, decreased their value between the two periods. Finally, the median shows that half of the observations encountered a decrease for most types of assets.

Table 7 Pearson correlation coefficient of variables relevant for H1

Correlations	-dGW	dTA	dFA	dCA	dTanA	dIntanA wogw	dINV	dAR	dCASH	dPAI
-dGW	1.000	-.243**	-.232**	-0.028	-.138*	.460**	0.006	.520**	0.053	.496**
dTA	-.243**	1.000	.792**	.777**	.975**	.364**	.760**	.571**	.846**	.661**
dFA	-.232**	.792**	1.000	.565**	.790**	.169*	.678**	0.117	.535**	.312**
dCA	-0.028	.777**	.565**	1.000	.737**	-.159*	.760**	.655**	.686**	.494**
dTanA	-.138*	.975**	.790**	.737**	1.000	.242**	.712**	.525**	.836**	.668**
dIntanA wogw	.460**	.364**	.169*	-.159*	.242**	1.000	0.125	.411**	.249**	.552**
dINV	0.006	.760**	.678**	.760**	.712**	0.125	1.000	.401**	.571**	.517**
dAR	.520**	.571**	0.117	.655**	.525**	.411**	.401**	1.000	.636**	.518**
dCASH	0.053	.846**	.535**	.686**	.836**	.249**	.571**	.636**	1.000	.509**
dPAI	.496**	.661**	.312**	.494**	.668**	.552**	.517**	.518**	.509**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Source: Authors' calculation

The correlation matrix shows statistically significant correlations between variables (Table 7). As expected, changes in total assets (dTA) are statistically significantly positively related with all other types of assets except with goodwill impairments (-dGW), where is present statistically significant but negative correlation of medium strength (-0.243). This means that if goodwill impairments occur, the change in total assets is negative, i.e., total assets decrease, as expected. The most significant correlation (0.520) of goodwill impairment is with changes in accounts receivable (dAR), changes in prepayments and accrued income (dPAI), and changes in intangible assets other than goodwill (dIntanA_wogw).

Firstly, we investigated the relationship of goodwill impairments with changes in total assets exclusively by constructing a model in which total asset changes is dependent and goodwill impairments are independent variables (Table 8). The results of the Hausman test (p=0.1518) and the Breusch and Pagan Lagrangian multiplier test (p=1.000) indicate that pooled OLS is the best fit for data. In this case, also occur heteroskedasticity (p=0.000) and autocorrelation (p=0.000) problems; thus, we applied clustered robust errors. However, the model is not statistically significant, which indicates that goodwill impairments (dGW-) do not significantly impact changes in total assets (dTA).

Table 8 Results of pooled OLS regression (model 2)

Number of observations =						213
F(1, 76) =						1.13
Prob > F =						0.2922
R-squared =						0.059
Root MSE =						1.20E+09
Dependent variable =						dTA
Independent variables	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
dGW-	7.3605	-1.0600	0.2920	-22.4670	6.8523	-7.8074
_cons	4.03E+07	-1.63	0.107	-1.46E+08	1.45E+07	-6.58E+07

Source: Authors' calculation

Finally, our model related to the first research question includes variables for changes in different types of assets, of course, including goodwill impairments (Table 9). In this case, the Hausman test indicates that using fixed effects is appropriate (p=0.0002). Modified Wald test for groupwise heteroskedasticity in fixed effect regression model with the value of p=0.000 suggests the existence of a heteroskedasticity problem. Still, according to the Wooldridge test for autocorrelation, there is no problem with serial correlation (p=0.2727). We applied robust errors to the fixed effects model to deal with heteroskedasticity. As expected, the model is statistically significant (F=24774.98, p=0.000) and explains 98.53% of the variability. The result of the model indicates that changes in cash (dCASH) and PAI (dPAI), as well as goodwill impairments (dGW-), do not statistically significantly change total assets.

Table 9 Results of fixed-effects regression (model 3)

Fixed-effects (within) regression			Number of observations =		213
Group variable: id			Number of groups =		77
R-sq:			Observations per group:		
within =	0.9946		min =		1
between =	0.9761		avg =		2.8
overall =	0.9853		max =		9
			F(7,76) =		24774.98
corr(u_i, Xb) =	-0.3792		Prob > F =		0.0000
Dependent variable =		dTA			
	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
dGW-	-0.6289	0.7905	-0.8000	0.4290	-2.2034	0.9455
dTanA	1.2276	0.0786	15.6200	0.0000	1.0711	1.3841
dIntanA_wogw	0.5291	0.0618	8.5500	0.0000	0.4059	0.6522
dINV	1.2277	0.1403	8.7500	0.0000	0.9482	1.5072
dAR	1.1192	0.1649	6.7900	0.0000	0.7907	1.4477
dCASH	-0.5429	0.5467	-0.9900	0.3240	-1.6317	0.5459
dPAI	0.3445	0.8138	0.4200	0.6730	-1.2762	1.9653
_cons	-2281832	1.05E+07	-0.2200	0.8290	-2.32E+07	1.86E+07

Source: Authors' calculation

According to obtained results, the most significant effect on total assets changes has a change in tangible assets (dTanA) (coefficient 1.228), followed by changes in inventory (dINV) (coefficient 1.228) and changes in accounts receivable (dAR) (coefficient 1.119). These results are rather expected, considering the features and purpose of current assets. In the context of the first research question (RQ1), the analysis results indicate no statistically significant relationship between changes in total assets and impairment of goodwill. Such a finding is not surprising, as 75% of observations with impairment of goodwill have a share of goodwill in total assets of less than 3.69% (Q3, Table 3). Therefore, although mathematically impairment of goodwill decreases assets, this economic effect is statistically difficult to detect in the case of Croatian groups, given the high variability of other asset components. In this sense, the absence of a statistically significant relation does not imply the absence of an economic effect of impairment of goodwill. Still, it highlights the model's limitation in isolating the effects of this variable, whose share in the dependent variable is negligible. At the same time, the results show that large Croatian groups are primarily driven by their operational activities, since changes in inventories and trade receivables, as well as changes in long-term tangible assets, which may imply certain investment cycles, primarily drive changes in total assets.

The second research question (RQ2) concerns whether there are differences in profitability between groups with goodwill on the balance sheet and those without. Considering that the group with goodwill expects returns for a higher price paid for the acquired entity, we expect that those groups have higher profitability indicators. To investigate this question, firstly, we created a dummy variable where we assigned 1 to those groups with reported goodwill in any period

and 0 to the groups that did not report goodwill in financial statements for any observed period. Of 152 groups, 55 did not have reported goodwill during the analysed years. Contrary to that, 97 had positive goodwill value in at least one year. Therefore, the number of observations for groups without goodwill is 478, and for groups with goodwill 927.

Table 10 Profitability ratios formulas

Financial indicator	Abbreviation	Numerator	Denominator
Return on equity	ROE	Net profit	Total equity
Return on assets	ROA1	Net profit	Total assets
Return on assets	ROA2	Earnings before interest and taxes	Total assets
Return on assets	ROA3	Net profit + Interest expenses	Total assets
Return on assets	ROA4	Net profit + Interest expenses (without g_IE)	Total assets

Source: Žager et al. (2020)

Practitioners and researchers usually use a wide range of indicators to measure profitability. However, the most used are return on assets (ROA) and return on equity (ROE). Thus, we calculated ROE and several variations of ROA for research purposes (Table 10).

Table 11 Mean values of calculated profitability ratios classified by goodwill status

Dummy_GW	n	ROE	ROA1	ROA2	ROA3	ROA4
0	478	0.0612	0.0132	0.0382	0.0328	0.0304
1	927	0.0653	0.0129	0.0390	0.0342	0.0324
Total	1405	0.0639	0.0130	0.0387	0.0337	0.0317

Source: Authors' calculation

Table 12 Median values of calculated profitability ratios classified by goodwill status

Dummy_GW	ROE	ROA1	ROA2	ROA3	ROA4
0	0.043705	0.016705	0.041116	0.036903	0.035398
1	0.053426	0.018006	0.042282	0.037718	0.036622
Total	0.051603	0.017545	0.042089	0.037446	0.036278

Source: Authors' calculation

Descriptive statistics show minimal differences in profitability between goodwill and no-goodwill groups (Table 11 and Table 12). The average ROE for all observations is 6.39%; for observations without goodwill, the average ROE is 6.12%; and for goodwill observations, the average ROE is 6.53%. The results are the same for all variations of ROA except the one calculated as the ratio of net profit and total assets, where no-goodwill observations have a higher average result

(1.32%) than goodwill observations (1.29%). The difference is nearly negligible. We used a parametric ANOVA test to test the statistical significance of differences.

Table 13 Kolmogorov-Smirnov's and Shapiro-Wilk's tests of normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
ROE	0.176	1339	0.000	0.828	1339	0.000
ROA1	0.185	1339	0.000	0.773	1339	0.000
ROA2	0.144	1339	0.000	0.822	1339	0.000
ROA3	0.155	1339	0.000	0.793	1339	0.000
ROA4	0.156	1339	0.000	0.789	1339	0.000

a. Lilliefors Significance Correction

Source: Authors' calculation

The assumption of applying a parametric test, among others, assumes the normality of distribution. Considering that the premise is often not met, it is acceptable to use a parametric test if the sample is large enough and homogeneity of variance exists. Kolmogorov-Smirnov and Shapiro-Wilk confirm that data for observed variables are not normally distributed (Table 13). However, by applying Levene's test for equality of variances, we confirmed the existence of homogeneity ($p>0.050$) for all observed variables except for ROE. Nevertheless, the results for all profitability indicators show no statistically significant differences between groups that reported goodwill in their financial statements compared to those without goodwill reported considering that the p-value is greater than the significance level of 5% (Table 14).

Table 14 Test for homogeneity of variance and equality of means for observed profitability indicators

	Equal variances	Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff.	Std. Error Diff.	95% Confidence Interval of the Diff.	
									Lower	Upper
ROE	assumed	11.444	0.001	0.384	1337.000	0.701	0.004	0.011	-0.017	0.025
	not assumed			**0.431**	1234.811	0.666	0.004	0.010	-0.015	0.023
ROA1	assumed	0.999	0.318	**-0.052**	1400.000	0.958	0.000	0.006	-0.011	0.011
	not assumed			-0.053	1020.734	0.958	0.000	0.006	-0.011	0.011
ROA2	assumed	0.266	0.606	**0.164**	1400.000	0.870	0.001	0.005	-0.010	0.012
	not assumed			0.167	1015.088	0.867	0.001	0.005	-0.010	0.011
ROA3	assumed	0.486	0.486	**0.262**	1400.000	0.793	0.001	0.005	-0.009	0.012
	not assumed			0.268	1023.784	0.789	0.001	0.005	-0.009	0.012
ROA4	assumed	0.354	0.552	**0.389**	1400.000	0.697	0.002	0.005	-0.008	0.013
	not assumed			0.398	1026.856	0.691	0.002	0.005	-0.008	0.012

Source: Authors' calculation

To confirm obtained results, considering that the assumption of a normal distribution is not met, we applied a nonparametric version of ANOVA, the Mann-Whitney U test, which compares differences between independent groups when data is not normally distributed (Table 15).

Table 15 Results of Mann-Whitney U test

	ROE	ROA1	ROA2	ROA3	ROA4
Mann-Whitney U	193694	217803	218745	219347	217696
Wilcoxon W	297890	332284	333226	333828	332177
Z	-1.138	-0.422	-0.291	-0.207	-0.437
Asymp. Sig. (2-tailed)	0.255	0.673	0.771	0.836	0.662

a. Grouping Variable: Dummy_GW

Source: Authors' calculation

The results of Mann-Whitney U confirm the previous conclusion that there are no statistically significant differences in profitability between observed groups, i.e., goodwill and no-goodwill groups. Therefore, the analysis found no significant differences in profitability across the observed financial indicators (RQ2). In this context, the question is, do acquirees manage to achieve predicted results in improving the efficiency and effectiveness of business operations resulting from the acquisition? No differences in profitability may result from several reasons. For example, integration costs, such as restructuring costs, in the first years of acquisitions may push profitability below the expected level. In addition, acquirers may have overpaid for acquired companies based on expected future economic benefits. Finally, the objectives of acquisitions need not be related to a significant increase in profitability. This result may indicate that large Croatian groups undertake acquisitions primarily for strategic reasons, such as market consolidation or the elimination of competition, rather than for short-term, financially motivated reasons. Future studies may focus on an in-depth analysis of this issue. Therefore, distinguishing between the above explanations requires a longitudinal approach that tracks changes in profitability before and after individual acquisition events, in the short, medium, and long term, while controlling for sector cycles and macroeconomic conditions. Regardless of the cause, the finding suggests that the mere recording of goodwill in financial statements does not reliably signal increased profitability to external stakeholders, especially in the short term. The results obtained have practical implications for analysts, investors, auditors, and other stakeholders who assess the value and risks of acquisition strategies of Croatian groups.

Apart from determining that there are no differences in profitability between groups with and without goodwill recorded, the third research question (RQ3) focuses on the relationship between goodwill impairment and the realised profitability of large Croatian groups. Namely, as in the case of total assets, there is a clear mathematical consequence of goodwill impairment. Since goodwill

impairment results in expenses, it will affect profitability. However, as with total assets, the question is whether these impairments will actually be sufficient to reduce profitability (Table 16).

Table 16 Descriptive statistics of chosen variables (absolute values of dGW expressed in EUR)

	Count	Mean	Standard Deviation	Median	Minimum	Maximum
GW/TA	219	0.02682	0.04050	0.00950	0.00000	0.29710
ROE	219	0.65178	9.51165	0.05221	-9.96251	138.76912
ROA1	219	-0.02332	0.21852	0.01725	-2.22240	0.30805
ROA2	219	0.00363	0.21650	0.04197	-2.17797	0.35058
ROA3	219	-0.00125	0.21682	0.03683	-2.21267	0.33861
ROA4	219	-0.00270	0.21669	0.03564	-2.21627	0.33861
dGW	219	-207,224	689,962	-33,978	-8,710,788	0
dGW/TA	219	-0.00854	0.01490	-0.00190	-0.09171	0.00000
dGW/NetPro	219	-0.48867	3.88443	-0.01710	-54.56772	10.17446
dGW/dNetPr	219	-0.27923	3.83497	0.00000	-42.59623	10.68132

Source: Authors' calculation

Although goodwill impairments, on average, make 48.87% of net profit for the year (dGW/NetPro), or 27.92% of changes of net profit for the year (dGW/dNetPr), high standard deviation and median value of the ratios indicate great deviation in the results. Thus, analysing in more detail, only 30 observations have a share of goodwill impairments in net profit higher than 5%, and 71 observations have a share of goodwill impairments in a change in net profit higher than 5%. Therefore, in a large number of observations, the amounts of goodwill impairments are so small in relation to the profit generated that they do not affect the profitability of the groups. Regardless of this, it is important to point out that in those observations where this share of impairment expenses is relevant, for example when this expense is greater than 5% of net profit, the economic impact can be significant. The results indicate significant heterogeneity among the analysed groups, and for most of them the impairment of goodwill is marginal. In contrast, for a smaller number it can represent a real threat to the financial result.

Table 17 Correlation matrix of goodwill impairments and chosen profitability indicators

	dGW	ROE	ROA1	ROA2	ROA3	ROA4
dGW	1.000	0.017	-0.026	-0.032	-0.025	-0.025
ROE	0.017	1.000	-0.043	-0.037	-0.036	-0.040
ROA1	-0.026	-0.043	1.000	.996**	.996**	.996**
ROA2	-0.032	-0.037	.996**	1.000	.999**	.999**
ROA3	-0.025	-0.036	.996**	.999**	1.000	1.000**
ROA4	-0.025	-0.040	.996**	.999**	1.000**	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Authors' calculation

The correlation matrix indicates no statistically significant correlation of goodwill impairments (dGW) with any calculated profitability indicators (Table 17). To analyse more comprehensive these results, we used panel data analysis and created five models in which chosen profitability indicator is the dependent variable, and goodwill impairments are the independent variable. It is significant to emphasise that we tested the model by including various control variables; however, the result is the same as presented.

Table 18 Results of testing for choosing appropriate model – only p-values

Dependent variables	Hausman test	test for random effects	Testparm	Heteroskedasticity	First-order autocorrelation	Error	Decision
ROE	0.8577	0.4547	0.8774	0.0000	0.1324	Robust error	OLS
ROA1	0.0095		0.1547	0.0000	0.0020	Cluster robust error	FE
ROA2	0.0078		0.0991	0.0000	0.0001	Cluster robust error	FE
ROA3	0.0069		0.1157	0.0000	0.0001	Cluster robust error	FE
ROA4	0.0072		0.1284	0.0000	0.0001	Cluster robust error	FE

Source: Authors' calculation

For all variations, except the one in which the dependent variable is ROE, the fixed effects model is the best fit because of Hausman test results in which the p-value is lower than the significance level of 5% (Table 18). In the case of ROE, pool OLS is the appropriate model considering that Breusch and Pagan's test suggests that random effects are not needed. Testparm results indicate that time for fixed effects is not needed. On the other side, the Modified Wald test for groupwise heteroskedasticity indicates a heteroskedasticity problem for every model ($p=0.000$); however, an autocorrelation issue does not exist in the case of ROE ($p=0.1324$) but in other cases exist ($p<0.05$). Thus, for the first model, we used pooled OLS model with robust errors to deal with heteroskedasticity. For other variations, we applied a fixed effects model with clustered robust errors to deal with heteroskedasticity and autocorrelation issues.

Table 19 Results of regression models

	(1)		(2)		(3)		(4)		(5)	
	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|	Coef.	P>|t|
dGW	0.0000	0.2590	0.0000	0.2860	-3E-10	0.148	-1.3E-09	0.2820	-1.3E-09	0.2840
_cons	0.7150	0.3010	-0.0371	0.0090	-0.0025	0.8910	-0.0153	0.2720	-0.0165	0.2360
Dependent variable	ROE		ROA1		ROA2		ROA3		ROA4	
Number of observations	213		213		213		213		213	
Number of groups			77		77		77		77	
Model	Pooled OLS		Fixed effects		Random effects		Fixed effects		Fixed effects	
F	(1, 211)	1.28	(1, 76)	1.15			(1,76)	1.18	(1,76)	1.16
Prob>F	0.2586		0.2863				0.2816		0.2840	
R-sq:										
within			0.0387		0.0413		0.0397		0.0393	
between			0.0137		0.0133		0.0151		0.0147	
overall	0.0003		0.0007		0.0010		0.0006		0.0006	

Source: Authors' calculation

Without applying robust standard error, all models, except in which ROE is the dependent variable, are statistically significant (p-value is lower than the significance level of 5%); however, they explain a very small proportion of variation (Table 19). In those models, goodwill impairments are statistically significant variables with extremely small but negative effects on each observed ROA indicator. Nevertheless, considering heteroskedasticity and autocorrelation problems, it is more appropriate to apply robust errors. This resulted in the non-significance of the models. Thus, neither model is statistically significant, nor are goodwill impairments a significant variable in any model. The result that goodwill impairments are not statistically significant for net profit value is confirmed with models in which we included other relevant independent variables such as operating revenues and operating expenses and financial revenues and financial expenses. The fact that models without robust errors show a statistically significant but negligibly small negative effect suggests that the relationship between goodwill impairment and profitability exists in the data but is so weak that it is methodologically sensitive to the model specification. The results obtained do not indicate that the economic effect does not exist but rather support the previous conclusion that the goodwill impairment loss is a small share of the realised profit across the largest number of observations. It is important to emphasise that the consistently low R^2 values across all models imply that the profitability of large Croatian groups is not a single-factor phenomenon but rather a result of multiple factors, including the business model used, seasonality, macroeconomic conditions, management competencies, and the like. A research approach that would more clearly isolate the effect of goodwill impairment on profitability could include an analysis of the profitability of the same entities in years with and without goodwill impairments. Therefore, the conclusion of RQ3 is not that goodwill impairment does not affect profitability, but that this effect, in the context of

Croatian large groups, is not large enough or consistent enough for an aggregate panel model to reliably identify it.

5. CONCLUSIONS

Goodwill recognition as an asset has caused controversy among accounting experts. There is a persisting debate on whether goodwill should be recognised as an asset and included in financial statements, and if so, what is the most appropriate accounting treatment. Previous papers related to goodwill analysis deal with its relationship with a company's financial performance (profitability), which is, in most cases, measured by return on assets (ROA) or return on equity (ROE). Additionally, for authors, it was interesting to research the impact of goodwill or goodwill impairments on the company's market value, cost of capital, or investors, as well as the relationship of goodwill with capital structure of the companies' sources of financing assets. Many authors dealt with internally created goodwill, which is not an accounting item. Still, it can be considered in terms of good reputation or as a social capital. The authors have obtained various outcomes when investigating the impact of recognising goodwill on financial performance, i.e., the company's profitability. The primary objective of this paper is to examine whether the occurrence of goodwill impairments significantly impacts the decrease in the financial performance and overall asset value of large Croatian groups.

To conduct our research, we collected data from the Financial agency, the official agency that manages the registry and collects data from annual financial statements in Croatia. From 2010 to 2021, there were 321 large groups in Croatia, as defined by the Croatian Accounting Law. Of the total number, 17% of these groups were classified as large for just one period, while 11% were classified as large for two periods. To ensure a more robust analysis, we removed entities that did not have available data for at least six years in row, resulting in a sample of 152 groups and 1,405 observations. Since we created lagged variables, we have data available for at least five years for all groups in the sample. Our panel data includes long data with more groups than the number of periods and it is an unbalanced panel due to many groups not being classified as large during the 12 years (2010-2021) and not disclosing their financial statements for 2021 at the time of data gathering.

Testing goodwill for impairment each year presents a significant challenge for management and external auditors accountable for financial statement audits. The critical question is whether the entity needs to impair goodwill between two periods, which implies a complex assessment of the recoverable amount of the cash-generating unit (CGU) under IAS 36. This assessment involves managerial discretion and is subject to opportunistic behaviour by managers to avoid asset impairment, as confirmed by other authors' research (Deng, 2025; Just et al., 2023; Kabir & Rahman, 2016). From a financial position and performance perspective, impairing goodwill result in a decrease in

assets and the occurrence of expenses, which negatively impact the financial result for the year. However, the findings of this research suggest that this effect, in the context of Croatian large groups, remains statistically imperceptible at the aggregate level for two structural reasons. This assumption is based on two key factors. Firstly, companies are often acquired by well established entities with considerable assets, so these acquisitions do not typically represent most of the group's assets. Secondly, in our sample, which included 1,253 observations (excluding the first year observed), only 219 cases noted goodwill impairment. After analysing the model results, we found that changes in cash and PAI, as well as goodwill impairments, have no significant impact on total assets. The reason for insignificance primarily reflects the fact that the share of goodwill in groups that have it recorded is extremely low, averaging 2.68% of total assets (median 0.95%). The research revealed that the most significant factor affecting total asset changes is the change in tangible assets, followed by changes in inventory and accounts receivable. The obtained conclusion does not negate the significance of goodwill impairment for the financial position and profitability of operations for those groups where the share of goodwill in total assets is considered significant, however, in the case of large Croatian groups, the results suggest that this share is quite low on average, which may indicate that the groups did not acquire companies at outstanding premiums and that the rapid generation of additional earnings did not primarily drive the acquisitions, but by adopting new business models and reducing competition. The logic behind this is strategic growth, not fast earnings opportunities. For external users of financial statements, this finding carries an important message: goodwill and its possible impairment are not the primary signal of changes in the asset opportunities to create future economic benefits of Croatian large groups – the dominant drivers of their asset dynamics are operating activities and investment cycles, which is a key contextual framework for assessing the future business and financial position of these groups. This finding is further supported by Buljat et al. (2026), who emphasise the importance of a disaggregated approach to analysing asset components in Croatia and confirm that individual asset categories contribute differently to overall asset dynamics. Thus, as confirmed by this research, goodwill represents only a marginal share of the total assets of large Croatian groups, which predominantly change as a result of changes in other types of assets, such as current assets or tangible fixed assets.

The paper further examined whether the profitability rates differ between Croatian large groups that report goodwill and those that do not. However, analysis of the results of Mann-Whitney U has revealed there are no statistically significant differences in profitability between the groups with goodwill and those without it. The results obtained are not consistent with the intuitive expectation that acquisitions at a premium result in higher profitability for the acquirer. However, other authors also reach similar conclusions by identifying the gap between the premiums paid and the expected gains of those acquisitions (Just et al., 2023). In addition, Adhikari et al. (2023) determine that changes in profitability indicators are not significant after M&A activities. Moreover, other authors find a negative correlation between profitability indicators and goodwill in the period after the

acquisition (Gao et al., 2023; Poramapojn & Wiboonchutikula, 2023). We interpreted these findings along several dimensions. First, the absence of increased profitability in the case of premium acquisitions can be reflected in the integration costs of the acquisitions and in the time lag between the implementation period and the realisation of the expected gain effects. In this sense, a longitudinal analysis over five to ten years could profile the specific effects of the acquisitions. On the other hand, we can extrapolate that the obtained result is in line with the agency theory, according to which managers may be willing to overpay for acquisitions for personal gain and compensation realisation, which results in the transfer of wealth from the shareholders of the acquirer to the owners of the acquired company without an appropriate return. Finally, as previously emphasised, the motive for acquiring a particular company may not be the realisation of additional profits. However, it may be the consolidation of market position or the elimination of competition, in which case the benefits of such ventures may not be visible in the short term but rather in the long-term better market position. For external users of financial statements, this finding indicates caution when interpreting goodwill as a signal of future profitability – the goodwill reported in the balance sheet of large Croatian groups does not represent a reliable indicator of superior financial results, but rather reflects strategic decisions whose impact cannot be evaluated solely through short-term accounting performance measures. This result is further supported by Tomas Žiković et al. (2024), who find a negative relationship between indebtedness and profitability in large companies, suggesting that the cost of debt financing acquisitions may offset any profitability gains that goodwill recognition was expected to signal.

Furthermore, as a third research question, we investigated whether goodwill impairments are related to the profitability of large Croatian companies. Therefore, according to our results, goodwill value makes an average of 0.85% of total assets value in cases where goodwill impairments occur. On the other side, net profit for the year makes, on average, 2.33% of total assets. The correlation matrix indicates no statistically significant correlation between goodwill impairments and calculated profitability indicators. Panel data model confirms results. Therefore, the obtained results imply that goodwill impairment does not affect profitability. However, again, the overall results may indicate that this effect, in the context of large Croatian groups, is neither large nor consistent enough for an aggregate panel model to identify it reliably. A single factor does not determine profitability; it results from numerous internal and external factors. These include the business model, activity, cyclicality and seasonality of operations, asset structure and macroeconomic environment. Although, viewed in aggregate, the results imply the insignificance of goodwill impairment for the profitability of large Croatian groups, the obtained results nevertheless indicate that for more than 75% of observations, this impairment is immaterial. Such a result may again indicate the avoidance of impairment as a mechanism for managing financial results. This is conceptually aligned with Šodan et al. (2023), who confirm that financial leverage significantly reduces earnings quality, indicating that managers of highly leveraged companies face additional pressure to use accounting discretion to protect reported

financial results. On the other side, it may also indicate that, in cases where entities recognise impairments, the impairments are relatively low due to the consequent low share of goodwill in total assets.

Research showed that the effects and outcomes of business combinations implemented by Croatian companies were not very apparent. Although the goodwill impairment does not significantly affect the profitability of large Croatian groups, financial performance is not evident by analysing traditional financial ratios, and the value of goodwill recognized in the consolidated financial statements of large Croatian groups is relatively low compared to total assets, the main objectives of acquisitions may differ. The lower share of goodwill reported in the financial statements of large Croatian groups may indicate that the acquirers did not overpay the target companies, i.e. that the consideration transferred is relatively close to the fair value of the net identifiable assets in accordance with IFRS 3. Such a finding is not a sign of an unsuccessful acquisition strategy. However, it may reflect the fundamentals of due diligence in valuing the target companies and the acquirer's significant bargaining power. In addition, it may indicate the primary strategic objective of the acquisitions: market consolidation, elimination of competition, or the takeover of business models, in which the entity may not realise a short-term increase in profitability. Similarly to Žmuk & Bradaš (2026), who show that formal governance compliance does not automatically translate into superior profitability, this study suggests that formal goodwill recognition, as a direct consequence of strategic governance decisions, is not a reliable predictor of improved financial performance. For this very reason, the results of this research indicate that widely used traditional financial indicators of profitability are not an appropriate instrument for a comprehensive assessment of the success of business combinations whose goals are strategic rather than exclusively financial. Rather, the results of our research indicate the need for more fitting and transparent measures of business combination outcomes. One way of achieving this is to disclose the objectives of the business combination in the notes to the financial statements along with defined measures of business combination outcomes – appropriate key performance indicators. Disclosing additional data in financial statements would increase the information value of available financial data and the results of calculated financial indicators, while also enabling an objective quantitative assessment of the realisation of the anticipated synergistic effects of the acquisitions in the short, medium, and long term.

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UČINCI UMANJENJA VRIJEDNOSTI GOODWILLA NA FINANCIJSKI POLOŽAJ I USPJEŠNOST POSLOVANJA GRUPA: SLUČAJ VELIKIH HRVATSKIH GRUPA

Sažetak

Cilj istraživanja jest ispitati utječu li umanjenja vrijednosti goodwilla značajno na uspješnost poslovanja i financijski položaj velikih hrvatskih grupa. Uzorak obuhvaća 152 velike hrvatske grupe (1.405 opažanja) u razdoblju od 2010. do 2021. godine, koje su sastavile i objavile konsolidirane godišnje financijske izvještaje u 2020. godini. Istraživačka pitanja analizirana su primjenom odgovarajućih modela analize panel-podataka. Rezultati pokazuju da umanjenja vrijednosti goodwilla nemaju statistički značajan utjecaj na profitabilnost grupa ni na promjene ukupne imovine. Također, grupe s evidentiranim goodwillom ne ostvaruju više stope profitabilnosti od grupa bez računovodstveno iskazanog goodwilla. Na temelju rezultata zaključuje se da umanjenja vrijednosti goodwilla nemaju statistički značajan učinak na financijski položaj ni uspješnost poslovanja velikih hrvatskih grupa.

Ključne riječi: goodwill, pripajanja, umanjenja vrijednosti goodwilla, profitabilnost, povrat na imovinu.

JEL klasifikacija: M41, G32, G34.