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DETERMINANTS OF PROFITABILITY OF THE IT INDUSTRY IN CROATIA

Abstract

Purpose: Two research questions are posed in the paper that investigate and analyze the relationship between profitability and microeconomic determinants of business activity classified under J62 in the Republic of Croatia on a sample of 280 IT firms in the period from 2019-2021.

Methodology: The present research is based on the resource-based view (RBV) approach - firm-specific determinants of firm profitability. Multiple regression analysis was conducted to investigate the determinants of industry profitability, as determined by ROA and ROE.

Results: Further analyses investigated a correlation between the identified internal factors and the profitability of IT firms. Finally, two profitability models were set up, defined by a single set of internal factors with different correlations and statistical significance. It was shown that the independent variables *Debt* (DBT), *Total assets* (SIZE), and *EBIT* have statistical significance in both models, ROA and ROE demonstrate a strong correlation, the variables *Stratification* and *Current liquidity* (CL) show a correlation with the ROA model, and the lagged variables have different predictive abilities in terms of mROE.

Conclusion: The results of multiple regression analysis show that there is a correlation between internal factors and profitability at the firm level.

Keywords: ROA, ROE, determinants of profitability, IT industry, multiple regression analysis

1. Introduction

Analysis of the state and level of development of the Croatian IT industry in the national economy was published by the Croatian Chamber of Economy (HGK, 2020; 2020a; 2021; 2022). According to data from the annual financial reports of entrepreneurs, in 2021, the IT sector participated in the Croatian non-financial sector with 4.5% of firms, 3.9% of employees, 3.7% of income and 6.3% of exports (HGK, 2022, p. 5), where micro and small enterprises recorded above-average growth in income, exports, EBITDA and average wages in the period from 2017-2021 (HGK, 2022, p. 4).

In view of the abundance and importance of the IT activity as a fast-growing industry, it is necessary to ask the following research questions: (i) RQ_1 - Do internal factors correlate with the profitability of the IT industry in Croatia?, and (ii) RQ_2 - What is the relationship between the identified internal factors and profitability in the Croatian IT industry? (Vuković et al., 2020; Margaretha & Supartika,

2016). The objectives of the paper are to determine and examine the relationship between profitability and microeconomic determinants of the IT industry in the Republic of Croatia on a sample of 280 IT firms in a three-year period based on 36,632 values and 38 balance sheet and profit and loss account positions, by virtue of which 824 observations were calculated. The collected data were tested by evaluating the time series of data using a standardized statistical methodology present in similar papers, i.e. multivariate regression analysis (Bhutta & Hasan, 2013).

The rest of the paper is organized in five sections. The second section reviews the literature on the relationship between the factors that shape the profitability of different industries in the Croatian research environment. Normality testing in large samples as well as sample and variable design are described in the third section. The statistical model of multiple regression analysis is presented in Section 4. Analysis results are also presented in Section 4 and discussed in Section 5. The limitations of the research and concluding remarks are given in Section 6.

2. Literature review and hypothesis formulation

According to Škuflić et al. (2018, p. 340), the determinants of profitability can be classified into four categories: global determinants, national determinants, industry determinants, and determinants of corporate profitability, in accordance with the contributions of Porter (1980), Oster (1990) and Scherer (1980), correlating the structural characteristics of individual industries and the causes of differences in profitability among industries through the structure-conduct-performance (SCP) paradigm (Škuflić & Mlinarić, 2015, p. 480). On the other hand, according to Yazdanfar (2013, p. 151), the RBV approach assumes that firm performance is mainly determined by internal rather than external variables (Barney, 1991), and explains firm performance in different ways, e.g. by explaining profitability mainly with specific characteristics, resources and capabilities at the firm level (Wernerfelt, 1984). Based on Mackey (2008) and McGahan and Porter (2002), Stierwald (2010, p. 5) summarizes the results of selected variance decomposition studies and illustrates that, depending on the size and period of the sample, either firm or industry effects play a central role in determining firm profitability.

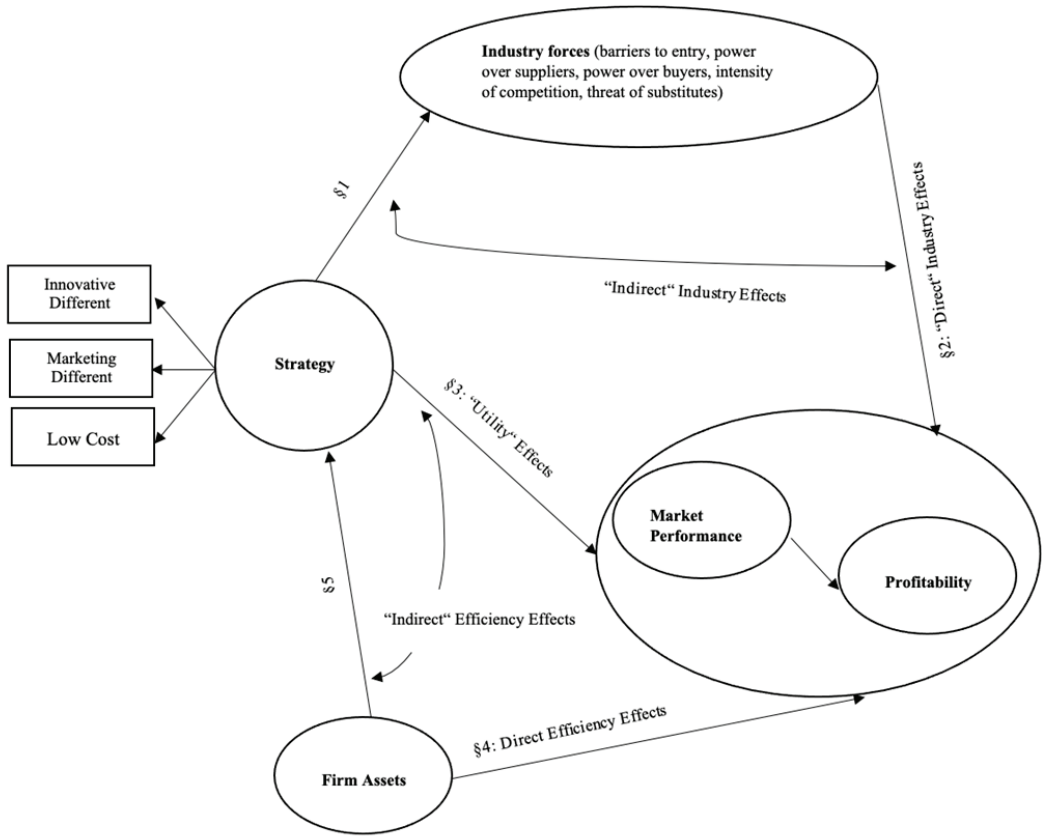
Spanos and Lioukas (2001, p. 922) conclude that according to Schmalensee (1985) and McGahan and Porter (1997), industry effects explain an important portion of profit variability, whereas Hansen and Wernerfelt (1989), Rumelt (1991) and Mauri and Michaels (1998) report that firm effects are more important than industry effects on firm performance. Therefore, profitability determinants at the firm level are influenced by exogenous and endogenous variables depending on the level of influence of internal management policies. Exogenous variables such as industry-specific variables (measured by the Herfindahl-Hirschman index or capital intensity) and macro-economic variables (measured by the inflation rate and the growth rate of economy) (Pervan et al., 2019, p. 974), which do not depend on the impact of firm management policies (Dimitrić et al., 2018, p. 334), are beyond the scope of this research.

A conceptual framework of profitability factors is given in Figure 1. The paths of Dehning and Richardson (2002, pp. 9-10) show how researchers have measured IT, business process performance or firm performance. In path 1, researchers typically measure firm performance using market metrics (Tobin's q) or accounting metrics (ROA, ROE, ROS), path 2 includes business process performance (gross margin, inventory turnover, customer service, quality, efficiency, profit margin, revenue metrics), path 3 shows firm performance, and path 4 presents contextual factors using business performance metrics (firm size, industry, financial health of the firm, growth options, and IT intensity).

The following internal determinants of profitability are usually emphasized in research studies as those that a firm can influence through its management policy: firm size, leverage, productivity, allocations to research and development, lagged earnings, investment, liquidity, and solvency (Škuflić & Mlinarić, 2015, p. 482), calculated using adjusted financial indicators and additionally classified, according to Tailab (2014), into financial and non-financial factors. In particular, metrics differ from industry to industry, especially as analysts tracking specific industries create and use specialized metrics designed to capture important elements of profitability and risk within that industry, such as revenue per passenger mile for airlines and loan loss provisions as a percentage of total loans for banks

(Wahlen et al., 2022, p. 247). Profitability is measured by relating various categories of earnings to assets, income and/or capital (Dimitrić et al., 2018, p. 338). In this paper, profitability can be expressed as a function of two dependent variables (dvROA, dvROE) that are statistically significantly related. ROA is important for analysts who are interested in the profitability and efficiency of the firm's core operations (Wahlen et al., 2022, p. 295), while ROE can be a particularly useful indicator of profitability as it indicates the efficiency of using capital, not just tangible assets.

Figure 1 Conceptual framework of profitability factors



Source: Spanos & Lioukas (2001)

Wahlen et al. (2022, p. 307) analyze profitability through four levels, where ROA interprets different levels of profitability ratios. According to these authors, the first level refers to profitability ratios for the firm as a whole (i.e., ROA - return on total assets, ROCE - return on common equity), while the second level breaks down the first level into: (2a) profit margin for ROA or ROE and asset turnover, and (2b) capital structure leverage for ROCE (operating vs. financial leverage). At the next level, ROA is broken down into other levels, with profit margin broken down into (2ai) various percentages of expenses to sales, i.e. asset turnover (2aii), which is further broken down into receivables turnover, inventory turnover and fixed asset turnover. Level 4 uses product and geographic segment data to analyse ROA, profit margin and asset turnover in more detail. Therefore, it is initially argued that **(H1)**: There is a correlation between internal factors and profitability.

Based on the reviewed literature, auxiliary hypotheses were set up according to Margaretha and Su-

partika (2016) and other authors (Yazdanfar, 2013; Öhman & Yazdanfar, 2017). However, previous studies have shown contradictory results that make generalisations questionable (Alarussi & Alhaderi, 2018, p. 443). Hence the paper tests conflicting features of the correlation between the internal determinants of non-financial firms and their profitability, such as Baum et al. (2006, p. 6).

A firm prefers to have a high current ratio because it means that it has enough current assets to pay its current liabilities, with an increase compared to the previous period indicating an improvement in a firm's ability to pay its current liabilities and vice versa (Horngren et al., 2012, p. 214). Some previous studies have shown positive effects in 2,154 Indian firms (Al-Homaidi et al., 2020), while Raheman and Nasr (2007) and Eljelly (2004) show a negative relationship between profitability and liquidity indicators. The assumption was formulated by hypothesis **H1a**: There is a correlation between current liquidity and profitability in the period 2019-2021 for J62. Previous literature has shown mixed effects of debt on firm profitability (Joh, 2003, p. 296), highlighting at the same time the positive, negative and mixed effects of debt, as shown by Habib et al. (2016). Nevertheless, the position of this factor is initially presented as **H1b**: There is a correlation between the debt ratio and profitability in the period 2019-2021 for J62.

Financial stability plays a significant role in defining liquidity and working capital, with smaller coefficient values indicating a greater share of working capital (Smith, 1987; Eljelly, 2004), which improves liquidity and profitability. On the other hand, fixed asset financing through other sources directly affects the way of using financial leverage, but it does not affect corporate ownership (Yazdanfar, 2013, p. 448). Ebaid (2009, p. 485) concludes that the choice of capital structure generally has a weak to no impact on the financial performance of listed firms in Egypt and that financial leverage has a negative impact on firm performance as measured by ROA, i.e. it has no significant impact on firm performance as measured by ROE or gross profit margin. The reviewed literature indicates indeterminate and divided research results, thus **H1c**: There is a correlation between financial stability and profitability in the period 2019-2021 for J62. In the paper, total assets were employed as one of the most commonly used variables for measuring firm size by the logarithm value of total assets. The results of recent research have revealed a positive size. Nevertheless, some studies found a negative predictive value (Hardwick, 1997; Dilling-Hansen, 2005; Margaretha & Supartika, 2016), which implies **H1d**: There is a correlation between size and profitability in the period 2019-2021 for J62.

The reviewed literature referring to the sales growth variable confirms dichotomous points of view. A positive relationship was established by many researchers such as Salman and Yazdanfar (2012), Grinyer and Mckiernan (1991), and Lazar (2016), in contrast to Margaretha and Supartika (2016), who confirmed a negative impact of lagged sales on current profitability. Auxiliary hypothesis **H1e** reads: There is a correlation between sales and profitability in the period 2019-2021 for J62. The number of IT firms in the country reached 5,718 and accounted for 4.2% of the total number of firms in the non-financial sector of the Croatian economy (HGK, 2020, p. 52), and the EBIT variable seems to be a justified choice. EBIT is calculated as operating revenues minus operating expenses, which leads to hypothesis **H1f**: There is a correlation between EBIT and profitability in the period 2019-2021 for J62.

McDonalds' (1999, p. 115) econometric results over the 1984-1993 period suggest that lagged profitability is a significant determinant characterized by persistence and cyclicality of firm profitability. A number of previous studies, e.g. by Yazdanfar (2013), Dilling-Hansen (2005), Goddard et al. (2005) and Stierwald (2010), have found a positive relationship between lagged and current profitability.Taking into account cyclicality and persistence, it is argued in **H1g**: There is a correlation between lagged and current profitability for J62.

3. Research metodology

3.1 Data collection and sample design

The scope of the IT industry is defined by the following areas and codes within sections of the National Classification of Activities (NKD 2007; NACE Rev. 2): C26, G46, G47, J58, J62, J63 and S95 (HGK, 2022, p. 21). The IT industry therefore consists of: (i) provision of IT services, (ii) manufacture of IT equipment and components, and (iii) sale of IT equipment, components and software. The scope of the IT industry defined in this way corresponds to the definition of the IT industry provided by the OECD in 2006 that excludes the telecom operator activity (HGK, 2020, p. 14). Division J62 covers computer programming (mainly micro-enterprises), comput-

er consultancy, computer equipment management and other information technology and computing services (NKD 2007; NACE Rev. 2; ISIC Rev. 4). Every financial enterprise in Croatia must annually submit data on a wide range of financial activities such as income and expenses, i.e. these data are confidential and remote access has been authorized as part of the specific research project (Škuflić et al., 2018, p. 347). Unconsolidated AFS data presented in the balance sheet and profit and loss account of the Financial Agency (FINA) for the period 2019-2021 were collected for firms with J62 activities and a turnover of more than HRK 7.5 million in 2021.

3.2 Description and operationalization of variables

The data collected from the FINA database include the necessary positions in the balance sheet and the profit and loss account for the basic calculations in Excel of the values of dependent and independent variables of profitability. Table 1 provides an overview of dependent and independent variables used in further analyses, symbols, and a description and calculation of variables using the methodology of displaying the relationship between variables by Wahlen et al. (2022) and Milenković et al. (2019).

Table 1 Overview of dependent and independent variables

Dependent variables	Symbol	Variable description	Expected relationship	
Return on assets	ROA	Net income / total asset ratio	ROA ± ROE	
Return on equity	ROE	Net income / total equity ratio		
Explanatory variables	**Symbol**	**Variable description**	**Expected relationship**	
Current liquidity ratio	CL	Current assets / Current liabilities	–	*
Debt ratio	DBT	Total liabilities / Total assets	–	+
Financial stability	FS	Long-term assets / Long-term liabilities	*	*
Size	SIZE	Natural algorithm of the total assets	–	–
Sales growth	SGR	$(Sales_t - Sales_{t-1}) / Sales_{t-1}$	+	*
Earnings before income and tax	EBIT	Operating revenues – Oper. expenses	+	+
Lagged profitability	lagROA	ROA_{t-1} = 20/19; ROA_{t-2} = 21/19	±	*
Lagged profitability	lagROE	ROE_{t-1}= 20/19; ROE_{t-2}= 21/19	*	±

Note: + positive relationship; – negative relationship; * no relationship

Source: Author's estimate

Two indicators - total assets and EBIT - are numerical indicators. Sales growth is a relative indicator of dynamics calculated as $Sales_t$ - $Sales_{t-1}$/ $Sales_{t-1}$. The income growth indicator includes only business revenue (the sales index), and the annual values are calculated cumulatively with respect to 2020/2019, 2021/2020 and 2021/2019 (base year). The financial stability ratio was measured by the ratio of long-term assets to long-term sources of financing, where the (non)inclusion of the own equity position was not of particular importance. For the sake of caution, both indicator values were calculated, and if the firm did not have an expressed value, for example, of long-term debt in MS Excel, 0 was calculated for such positions. In the paper, the correlation is explained in terms of a positive and a negative relationship between dependent and independent variables, and the initial expectations are shown in Table 1.

4. Research methodology and results

4.1 ROA model (Model 1) and ROE model (Model 2)

An empirical examination of profitability factors of IT firms was carried out by using multiple linear regression. A general form of a multiple linear regression model (Eq. 1) can be written following Horvat and Mijoč (2019); if the relationship between x is linear, then the expanded form of the equation is as follows (Eq. 2):

$$y = f(x_1, x_2, ..., x_i, ..., x_k) + \varepsilon \quad \text{(Eq. 1)} \quad \overset{\text{x is linear}}{\rightarrow} \quad y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + ... + \beta_j x_j + ... + \beta_k x_k + \varepsilon \quad \text{(Eq. 2)}$$

where y is a dependent, regressor, endogenous or output variable, $x_1, x_2, ..., x_k$ are independent, regressor, exogenous or input variables, while *e* is a random error in the model, i.e., an error term, and β_0, $\beta_1,..., \beta_k$ are population parameters, where β_0 is the constant term and $\beta_1,..., \beta_k$ are the coefficients of the independent variables. The following initial profitability models were established (Eq. 3 and Eq. 4):

$$ROA_t = \beta_0 + \beta_1 CL_t + \beta_2 DBT_t + \beta_3 FS_t + \beta_4 SIZE_t + \beta_5 SGR_t + \beta_6 EBIT_t + \beta_{7_{lagg}} ROA_t + e_t. \quad \text{(Eq. 3)}$$

$$ROE_t = \beta_0 + \beta_1 CL_t + \beta_2 DBT_t + \beta_3 FS_t + \beta_4 SIZE_t + \beta_5 SGR_t + \beta_6 EBIT_t + \beta_{7_{lagg}} ROE_t + e_t. \quad \text{(Eq. 4)}$$

4.2 Descriptive statistics

Table 2 presents a summary of descriptive statistics of dependent and independent variables used in the study that indicate several performances of the observed activity. ROE can be expressed as the product of ROA by measuring total equity and total assets. In most industries, a 10% return on assets is considered good and most firms strive for a return on equity of 15% or higher (Horngren et al., 2012, p. 599). So, it can be concluded that ROE (mean 45.1%) is higher than ROA (mean 21.9%) for all IT firms, which is a healthy sign for J62 firms because they earn more for their stockholders than they pay for interest. A high ROA indicates that an IT firm generates more income for each unit of assets it owns, and a high ROE means that an IT firm has more profit for each unit of equity it owns. It is assumed that high ROA and ROE mean that an IT firm uses its resources well and operates efficiently, which in the long run can lead to higher revenues and an increase in the firm's market value. On the other hand, low ROA and ROE indicate problems in doing business, which is manifested through high operating costs, low efficiency in the use of resources, high financing costs or low income earned from product sales, which leads to lower profitability (Ebaid, 2009).

In the selected activity code, service firms account for 87.7%, of which 65.4% deal with computer programming (HGK, 2022, p. 5). In 2021, IT firms dealing with computer programming accounted for 60.4% of business revenue of IT service firms, i.e., 38.1% of revenue of the entire IT industry, whose revenue was 2.8 times higher than IT retail revenue and 1.6 times higher than IT producer revenue (HGK, 2022, p. 7), which is attributable to exceptional fragmentation of the Croatian IT industry, deep capillarity of profit and profitability inhomogeneity.

Table 2 Descriptive statistics

Variable	Mean	Median	St. Deviation	Minimum	Maximum	N
ROA	21.90	16.80	30.70	-192.40	408.70	809
ROE	45.10	36.40	73.60	-648.80	1,078.10	809
CL	399.70	222	592.30	104	7,469	809
DBT	50.40	41.70	53.50	1.30	718,60	809
FS	42.90	0	583.40	0	14,816.85	809
$FS_{ownequity}$	43.80	23.30	146.80	-10.10	35.20	809
SZ	23,595.918	8,703.327	54,975.684	8,737	763,932.288	809
EBIT	3,986.700	1,832.133	6,944.297	-15,396.460	61,714.566	809
$SGR_{(20/19)}$	51.50	0.10	840.80	-1	13.824	809
$SGR_{(21/20)}$	501.90	0.20	8.224	-0.50	135.224	809
$SGR_{(21/19)}$	68.50	0.30	1.013	-0.70	16,583.20	809
$laggROA_{21/19}$	1.60	1	3.80	-14.60	42.40	788
$laggROA_{20/19}$	1.40	1	2.60	-5.70	33.80	788
$laggROE_{21/19}$	1.20	0.90	2.60	-24	20.40	788
$laggROE_{21/19}$	1.10	0.90	1.70	-10.70	15.30	788

Source: Author's estimate

In addition, a large standard deviation, which is almost twice as large as the mean, shows that profits are widely dispersed and that the sample is not homogeneous in terms of profitability (Stierwald, 2010, p. 12). The results of Pearson's correlation for the variables of interest for 809 observations are shown in Appendix 1. The results of the correlation matrix show that EBIT plays a positive and significant role in achieving the profitability of Croatian IT firms, compared to the negative value of the SIZE variable. Other independent variables showed an inversely proportional relationship, while the remaining variables were not statistically significant. In respect of the correlations between the independent variables, as shown by the results of Gharaibeh and Khaled (2020, p. 283), the values of the correlation matrix are below 0.80, which means that these variables are not strongly correlated and there is no multicollinearity.

4.3 Regression results

SPSS parametric models were used for data analysis. Profitability models were tested in the same way, and the results presented in an aggregated manner are reported in the model summary table (Table 3), the ANOVA table (Table 4) and regression tables (tables 5 and 6), following the multiple regression decision diagram by Hair et al. (2009). The aim of the model summary is to determine the R^2, i.e., adjusted R^2, value. Second, the ANOVA table shows the F-ratio for testing H_0, while the P-value determines the level of confidence. According to Mason and Perreault (1991, p. 268), regression tables contain the regression coefficients, their standard errors and the associated t-tests.

The R column represents the value of the multiple correlation coefficient and is used to determine the quality of the prediction of the dependent variable (R1=0.747 ROA model; R2=0.527 ROE model). The R-squared column indicates the coefficient of determination, i.e. the proportion of the variance of the dependent variable that can be explained by independent variables. The ROA coefficient of determination is 0.558, which corresponds to 55.8% of the variability of the dependent variable that can be explained by the independent variables, which means that the strength of the relationship is good, as expected. In the second model, R2 is 0.278 and accounts for 27.8% of the variability of the dependent variable that can be explained by the independent variables, which describes the strength of the relationship as sufficiently good.

The adjusted R^2 is 0.554, indicating 55.4% of the variance proxied by ROA, and it is 0.273, indicating 27.3% of the variance proxied by ROE (Tailab, 2014: R^2 for ROE=0.10 and ROA=0.337). The adjusted R^2 is slightly smaller than the exact value of R^2 for 0.004 and 0.005, respectively, which is less than 0.009 in Shrestha (2020, p. 41). This means that if the model were derived from the population and not from a sample, it would explain about 0.4% and 0.5% less variance in the result. The Durbin-Watson statistic was used as a test for autocorrelation in the residuals of a regression analysis (Hayes & Cai, 2007; Wooldridge, 2016; Garefalakis et al., 2016). The above results show that the models are acceptable in explaining the effects of the independent variables on profitability proxied by ROA/ROE.

Table 3 Model summary for ROA and ROE

Model Summary [ab]					
Model	R	R^2	Adjusted R^2	SEE	Durbin-Watson
1 ROA	.747[c]	0.558	0.554	20.524	1.411
2 ROE	.527[d]	0.278	0.273	63.352	1.847

a. Dependent variable: ROA

b. Dependent variable: ROE

c. Predictors: (Constant), Stratification, EBIT, $SGR_{20/19}$, $SGR_{21/20}$, Current liquidity (CL), ROE, Total assets (SIZE), Debt (DBT) – model 1

d. Predictors: (Constant), $LAGROE_{20/19}$, Total assets (SIZE), ROA, Debt (DBT), EBIT – model 2

Source: Author's estimate

In addition, an extensive literature in marketing, statistics and other quantitative fields suggests various ways to diagnose or manage multicollinearity (Mason & Perreault, 1991, p. 268). Recognising multicollinearity is important because multicollinearity does not reduce the explanatory power of the model, but rather the statistical significance of the independent variables. The presence of multicollinearity between independent variables was tested using the variance inflation factor as $(1 - R_k^2)^{-1}$, where R_i^2 is the unadjusted coefficient of determination for the regression i of the independent variable on the other variables (Mason & Perreault, 1991, p. 270). A large VIF for an independent variable indicates a strong collinear relationship with other variables, which should be taken into account or adjusted for in the model structure and the selection of independent variables. In models 1 and 2, VIF < 5, whose dispersion is between 1.020 and 1.947, indicates that the mutual collinearity between the variables is extremely low (Marquardt, 1970). The results of the ANOVA are shown in Table 4.

Table 4 Significance test and model summary for ROA and ROE

ANOVA[a c]

	Model	Sum of squares	df	Mean Square	F	Sig.
1	Regression	425378.455	8	53172.307	126.224	.000[b]
	Residual	337001.844	800	421.252		
	Total	762380.299	808			
2	Regression	1209169.422	5	241833.884	60.254	.000[d]
	Residual	3138607.700	782	4013.565		
	Total	4347777.122	787			

a. Dependent variable: ROA

b. Predictors: (Constant), Stratification, EBIT, $SGR_{20/19}$, $SGR_{21/20}$, Current liquidity (CL), ROE, Total assets (SIZE), Debt (DBT) – model 1

c. Dependent variable: ROE

d. Predictors: (Constant), $laggROE_{20/19}$, Total assets (SIZE), ROA, Debt (DBT), EBIT – model 2

Source: Author's estimate

The results of the first regression model (F_1=126.224) indicate that there is significant predictive ability of the independent variables (p<0.001) for the dependent variable (the ROA model), where F_1 (425,378.455; 337,001.844)=126.224; p<0.001. Statistical predictive ability of independent variables for the dependent variable ROE is also confirmed in the ROE model, F_2=60.254, because a combination of predictors has a statistically significant influence (p<0.001), which is written as F_2 (1209169,422; 3138607,700)=60.254; p<0.001. The ROA model and the ROE model are denoted as Model 1 and Model 2, respectively. Tables 5 and 6 provide evaluations of the ROA/ROE model coefficients and the significance of independent variables.

The coefficient t fulfils the criterion t>0, which means that the individual predictors are significant in explaining the dependent variable. However, some predictors have a negative t-value (e.g. SIZE -1.064E-07), which indicates reverse regression, i.e. the higher the value of the relevant predictor, the lower the value of the dependent variable, ceteris paribus. In the Sig. column, it is possible to check how significant a particular predictor is in the profitability models. If p<0.05, it is concluded that the observed coefficient is statistically significantly different from 0, i.e. that the corresponding variable is needed in the study and is therefore retained in the model. If, on the other hand, p>0.05, it is concluded that the coefficient is not statistically significantly different from 0. In this case, the ROA regression model is statistically significant and sufficiently reliable (p<0.05).

5. Discussion

One main and seven auxiliary hypotheses were set up in the paper. The aim of the paper was to determine a correlation between internal factors and

the profitability of IT firms as well as to identify predictive relationships between independent variables and ROA and ROE. In the initial analysis, all independent variables were used. The calculated regression models are statistically significant with a high percentage of explained variance in both models ($p<0.05$). It was shown that eight independent variables had a statistically significant influence in the ROA model. In the ROE model, predictive significance of five independent variables was determined, confirming in this way that the profitability of a firm can be predicted by internal factors, thus accepting H1 (ANOVA F and Sig.<0.005), which confirms the RBV approach. Table 7 shows the status of the remaining research hypotheses based on the results of statistical analysis, where those hypotheses with a positive and/or negative correlation are confirmed compared to unconfirmed hypotheses, where one of the independent variables shows no correlation with profitability.

Table 7 Hypothesis testing

Hypothesis	Test result	ROA model	ROE model
H1a	Accepted	CL is negatively related to ROA.	CL is not related to ROE.
H1b	Accepted	DBT is positively related to ROA.	DBT is negatively related to ROE.
H1c	Rejected	FS is not related to ROA.	FS is not related to ROE.
H1d	Accepted	SIZE is negatively related to ROA.	SIZE is negatively related to ROE.
H1e	Accepted/Rejected	SGR is positively related to ROA.	SGR is not related to ROE.
H1f	Accepted	EBIT is positively related to ROA.	EBIT is positively related to ROE.
H1g	Rejected	Lagged ROA is not related to ROA.	Lagged ROA is not related to ROE.
	Rejected	Lagged ROE is not related to ROA.	LaggROE is positively related to ROE.

Note: +ROA +ROE = accepted; –ROA –ROE = accepted; *ROA*ROE = rejected; –ROA /+ *ROE = rejected

Source: Author's estimate

The first row in regression tables shows the coefficients of the regression constant of the expected ROA (and ROE) when all other variables are equal to zero. The regression equation suggests a positive value of ROA and a negative value of ROE, but a strong relationship of the regressor variables ROA/ROE with each other and in relation to the regressor variables EBIT (positive) and SIZE measured by the book value of assets (negative). The impact of ROE on ROA is positive (r=.444) and statistically significant ($p<0.001$) with a beta coefficient of 0.347, which means that for every percentage increase in ROE, a positive change in ROA is expected by 0.347%. The correlation between ROA and ROE is also positive (r=.444) and statistically significant ($p<0.001$), and an increase in ROA by 1% leads to an increase in ROE by 0.566%. The interrelationship of the dependent variables of profitability is as expected, as previously confirmed by Hutchinson and Gul (2004) and Antle and Smith (1986), which means that an increase in ROE leads to an increase in ROA, and *vice versa*. However, these variables cannot be observed separately and in isolation.

The EBIT variable has positive (r(ROA)=.308; r(ROE)=.153) and statistically significant effects ($p<0.001$) on the profitability of IT firms, and represents operating profit before interest and depreciation. In the profitability models, a proportional relationship is evident, where a 1% increase in EBIT leads to higher ROA and ROE by 0.258% and 0.113%, respectively. A higher EBIT occurs when the sales price exceeds the variable cost per unit, where the sales price must be high enough to ensure the contribution margin (the sales price minus the variable cost) and cover fixed costs (Morris & Daley, 2009, p. 63). A higher level of the EBIT margin is desirable because such firms retain a larger portion of their income after covering business costs than those with a lower value of this indicator (Periša et al., 2017, p. 233).

Table 5 Model ROA

Coefficients[a]											
Model ROA		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Err.	Beta			Zero-order	Partial	Part	Tolerance	VIF
model 1	(Constant)	37.134	2.339		15.876	0.000					
	Stratification	-2.076	0.711	-0.076	-2.920	0.004	-0.042	-0.103	-0.069	0.814	1.228
	ROE	0.145	0.010	0.347	13.995	0.000	0.444	0.443	0.329	0.898	1.113
	CL	-0.003	0.001	-0.064	-2.570	0.010	0.144	-0.091	-0.060	0.880	1.136
	DBT	-0.343	0.017	-0.597	-20.675	0.000	-0.526	-0.590	-0.486	0.663	1.508
	SZ	-1,064E-07	0.000	-0.190	-6.736	0.000	-0.103	-0.232	-0.158	0.692	1.445
	$SGR_{20/19}$	0.002	0.001	0.066	2.793	0.005	-0.003	0.098	0.066	0.980	1.020
	$SGR_{21/20}$	0.001	0.000	0.205	7.537	0.000	-0.014	0.257	0.177	0.750	1.333
	EBIT	1,143E-06	0.000	0.258	8.476	0.000	0.308	0.287	0.199	0.594	1.683
a. Dependent Variable: ROA (N = 809)											

Source: Author's estimate

Table 6 Model ROE

Coefficients[a]											
Model ROE		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Err.	Beta			Zero-order	Partial	Part	Tolerance	VIF
model 2	(Constant)	-11.858	5.046		-2.350	0.019					
	ROA	1.357	0.095	0.566	14.234	0.000	0.441	0.454	0.432	0.585	1.710
	DBT	0.443	0.050	0.322	8.900	0.000	-0.005	0.303	0.270	0.704	1.420
	SZ	-1,495E-07	0.000	-0.098	-2.302	0.022	-0.097	-0.082	-0.070	0.514	1.947
	EBIT	1,196E-06	0.000	0.113	2.546	0.011	0.154	0.091	0.077	0.472	2.117
	$_{lagg}ROE_{20/19}$	2.958	1.326	0.068	2.230	0.026	0.048	0.080	0.068	0.986	1.014
a. Dependent Variable: ROE (N = 788)											

Source: Author's estimate

The results of Gharaibeh and Khaled (2020, p. 284) show that firm size, growth and leverage have a positive influence on EBIT, in contrast to leverage, business risk and tangible assets. A positive relationship between profitability and EBIT was also confirmed in the study conducted by Ali (2020), so H1f must be accepted.

In this research, the effect opposite to EBIT in terms of profitability is shown by firm size (SIZE) measured by the logarithmic asset values as (r(ROA)=-.103; r(ROE)=-.101) and a statistically significant variable (0.003 vs. 0.004<0.01). The research results show that a decrease in the size of the firm by one unit leads to a decrease in the profitability proxied by ROA by 0.19% (Stratification -.076) with a simultaneous decrease in the return on capital of 0.098. Negative predictive ability of firm size has been proven by previous research studies. According to Margaretha and Supartika (2016, p. 134), the larger a firm, the lower its profitability (and vice versa) because it is more difficult for larger firms to manage their organisational effectiveness by overcoming problems in the bureaucratic management structure. Other studies such as Ramadan et al. (2011, p. 180) have shown that the estimated effect of size does not support the significant economies of scale for Jordanian banks. In view of all this, hypothesis H1d is considered to be confirmed.

The debt ratio showed a dual inverse relationship with the profitability of IT firms. As expected, the debt ratio is statistically significantly related to return on assets, where a 1% increase in the debt ratio leads to a decrease in profitability of 0.597%. A negative correlation between the debt ratio and profitability was previously observed by Goddard et al. (2005) and some other authors. On the other hand, the debt ratio in Model 2 has a beta coefficient of 0.322, and it can be concluded that the optimal ratio of liabilities and assets has a positive effect on the profitability proxied by ROE. Furthermore, Gill et al. (2011, p. 12) found positive relationships between the debt ratio and profitability in the service and manufacturing industries (service industry: B=0.486; R^2=0.081; SEE=0.301; F=3.689; manufacturing industry: B=0.397; R^2=0.203; SEE=0.138; F=6.942), and these results indicate that an increase in debt is associated with an increase in profitability, which is consistent with the results reported by Abor (2005), confirming H1b.

Based on tables 5 and 6, it can be concluded that sales growth has a significant positive effect exclusively through return on assets of Croatian IT firms, which partially confirms H1e. The coefficient of sales growth measured by lagged income has a positive statistical significance (of 0.066 and 0.205, respectively) in return on assets. Positive values of historical sales results of 1% lead to positive beta values and higher revenue compared to Jordanian service firms that generate as much as 1.09% more profit (Gharaibeh & Khaled, 2020). The obtained values are as expected for a very simple reason (Table 1). As the sales volume increases, costs increase proportionally, which guarantees lower current profitability. On the other hand, firms consider investment opportunities with the aim of ensuring greater investments, firm growth and future earnings (Margaretha & Supartika, 2016, p. 135). In terms of the effect of sales growth and profitability measured by ROE, the results show that there is no evidence that historical sales growth figures are related to current profitability of the Croatian IT firms (Roper, 1999; Fitzsimmons et al., 2005).

The same was found for the financial stability variable measured by the share of long-term assets in long-term liabilities, which does not have any statistically significant influence in relation to Pearson's coefficient of correlation and regression analysis, which is in line with the results of Abor (2005). The HGK 2021 analysis (p. 12) emphasizes that investments were focused on a smaller number of firms, i.e., only 15% of the total number of IT firms reported the investment value of new fixed assets greater than zero, which makes up 58% of all investments in the IT sector. Thus, lagged profitability variables mostly show no relationship with current profitability of Croatian IT firms, as confirmed by Suarez et al. (2013). In this regard, the positive value of the laggROE variable in relation to capital can indicate the degree of efficiency of reinvestment, i.e., profit retention as a short-term source of raising capital to finance current investment projects. With such a conservative approach, IT firms strive to grow and survive in view of the strong growth of competition, the rapid entry of new firms in the market and the mortality in the industry, as concluded by Suarez et al. (2013, p. 12). Therefore, H1g was not confirmed (Table 1/Table 6).

Similarly to Alarussi and Alhaderi (2018, p. 452), the results of the study show unexpected results in relation to liquidity. It indicates that the two objectives of liquidity and profitability are inversely related to each other (Raheman & Nasr, 2007, p. 289),

i.e., no relationship between current liquidity and ROE was established (Ghasemi & Razak, 2017). Table 5 predicts that the profitability of IT firms in Croatia is negatively and significantly related to current liquidity proxied by ROA. The unstandardized beta of current liquidity is -.064, indicating that a 1% decrease in current liquidity leads to an increase in return on assets. This indicates that higher liquidity leads to less funding engaged in generating income (and consequently profit), which enables a lower yield proxied by ROA. In the first model, this is because profitability does not depend on the cash base and liquidity is important for financial institutions such as banks, but not for non-financial firms, as Alarussi and Alhaderi (2018, p. 452) note. Pervan et al. (2019, p. 976) found that current liquidity has no statistically significant relationship with profitability. They explain this phenomenon by the fact that managers of firms with low liquidity must invest a lot of time and effort to convert receivables into cash or to negotiate additional short-term financing with suppliers and banks. However, the research studies by Majumdar (1997, p. 240) and Sur and Chakraborty (2011, p. 7) have established the neutrality of the relationship and claimed that liquidity is strongly significant to the productivity equation, i.e. it essentially represents the working capital dimension.

6. Concluding remarks

The aim of this paper was to examine the factors that determine firm profitability in the J62 sector in the period from 2019 to 2021 at the firm level. After data processing by correlation analysis, some independent variables were omitted that did not have statistically significant predictive ability in explaining a certain dependent variable. Finally, as expected, two profitability models were obtained - the ROA model and the ROE model, which confirmed five research hypotheses, while the remaining two hypotheses were not confirmed. Taking into account the correlation values and the regression analysis results, it can be concluded that there is statistically significant prediction in terms of ROA of the following variables: stratification, ROE, current liquidity, debt ratio, firm size, lagged sales growth, and EBIT. However, the independent variables, financial stability and lagged ROA do not have a significant impact on ROA, as suggested by the literature and the results of multiple linear regression analysis. Regressor variables ROA, debt ratio, firm size, EBIT and lagged ROE have predictive ability for ROE. Other independent variables in the ROE model were not used in further analyses since they did not show any statistically significant relationship, which indicates that the variables removed from the study have no impact on the profitability of Croatian IT firms.

In the Croatian context, the existence of research studies in the analyzed activity is not proven. Therefore, the results obtained for the profitability factors are applicable at several levels. First, at the micro level, the corporate environment, which includes managers, owners of IT firms and shareholders, should take into account the identified internal factors of profitability in order to achieve successful management goals in IT firms in Croatia, as called for by Škuflić et al. (2018, p. 351), especially when examining the relationship between isolated micro-determinants that are directly related to the firm's profitability (Vuković et al., 2020, p. 508). Second, the established determinants of profitability should be viewed as a synergistic upgrade of continuous annual editions of HGK analysis in the IT industry. Third, the research results will possibly have positive effects on the shaping of national policies in terms of strengthening the IT industry and increasing competitiveness in order to reduce the possibility of profit shifting in regional and global frameworks. Finally, researchers can additionally measure the robustness of profitability models by other scientific approaches in terms of improving and upgrading previous results. Azhagaiah and Candasamy (2011, p. 382) suggest that future studies could also be conducted to find out whether there is a significant relationship between fixed assets, asset structure, investment and volatility, advertising expenditure, probability of bankruptcy and uniqueness of the product, profit volatility of firms, etc. in terms of capital structure and profitability. In addition, at the firm level, the established determinants of profitability can be extended horizontally and vertically for other endogenous and exogenous variables within the four categories of profitability determinants by using longer time series data and certain dynamic models in the same or different industries.

However, the research results have certain long-term and short-term limitations. The quality of the obtained results depends on the reliability and accuracy of FINA (secondary) data. The time series of data includes a detailed set of values in a three-

year period that includes the COVID year - 2020, i.e., a longer time trend could not be covered due to lack of resources (Azhagaiah & Candasamy, 2011, p. 381). Likewise, Wahlen et al. (2022, p. 295) emphasize that the traditional analysis of financial ratios has certain disadvantages for start-up firms and firms with early high-growth stages of their life cycles, and as a result, adjusted financial statements are used to enable capitalization of technological assets and subsequent depreciation, as shown in the study of Lev & Sougiannis (1996). At the same time, researchers should focus in their future research on broader areas and codes within sections of the National Classification of Activities (NKD 2007; NACE Rev. 2). For example, in April 2022, the largest IT firm Ericsson Nikola Tesla d.d. re-registered from NKD C26.30 to J62.01, and as of 2022, it will be analyzed in the group of IT service providers (HGK, 2022, p. 7), which could leave a mark on code C26 in relation to industrial profitability.

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Appendix 1 Correlation matrix

		ROA	ROE	CL	DBT	FS	FS2	SZ	$SGR_{20/19}$	$SGR_{21/20}$	$SGR_{21/19}$	EBIT	$lagg ROA_{21/19}$	$lagg ROA_{20/19}$	$lagg ROE_{21/19}$	$lagg ROE_{20/19}$
ROA	Pearson Corr.	1														
	Sig. (2-tailed)															
	N	809														
ROE	Pearson Corr.	.444**														
	Sig. (2-tailed)	0.000														
	N	809														
CL	Pearson Corr.	.144**	-0.007													
	Sig. (2-tailed)	0.000	0.846													
	N	809	809													
DBT	Pearson Corr.	-.526**	-0.003	-.296**												
	Sig. (2-tailed)	0.000	0.932	0.000												
	N	809	809	809												
FS	Pearson Corr.	-0.011	-0.021	0.004	-0.036											
	Sig. (2-tailed)	0.750	0.548	0.905	0.313											
	N	809	809	809	809											
FS2	Pearson Corr.	-.070*	-0.058	-.101**	0.056	0.008										
	Sig. (2-tailed)	0.045	0.101	0.004	0.109	0.824										
	N	809	809	809	809	809										
SZ	Pearson Corr.	-.103**	-.101**	0.019	-0.043	-0.001	0.030									
	Sig. (2-tailed)	0.003	0.004	0.587	0.220	0.976	0.390									
	N	809	809	809	809	809	809									
$SGR_{20/19}$	Pearson Corr.	-0.003	0.010	-0.019	.116**	-0.005	-0.013	-0.025								
	Sig. (2-tailed)	0.940	0.777	0.597	0.001	0.898	0.710	0.482								
	N	809	809	809	809	809	809	809								
$SGR_{21/20}$	Pearson Corr.	-0.014	.144**	-0.030	.456**	-0.004	-0.022	-0.024	-0.004							
	Sig. (2-tailed)	0.685	0.000	0.395	0.000	0.899	0.532	0.504	0.914							
	N	809	809	809	809	809	809	809	809							
$SGR_{21/19}$	Pearson Corr.	-0.004	0.024	-0.022	.162**	-0.005	-0.015	-0.027	.995**	.097**						
	Sig. (2-tailed)	0.910	0.487	0.539	0.000	0.888	0.667	0.442	0.000	0.006						
	N	809	809	809	809	809	809	809	809	809						
EBIT	Pearson Corr.	.308**	.153**	.179**	-.228**	-0.008	-0.044	.501**	-0.027	-0.008	-0.028					
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.812	0.208	0.000	0.439	0.818	0.427					
	N	809	809	809	809	809	809	809	809	809	809					
$lagg ROA_{21/19}$	Pearson Corr.	-0.034	-0.003	-0.030	0.005	-0.009	0.014	-0.048	-0.048	-0.060	-0.053	-0.034				
	Sig. (2-tailed)	0.343	0.938	0.399	0.895	0.800	0.686	0.175	0.182	0.091	0.135	0.335				
	N	809	809	809	809	809	809	809	809	809	809	809				
$lagg ROA_{20/19}$	Pearson Corr.	-0.008	0.011	-0.063	-0.029	-0.019	.174**	-0.003	-0.054	-0.012	-0.054	-0.020	.388**			
	Sig. (2-tailed)	0.816	0.766	0.079	0.413	0.592	0.000	0.931	0.133	0.735	0.127	0.577	0.000			
	N	809	809	809	809	809	809	809	809	809	809	809	788			
$lagg ROE_{21/19}$	Pearson Corr.	-0.015	0.063	-0.035	.182**	-0.004	-0.035	-0.053	.114**	.338**	.147**	-0.011	.513**	.091*		
	Sig. (2-tailed)	0.672	0.078	0.331	0.000	0.918	0.323	0.135	0.001	0.000	0.000	0.758	0.000	0.011		
	N	809	809	809	809	809	809	809	809	809	809	809	788	788		
$lagg ROE_{20/19}$	Pearson Corr.	0.018	0.048	0.040	-.104**	-0.018	-0.038	-0.006	.084*	-0.013	.083*	0.020	.269**	.432**	.198**	
	Sig. (2-tailed)	0.611	0.180	0.260	0.003	0.611	0.284	0.867	0.018	0.723	0.020	0.579	0.000	0.000	0.000	
	N	809	809	809	809	809	809	809	809	809	809	809	788	788	788	

*. Correlation is significant at the 0.05 level (2-tailed) **. Correlation is significant at the 0.01 level (2-tailed).

Source: Author's estimate