Determinants of firm profitability in the Croatian manufacturing industry: evidence from dynamic panel analysis

Pervan, Maja; Pervan, Ivica; Ćurak, Marijana

Download date / Datum preuzimanja: **2025-01-05**

UNIVERSITY OF SPLIT

dabar
DIGITALNI AKADEMSKI ARHIVI I REPOZITORIJI

Determinants of firm profitability in the Croatian manufacturing industry: evidence from dynamic panel analysis

Maja Pervan, Ivica Pervan & Marijana Ćurak

Published online: 06 May 2019.

Submit your article to this journal ⏎

Article views: 839

View related articles ⏎

View Crossmark data ⏎

Routledge
Taylor & Francis Group

🔓 OPEN ACCESS | Check for updates

Determinants of firm profitability in the Croatian manufacturing industry: evidence from dynamic panel analysis

Maja Pervan, Ivica Pervan and Marijana Ćurak

Faculty of Economics, University of Split, Split, Croatia

ABSTRACT

Given that the goal of this study was to examine the influence of different factors on a firm's profitability, we designed a model with three categories of profitability determinants: firm-specific, industry-specific and macroeconomic. The analysis was performed on 9359 firms operating in the Croatian manufacturing industry during the 2006–2015 period. Since the designed model was formulated in a way that encompasses the dynamic aspect of profitability, the General Method of Moments (G.M.M.) dynamic panel estimator was applied. Formulation of such a model adds to the existing literature if one takes into account that a dynamic analysis of the drivers of profitability has not been done using data from the Croatian manufacturing sector. The results of the conducted analysis revealed that a firm's age, labour cost and industry concentration, as well as G.D.P. growth and inflation, have significant influence on a firm's profitability.

1. Introduction

Although different theories have tried to illuminate the reasons why some firms are more profitable than others, and a large amount of research has considered and explored different factors that may impact firm performance, the issue of firm profitability continues to be an actual, significant and inexhaustible phenomenon that attracts the attention of many researchers and practitioners. In the present context of market liberalisation, globalisation and increased competition, the examination of the determinants that are relevant and significant in explaining firms' business success becomes crucial.

Having in the above in mind, the aim of this research is to create a model that will identify factors that determine a firm's success. In order to accomplish the aim, we designed three categories of a firm's profitability determinants. The first category, *firm-specific* determinants, encompasses different firm characteristics such as the firm's age, liquidity and labour costs. The second category of determinants embodies *industry-specific* determinants that capture the market structure within which firms

---

operate. In this category, industrial concentration and capital intensity of the industry are included as explanatory variables. The final category of determinants refers to *macroeconomic variables.* Since the overall state of the country's economy can also influence a firm's business success, the inflation rate and annual growth rate of gross domestic product G.D.P. were included into the model. Additionally, in order to control for cross-sectional dependency, time dummy variables were included in the model. Since the manufacturing industry is recognised as a key driver of prosperity and growth in any economy, the focus of this research is on the performance of firms operating within this industry.

This research builds on the previous empirical research in several ways. It will simultaneously comprise three different dimensions that may influence a firm's success: firm-level determinants, industry-level determinants and macroeconomic determinants. Hence, this model represents an upgrade to those researches focused only on firm-specific determinants (for instance, Goddard et al., 2005; Nunes & Serrasqueiro, 2015). As a result, the model will provide a more accurate picture of a Croatian manufacturing firm's success. Furthermore, since a vast majority of studies come from the United States, this research will contribute to the literature by providing comparable data from a developing economy, Croatia, which is important for the generalisation of the results across economies at different stages of development. Also, the model will be formulated in a way that encompasses the dynamic aspect of profitability. Formulation of such a model particularly gains in importance if one takes into account that empirical models of dynamic analysis are non-existent in the Croatian manufacturing sector. Moreover, among the studies that have been carried out in Central and Eastern European (C.E.E.) countries, only a very limited number of these studies have simultaneously incorporated firm-specific, industry-specific and macroeconomic variables as determinants of manufacturing firm profitability by using dynamic panel analysis. Finally, unlike most studies on a firm's profitability, which were restricted to only publically listed firms (e.g., Demir, 2009; Vătavu, 2014) or to only larger firms (e.g., McDonald, 1999; Mueller, 1986), this research uses an unbalanced panel dataset on Croatian manufacturing firms obtained from the Amadeus database. The percentage of sampled firms in terms of active firms in the manufacturing industry varies on a yearly basis and it ranges from 49.4% to 66.6% (a detailed table is provided in Appendix).

The rest of the paper is organised as follows. Section 2 reviews the works that have employed the determinants of profitability used in this research. In Section 3, the data is described and the empirical model is presented. Section 4 provides the results, discussion and policy implications. Conclusions are presented in the final section.

2. Theoretical framework and variables

Determinants of a firm's profitability can be analysed from various aspects, with the application of different methodologies and within different theoretical frameworks. All variables in this research were chosen on the basis of relevant theories, empirical research and data availability. Theoretical reasoning for each of the variable included into analysis is presented in subsequent paragraphs.

2.1. Age

Large amounts of both theoretical and empirical work in different scientific areas (economics, strategic management and finance) have been dedicated to understanding and exploring the issue of whether older firms are more profitable than smaller ones. The strongest arguments for why there may exist a positive influence of age on performance are the firm's experience, business reputation and consideration that it has easier access to financing. However, older firms often try to codify decision-making procedures, which makes them very bureaucratic and reduces their organisational flexibility and their ability for prompt changes. Such rules and procedures can be major obstacles for organisational change and innovation which are crucial in a competitive business environment. With the application of different statistical methodologies, such as ordinary least squares (O.L.S.), least absolute deviations (L.A.D.) and value at risk (V.A.R.), Coad, Segarra, and Teruel (2013) found evidence of a decline in profitability as the firms grew older. Majumdar (1997) investigated the influence of an Indian firm's size and age on the firm's productivity and profitability. The results showed that the older firms were more productive and less profitable than the younger firms. Other recent empirical studies (Hirsch & Hartmann, 2014; Pervan, Pervan, & Ćurak, 2016) mainly confirmed that firm performance deteriorates with firm age. However, some researchers found either an insignificant (Gaur, 2011) or positive relationship (Bhayani, 2010).

2.2. Liquidity

Liquidity is often defined as a firm's ability to settle short-term liabilities and, therefore, it can be viewed as a measure of risk that a firm will not be able to meet its short term obligations. In addition to measuring short-term risks, liquidity is also related with long-term firm performance and survival. Namely, many firm failure models confirmed that liquidity ratios were useful for failure prediction (Altman, 1968; Pervan, Pervan, & Vukoja, 2011; Situm, 2015). Such studies confirmed that increased liquidity reduces the probability of firm failure. Empirical studies that have explored the influence of liquidity on short-term performance (annual profitability) have shown conflicting results. Some studies have confirmed a positive relationship (Chamberlain & Gordon, 1989; Nunes, Viveiros, & Serrasqueiro, 2012; Hirsch & Hartmann, 2014; Hirsch, Schiefer, Gschwandtner, & Hartmann, 2014), while others have reported no relationship (Majumdar, 1997; Sur & Chakraborty 2011) or even a negative relationship (Eljelly, 2004).

2.3. Labour cost

Firm competitiveness and profitability in the case of manufacturing industries may be significantly influenced by labour cost. Previous research (Stojčić, Bečić, & Vojinic, 2012) on determinants of Croatian manufacturers export competitiveness has found that labour costs play a central role in explaining export competitiveness in EU15 markets. Although strategies for achieving competitive advantage (e.g., brand development, focusing on market niche, etc.) may work for some, usually more innovative

manufacturing sectors, a cost leadership strategy still might be crucial for a large number of traditional manufacturing sectors. Such a standpoint for Croatian firms can be supported by recent Eurostat (2018) statistics, which show that for EU28 countries, average R&D spending of business sector reaches 1.32% of G.D.P., while in Croatia such a spending is only 0.38% of G.D.P. Presented data clearly indicate that Croatian firms are still not focusing on R&D as much as their EU28 competitors. In order to control for labour cost, it is necessary to include an explanatory variable that measures unit labour cost. In accordance with economic theory, it is expected that the labour cost variable will negatively influence profitability, i.e., increase of unit labour cost will result in lower firm profitability.

2.4. Concentration

The industrial organisation literature emphasises market structure as the main determinant of an industry's/firm's performance. Precisely, the structure–conduct–performance (S.C.P.) hypothesis, developed in the seminal work of Mason (1949) and Bain (1951) within the Harvard school of economic thought, states that market structure influences the industry's/firm's conduct and performance. By using their market power, colluding firms are able to set prices at a level that ensures extranormal profit. The positive effect of concentration on a firm's profitability has been found in numerous subsequent studies (Jeong & Masson, 1990; McDonald, 1999; Resende, 2007; Hirsch et al., 2014). In contrast to Bain's approach, the efficiency hypothesis (Demsetz, 1973) and the Chicago school state that the market structure is endogenous, resulting from the firm's efficiency. Based on an analysis of Dutch manufacturing industries, Prince and Thurik (1995) showed the negative effect of concentration on profitability for both small and large companies. Likewise, Yoon (2004) found a negative effect of concentration on profitability for the Korean manufacturing industry. On the other hand, Kaluwa and Reid (1991) found insignificant, although negative, effect of profit/sales ratio on concentration presented by three leading firms in the industry.

2.5. Capital intensity

Capital-intensive industries are characterised by significantly higher share of capital employed in production processes in comparison to the share of labour. Due to the nature of their businesses, firms belonging to the capital-intensive industries are required to take high level of investment in fixed assets for starting up the business as well as for their overall functioning. With investments that involve technologically more advanced machinery and equipment, firms could achieve higher productivity (Grazzi, Jacoby, & Treibich, 2016) and greater output, resulting in higher level of profitability. The requirements for substantial investment in fixed assets indicate the existence of economies of scale, which limits the number of the companies that could profitably operate within an industry, thus creating an entry barrier. Additionally, high capital costs in the initial phase of the business require substantial financial resources that could be limited for the new entrants. The costs of financing are higher

for the new firms in comparison to the existing ones, which are larger and have higher credit rating. With less exposure to the new competitors, firms in capital-intensive industries may exercise higher market power (Prince & Thurik, 1992). By setting the price above the competitive level, profitability increases. Consequently, more capital-intensive industries may have a higher level of price–cost margins in comparison to less capital-intensive industries (Strickland & Weiss, 1976; Domowitz, Hubbard, & Petersen, 1986a; Prince & Thurik, 1993; Go, Kamerschen, & Delorme, 1999, Goldar & Aggarwal, 2005). However, at the mature phase of the industry, due to excess capacity capital investments could negatively affect profitability (Lieberman, 1987; Dickinson & Sommers, 2012).

2.6. Economic growth

Economic growth reflects general macroeconomic conditions. More precisely, it indicates the change in economic activity within the country. It is anticipated that a shift in economic activity can influence a firm's performance. Therefore, adding this variable to the profitability model enables us to control for the business cycle (economic boom and recession). During periods of economic growth demand for the firm's goods and services is potentially increasing, and consequently it is expected that the firm will increase its sales and achieve higher profitability. Conversely, unfavourable economic conditions reflected in economic contractions – as was the case with the recent recession – deteriorate a firm's performance. The influence of the business cycle on industry margins was found in a study of U.S. manufacturing industries by Domowitz, Hubbard, and Petersen (1986b). Additionally, the authors confirmed that the business cycle has a higher impact on profit margins in more concentrated markets. On a sample of large U.K. manufacturing firms, Machin and Van Reenen (1993) found a pro-cyclical feature of profit margins. Lima and Resende (2004) found evidence of pro-cyclical trends of profitability for the aggregate business cycle for the Brazilian industry. Pattitoni, Petracci, and Spisni (2014) also showed a positive impact of G.D.P. growth on the performance of private firms in the EU15 area. However, Lee (2009) did not find a significant relationship between the business cycle and profitability for publicly-held U.S. firms.

2.7. Inflation

In addition to economic growth, it is expected that firm performance could be affected by monetary instability. It is usually stated that a general rise in the price of goods and services could impact both the firm's costs and revenues. However, according to Perry (1992) the effect of inflation on profitability depends on whether inflation is anticipated or unanticipated. In the case of anticipated inflation, firms are able to timely adjust the prices of goods at a level which would ensure higher revenues and take adequate cost management measures, ensuring that operating costs do not exceed revenues, resulting in increasing profit. On the contrary, in conditions of unanticipated inflation, the firms do not adjust prices properly, facing a slower increase in revenues in comparison to costs and ultimately a decrease in profitability.

Additionally, inflation could affect demand for a firm's goods, by decreasing the value of money and the purchasing power of customers with fixed income. In conditions of decreasing purchasing power, economic units with fixed income decrease demand for goods and services. Reduced demand negatively influences a firm's performance. According to Cooper (1983), besides the effect of inflation on a firm's profitability through costs and revenue, and a shift in demand, inflation impacts a firm's performance by affecting the costs of borrowing (through increased interest rates) and taxes, as well. Demir (2009) confirmed the negative effect of inflation uncertainty on publicly traded firms in Turkey, as did Pattitoni et al. (2014) for European firms.

3. Research methodology

3.1. Data

This research is based on firm level financial data that was collected from 2006 through 2015 from the Amadeus database compiled by Bureau van Dijk. The total number of firms analysed in this research amounted to 9359. Since this database also includes some additional non-financial firm data (such as year of firm incorporation), additional effort is invested in filling in missing data for a significant number of firms without information on their incorporation. Data for these firms, one by one, were obtained from the website of the Court Register[1] of the Ministry of Justice of the Republic of Croatia and the Croatian Trade Register[2]. Since the total number of analysed firms was changing over the years (as a result the liquidations and/or mergers and acquisitions), we were dealing with an unbalanced panel. With regards to industry level data, it was computed/aggregated from the firm level data since no official statistics regarding our variables of interest (e.g., the industrial concentration) exist. This means that for each of the 92 three-digit industries (and for each of the ten analysed years) the concentration ratio and the Herfindahl–Hirschman (H.H.) index were individually computed. This is probably one of the reasons why industrial concentration (especially in H.H. form) is almost non-existent as a determinant of profitability in previous studies focused on the Croatian manufacturing sector. Finally, macroeconomic data were extracted from the World Development Indicators database of the World Bank (2017).

3.2. Estimation method and variables

A large number of economic relationships have dynamic characteristics. In terms of firm performance this can be interpreted in a way that firm profitability in the previous period is related to firm profitability in the current period. Therefore, the authors decided to use a dynamic component in the form of a lagged dependent variable as a regressor in the following model:

$$ROA_{it} = \alpha + \delta ROA_{i,t-1} + \sum_{f=1}^{F} \beta_f X_{it}^f + \sum_{s=1}^{S} \beta_s X_{it}^s + \sum_{m=1}^{M} \beta_m X_{it}^m + \varepsilon_{it}, \varepsilon_{it} = \nu_i + u_{it} \quad (1)$$

where ROA_{it} represents the profitability of firm i at time t, with $i = 1, \ldots, N$, and $t = 1, \ldots, T$, $ROA_{i,t-1}$ is the one-period lagged profitability, δ is the speed of

Table 1. Measurement of variables.

Variable		Symbol	Description
Dependent variable	Return on assets	ROA	Ratio of profit (loss) before tax and total assets
Firm specific variables	Age	Age	Number of years the firm operates in the market
	Current ratio	Liq	Current assets / Current liabilities
	Labour cost	Lab	Ratio between firm's labour cost and its sales
Industry specific variables	Herfindahl–Hirschman index	HHI	Sum of the squared market share (asset based) of all firms operating in the respective three-digit industry
	Capital intensity	Cap	Ratio between fixed assets and sales
Macro-economic variables	Inflation rate	IR	Annual inflation rate
	Growth rate of economy	GGDP	Annual growth rate on GDP

Source: Authors.

convergence toward equilibrium, α is a constant term, β_f, β_s and β_m represent vectors of coefficients to be estimated, x'_{it}'s are the explanatory variables (specifically, X^f_{it} stands for firm-specific variables; X^s_{it} denotes structure (industry-specific variables) and X^m_{it} stands for macroeconomic variables), ε_{it} is the error term with ν_i the unobserved firm-specific effect and u_{it} the idiosyncratic error.

All variables used in this analysis, together with the symbol and corresponding manner in which they were computed, are presented in Table 1. Additionally, in our model, we treated firm's liquidity and labour cost variables as endogenous ones (and therefore they were instrumented with their lags), while all other variables were treated as exogenous ones (and hence instrumented with themselves).

Estimation of model (1) by O.L.S. would yield biased and inconsistent results. Hence, a dynamic panel estimator known as the generalised methods of moments (G.M.M.) which was developed by Arellano and Bond (1991), augmented by Arellano and Bover (1995) and fully developed in Blundell and Bond (1998) is applied.

The G.M.M. estimator is valid only if two conditions are met. The first condition requires that the over-identifying restrictions (all chosen instruments) are valid, while the second condition excludes the presence of second-order serial correlation in residuals. The overall validity of the instruments (the first condition) is tested with the Hansen test, while the second condition can be verified with Arellano and Bond's test statistics (m_1 and m_2). It must be noted that the existence of a first-order autocorrelation in the differenced residuals does not indicate that the estimates are inconsistent (Anderson & Hsiao 1981). Therefore, the GMM estimator will be consistent even if first-order autocorrelation exists; however, second-order autocorrelation must not be present in the model.

4. Research results and discussion

Descriptive statistics for the variables used in this analysis are reported in Table 2 while Table 3 shows the pairwise correlation matrix.

Most of the correlation coefficients have low values which is desirable. The highest value of the correlation coefficient is recorded between inflation and the G.D.P. growth variables and is equal to 0.32. According to Gujarati (1995) collinearity should not be considered harmful until the value of correlation coefficient exceeds 0.7. Consequently, we can easily conclude that multicollinearity should not be a problem for our analysis.

Table 2. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	79,814	2.778833	21.11192	−100	100
Age	82,253	14.23349	13.14353	1	319
Lab	74,261	0.42575	7.320476	0	1357.572
Liq	80,606	2.595145	5.918342	0	100
HHI	82,337	1271.737	1423.545	146.7332	10000
Cap	82,326	43.40608	127.7611	0	7183.468
IR	82,337	1.939131	1.755358	0.0143	5.7025
GGDP	82,337	−0.22045	3.279271	−7.3837	5.1500

Source: Authors̀ calculations.

Table 3. Pairwise correlation.

Variable	ROA	Age	Lab	Liq	HHI	Cap	GGDP	IR
ROA	1							
Age	−0.0108	1						
Lab	−0.0401	−0.0019	1					
Liq	0.0721	0.0494	−0.0047	1				
HHI	−0.0055	0.0470	0.0163	0.0203	1			
Cap	−0.0132	0.0129	0.0033	0.0047	0.1957	1		
GGDP	0.0568	−0.0039	−0.0043	−0.0060	0.0214	−0.0145	1	
IR	0.0443	−0.0626	−0.0090	−0.0165	0.0345	−0.0267	0.3245	1

Source: Authors' calculations.

The application of system G.M.M. showed that instruments for levels were not valid implying that the steady-state assumption is not satisfied and therefore difference G.M.M. estimator is used. Results of this estimation are shown in Table 4. In order to eliminate any common time-varying shocks and to control for cross-sectional dependency, a time dummy variables were included in the model, as suggested by Sarafidis et al. (2009). Further examination of cross-sectional dependence by the difference in difference Sargan test did not confirm its existence.

As stated by Roodman (2009), good estimates of the lagged dependent variable should lie in or near the range between the least square dummy variable (L.S.D.V.) and O.L.S. point estimates. Moreover, a credible estimate should probably obtain value below 1.00 since values above 1.00 suggest an unstable dynamic, with accelerating divergence away from equilibrium values. Both of former requirements were satisfied in our model, since the point estimate on the lagged dependent variable of 0.215 was lower than 1.00 and because this value was falling within the credible 0.072–0.419 range (between the L.S.D.V. and O.L.S. point estimates).

The Wald statistic, which tests the joint significance of the regressors under the null of no relationship, (Arellano & Bond 1991) is rejected. The insignificant p-value of Hansen test suggests the acceptance of the null hypothesis which confirms that over-identifying restrictions (all chosen instruments) are valid. It is important to notice that in a situation when the number of instruments is greater than the number of groups, the previous test can be weak. However, in our case, the number of instruments is quite low in comparison to the number of groups, i.e., firms, indicating that this test is not likely to be weakened. Additionally, the results of the Arellano–Bond second-order autocorrelation test indicate the acceptance of the null hypothesis, suggesting the nonexistence of autocorrelation. Since the results of the statistical tests are in line with the requirements that the GMM postulates, we can conclude that the model specification, as well as all instruments, are valid.

Table 4. Profitability determinants.

Independent variables	Dependent variable: ROA	
	Coeff.	Std. Err.
ROA$_{(t-1)}$	0.21556***	0.137866
Age	6.08793***	0.119412
Lab	−0.07019***	0.017044
Liq	0.13971	0.163615
HHI	−0.00059*	0.000341
Cap	0.00036	0.000320
GGDP	0.12689***	0.024715
IR	11.9005***	0.208628
td2	−26.28202***	0.532340
td5	14.92197***	0.309485
td6	−0.48395**	0.242367
td7	−6.63595***	0.284200
td8	−2.92803***	0.245227
td10	−7.84005***	0.265484
Number of firms	9359	
Number of observations	50,003	
Number of instruments	49	
Wald chi^2	17,739.70***	
Hansen test (*p*-value)	0.224	
Arellano–Bond (m_1) (*p*-value)	0.001	
Arellano–Bond (m_2) (*p*-value)	0.822	

Source: Authors̀ calculations.
Notes: *** indicate significance at the 1% level, ** indicate significance at the 5% level, indicates significance at the 10% level.

The obtained results indicate a low level of profit persistence in the Croatian manufacturing industry, as presented by the ROA$_{(t-1)}$ variable. A low value for this variable points to the relatively high intensity of competition among firms operating in the manufacturing industry. Due to the intensive competition, the speed of adjustment process toward the competitive ideal (convergence toward industry's mean profit) is quite high.

Regarding the *firm's age*, it is revealed that for the firms operating in the Croatian manufacturing industry, profitability increases as time goes by. The positive effect of age on profitability may imply that firms with time accumulate knowledge in different areas of business operations (production, logistics, quality control, etc.) what in turn results with reduction of operational costs, high quality products and higher product prices. Additionally, older firms may exploit benefits of business reputation and optimal financial structure and negotiate lower financing costs on firm debts. Moreover, it seems that potentially negative effects of bureaucratic procedures developed with firm age are not high enough to diminish positive effects of accumulated knowledge and business reputation.

Obtained results indicate that firms with higher *liquidity* achieve better performance, however, this relationship was not statistically significant. The managers of firms with low liquidity must invest a lot of time and effort in order to convert receivables into cash or to negotiate additional short term financing with suppliers and banks. This might especially be the case in Croatian economy, since a substantial number of illiquid firms have always characterised it. Data obtained from the Croatian Financial Agency[3] (FINA) indicates that a share of insolvent firms in the total number of firms ranges from 28% (2005) to 33% (2011). Operations in an economy in which more than 30% of potential business partners are illiquid require a sufficient amount of current assets in order to absorb losses from receivables write-offs and to allow for profitable operations.

According to the evaluated model, *labour cost is* playing significant role in determining firm's profitability. In line with (micro)economic theory, the sign of this variable is negative, implying that higher cost leads to lower profitability. Since the influence of this variable is statistically significant, it confirms that cost leadership strategy is still crucial for a large number of traditional manufacturing sectors. Such a finding was not surprising since R&D investments (required for alternative, more innovative strategies) for Croatian firms are significantly lower in comparison to firms in other EU countries.

Coefficient on *industry concentration* has statistically significant negative sign. Thus, the evidence suggests that the concentration of the industry affects a firm's profitability, however, the hypothesis of the S.C.P. paradigm is not valid for the Croatian manufacturing industry. The coefficient on *capital intensity* variable shows positive sign. According to the theoretical considerations the capital intensity may affect the profitability as an entry barrier. Additionally, if capital investments embed a new technology they could increase productivity and consequently, profitability. However, capital intensity was not confirmed as a determinant of performance for firms operating in Croatian manufacturing industries.

According to the results, *economic growth* has a positive effect on a firm's performance in the Croatian manufacturing sector. Favourable economic conditions encourage demand for a firm's goods, which contributes to increasing sales and, ultimately, a higher level of profitability. The impact of *inflation* on the profitability is positive and statistically significant, indicating ability of Croatian manufacturing firms to adjust the price of goods and consequently achieve higher revenues as well as to take activities for ensuring that operating costs are kept below the firm's revenue resulting in higher profitability. The results indicate the importance of including macroeconomic conditions in the firm's profitability model.

5. Conclusion

Based on the relevant literature and the synthesis of different theories, we proposed a model that incorporated three types of firms' profitability determinants: firm-specific (age, liquidity and labour cost), industry-specific (industry concentration and capital intensity) and macroeconomic variables (inflation rate and G.D.P. growth). An empirical estimation of the model was based on firms operating in the Croatian manufacturing industry during the 2006–2015 period.

According to the evaluated model, firm age variable had a positive sign suggesting that older manufacturing firms operate with higher level of profitability. Such a finding confirms theoretical propositions that older firms exploit benefits of accumulated knowledge and business reputation trough cost savings and higher profitability. Liquidity in Croatia was always problematic because many firms in the (pre)crisis period were illiquid. Precisely, this ratio ranged from 28% in 2005 to 33% in 2011. Although this variable did not prove to be statistically significant, in such a business environment it was not surprising to find that liquidity was positively influencing profitability. Labour cost variable resulted in negative sign, indicating that increase of unit labour cost results in lower firm profitability. According to such finding, we can conclude that strategy of cost leadership is still predominant strategy for the majority of

Croatian manufacturing firms. One of two industry variables significantly affect the profitability of manufacturing firms. Market concentration negatively effects profitability suggesting that it is not likely for the firms operating in Croatian economy to collude and that, based on their market power, increase price of their products. Although capital intensity may stand as an entry barrier and different capital investments can assure implementation of advanced technology whose inclusion may affect firms' productivity and profitability, this variable was not found to be statistically significant.

Finally, the estimated parameters confirmed the significance of the macroeconomic environment for manufacturing firms in Croatia. Economic growth positively influenced firm profitability. Given the favourable economic conditions, demand for a firm's goods increases, contributing to increasing sales and ultimately, achieving higher profitability. The opposite was true for the downward trend in the economy. Inflation rates positively affected firm performance, indicating that a firm's costs decreased more with inflation than revenues, resulting in higher profitability.

The empirical findings from this study have some interesting implications for policy makers. Although industrial concentration and the potential collusion of the largest firms appear not to be the case for the Croatian manufacturing industry, the Croatian Competition Agency should carefully supervise the actions of large firms in order to prevent them from obtaining a dominant position and other uncompetitive practices. Considering the statistical significance of macroeconomic variables on firm profitability, as well as the dependence of macroeconomic conditions on the government's and central bank's policies, it is important for the government to take actions that ensure a favourable economic environment. Central bank should also maintain an adequate monetary policy in order to achieve its main goal, price stability. Although small level of inflation may boost economic activity, it is important to keep it within acceptable range.

In order to achieve more deep insight into profitability determinants, some future studies might include a broader set of variables in accordance with data availability. Additionally, in order to reveal intensity and the relevance of different determinants of the profitability of firms that are operating in different subsectors of the manufacturing industry, further research may perform industry-by-industry analysis.

Notes

1. https://sudreg.pravosudje.hr/registar/f?p=150:1
2. http://www1.biznet.hr/HgkWeb/do/extlogon
3. http://www.fina.hr/Default.aspx

Acknowledgment

References

Altman, E. I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *Journal of Finance*, 23, 609–889.

Anderson, T. W., & Hsiao, C. (1981). Estimation of dynamic models with error components. *Journal of the American Statistical Association*, 76(375), 598–606. doi:10.2307/2287517

Arellano, M., & Bond, S. (1991). Some test of specification for panel data. Monte Carlo evidence and application to employment equations. *Review of Economic Studies*, 58(2), 277–297. doi:10.2307/2297968

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29–51. doi:10.1016/0304-4076(94)01642-D

Bain, J. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936-1940. *Quarterly Journal of Economics*, 65(3), 293–324. doi:10.2307/1882217

Bhayani, S. J. (2010). Determinant of profitability in Indian cement industry: An economic analysis. *South Asian Journal of Management*, 17, 6–20.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.

Chamberlain, T. W., & Gordon, M. J. (1989). Liquidity, profitability, and long-run survival: Theory and evidence on business investment. *Journal of Post Keynesian Economics*, 11(4), 589–610. doi:10.1080/01603477.1989.11489765

Coad, A., Segarra, A., & Teruel, M. (2013). Like milk or wine: Does firm performance improve with age?. *Structural Change and Economic Dynamics*, 24, 173–189. doi:10.1016/j.strueco.2012.07.002

Cooper, I. (1983). Inflation and financial decision. *In Financial Management Handbook*, edited by Broyles, J., Cooper, I., & Archer, S. Aldershot: Gower Publishing Company Limited.

Demir, F. (2009). Financialization and manufacturing firm profitability under uncertainty and macroeconomic volatility: Evidence from an emerging market. *Review of Development Economics*, 13(4), 592–609. doi:10.1111/j.1467-9361.2009.00522.x

Demsetz, H. (1973). Industry structure, market rivalry, and public policy. *Journal of Law and Economics*, 16(1), 1–9. doi:10.1086/466752

Dickinson, V., & Sommers, G. A. (2012). Which competitive efforts lead to future abnormal economic rents? Using accounting ratios to assess competitive advantage. *Journal of Business Finance & Accounting*, 39(3-4), 360–398. doi:10.1111/j.1468-5957.2012.02283.x

Domowitz, I., Hubbard, G. R., & Petersen, B. C. (1986a). Business cycles and the relationship between concentration and price-cost margins. *Rand Journal of Economics*, 17(1), 1. 17. doi:10.2307/2555624

Domowitz, I. R., Hubbard, G., & Petersen, B. C. (1986b). The intertemporal stability of the concentration-margins relationship. *The Journal of Industrial Economics*, 35(1), 13–34. doi:10.2307/2098604

Eljelly, A. M. (2004). Liquidity – profitability trade-off: An empirical investigation in an emerging market. *International Journal of Commerce and Management*, 14, 48–61. doi:10.1108/10569210480000179

Eurostat (2018). Statistics explained, R&D expenditure, available at https://ec.europa.eu/eurostat/statistics-explained/index.php/R_%26_D_expenditure (accessed on October, 2018.)

Gaur, J. (2011). Financial Performance Measures of Business Group Companies: A Study of Indian Non-Metallic Mineral Products Industries. *The IUP Journal of Business Strategy*, 7, 45–53.

Go, G., Kamerschen, D., & Delorme, C. (1999). Market structure and price-cost margins in Philippine manufacturing industries. *Applied Economics*, 31(7), 857–864. doi:10.1080/000368499323814

Goddard, J., Tavakoli, M., & Wilson, J. O. (2005). Determinants of profitability in European manufacturing and services: evidence from a dynamic panel model. *Applied Financial Economics*, 15(18), 1269–1282. doi:10.1080/09603100500387139

Goldar, B., & Aggarwal, S. C. (2005). Trade liberalization and price-cost margin in Indian Industries. *The Developing Economies*, 43(3), 346–373. doi:10.1111/j.1746-1049.2005.tb00949.x

Grazzi, M., Jacoby, N., & Treibich, T. (2016). Dynamics of investment and firm performance: comparative evidence from manufacturing industries. *Empirical Economics*, *51*(1), 125–179. doi:10.1007/s00181-015-0991-2

Gujarati, D. N. (1995). *Basic Econometrics*. New York: McGraw-Hill Companies.

Hirsch, S., Schiefer, J., Gschwandtner, A., & Hartmann, M. (2014). The determinants of firm profitability differences in EU food processing. *Journal of Agricultural Economics*, *65*(3), 703–721. doi:10.1111/1477-9552.12061

Hirsch, S., & Hartmann, M. (2014). Persistence of firm-level profitability in the European dairy processing Industry. Journal of *Agricultural Economics*, *45*(S1), 53–63. doi:10.1111/agec.12129

Jeong, K. Y., & Masson, R. T. (1990). Market Structure, Entry, and Performance in Korea. *The Review of Economics and Statistics*, *72*(3), 455–462. doi:10.2307/2109353

Kaluwa, M. B., & Reid, C. G. (1991). Profitability and price flexibility in manufacturing for a developing country. *The Journal of Industrial Economics*, *39* (6), 689–700. doi:10.2307/2098671

Lee, J. (2009). Does size matter in firm performance? Evidence from US public firms. *International Journal of the Economics of Business*, *16*(2), 189–203. doi:10.1080/13571510902917400

Lieberman, M. (1987). Strategies for capacity expansion. *Sloan Management Review*, *28*, 4, 19–27.

Lima, M. A., & Resende, M. (2004). Profit margins and business cycles in the Brazilian industry: A panel data study. *Applied Economics*, *36*(9), 923–930. doi:10.1080/0036840042000233140

Machin, S., & Van Reenen, J. (1993). Profit margins and the business cycle: Evidence from UK manufacturing firms. *The Journal of Industrial Economics*, *41*(1), 29–50. doi:10.2307/2950616

Majumdar, S. K. (1997). The impact of size and age on firm-level performance: Some evidence from India. *Review of Industrial Organization*, *12*, 231–241.

Mason, E. S. (1949). The current state of the monopoly problem in the United States. *Harvard Law Review*, *62*(8), 1265–1285. doi:10.2307/1336466

McDonald, J. T. (1999). The determinants of firm profitability in Australian manufacturing. *Economic Record*, *75*(2), 115–126. doi:10.1111/j.1475-4932.1999.tb02440.x

Mueller, D. C. (1986). *Profits in the long run*. Cambridge: Cambridge University Press.

Nunes, P. M., Viveiros, A., & Serrasqueiro, Z. (2012). Are the determinants of young SME profitability different? Empirical Evidence using dynamic estimators. *Journal of Business Economics and Management*, *13*(3), 443–470.

Nunes, P. M., & Serrasqueiro, Z. (2015). Profitability determinants of Portuguese knowledge-intensive business services: Empirical evidence using panel data models. *Applied Economics Letters*, *22*(1), 51–56. doi:10.1080/13504851.2014.925041

Pattitoni, P., Petracci, B., & Spisni, M. (2014). Determinants of profitability in the EU-15 area. *Applied Financial Economics*, *24*(11), 763–775. doi:10.1080/09603107.2014.904488

Perry, P. (1992). Do banks gain or lose from inflation?. *Journal of Retail Banking*, *14*, 25–30.

Pervan, I., Pervan, M., & Vukoja, B. (2011). Prediction of company bankruptcy using statistical techniques. *Croatian Operational Research Review*, *2*, 158–167.

Pervan, M., Pervan, I., & Ćurak, M. (2016). *Business Success Enhance with Firm's Age? Case of Croatian Food Manufacturing Industry. Proceedings of the 26th International Business Information Management Association Conference, Amsterdam, Milano: 826-838*, Does

Prince, Y. M., & Thurik, A. R. (1995). Do small firms' price-cost margins follow those of large firms? *Bulleting. Bulletin of Economic Research*, *47*, 321–327. doi:10.1111/j.1467-8586.1995.tb00618.x

Prince, Y. M., & Thurik, A. R. (1992). Price-cost margins in Dutch manufacturing: Effects of concentration, business cycle and international trade. *De Economist*, *140*(3), 310–335. doi:10.1007/BF01799323

Prince, Y. M., & Thurik, A. R. (1993). Firm-size distribution and price-cost margins in Dutch manufacturing. *Small Business Economics*, *5*(3), 173–186. doi:10.1007/BF01531914

Resende, M. (2007). Structure, conduct and performance: A simultaneous equations investigation for the Brazilian manufacturing industry. *Applied Economics*, 39(7), 937–942. doi: 10.1080/00036840500461949

Roodman, D. (2009). How to do xtabond2: An introduction to difference and system GMM in stata. *The Stata Journal: Promoting Communications on Statistics and Stata*, 9(1), 86–136. doi:10.1177/1536867X0900900106

Sarafidis, V., Yamagata, T., & Robertson, D. (2009). A test of cross section dependence for a linear dynamic panel model with regressors. *Journal of Econometrics*, 148(2), 149–161. doi: 10.1016/j.jeconom.2008.10.006

Situm, M. (2015) The relevance of trend variables for the prediction of corporate crises and insolvencies. *Zagreb International Review of Economics and Business*, 18, 17–49. doi:10.1515/zireb-2015-0002

Stojčić, N., Bečić, M., & Vojinic, P. (2012). The competitiveness of exports from manufacturing industries in Croatia and Slovenia to the EU-15 market: A dynamic panel analysis. *Croatian Economic Survey*, 14(1), 69–105.

Strickland, A. D., & Weiss, L. W. (1976). Advertising, concentration, and price-cost margins. *The Journal of Political Economy*, 84(5), 1109–1122. doi:10.1086/260499

Sur, D., & Chakraborty, K. (2011). Evaluating relationship of working capital and profitability: A study of select multinational companies in the Indian pharmaceutical sector. *The IUP Journal of Management Research*, 10, 7–22.

Vǎtavu, S. (2014). The determinants of profitability in companies listed on the Bucharest stock exchange. Annals of the University of Petrosani Economics, 14, 329–338.

World Bank. (2017). *World Development Indicators, 2017*. Washington, DC: World Bank. http://data.worldbank.org/data-catalog/world-development-indicators (accessed January 15, 2017).

Yoon, S. (2004). A note on the market structure and performance in Korean manufacturing industries. *Journal of Policy Modelling*, 26, 733–746. doi:10.1016/j.jpolmod.2004.03.005

Appendix

Table A. Number of sampled and active firms operating in the Croatian manufacturing industry.

Year	Number of registered business entities	Number of active business entities	Number of business entities in the sample	Percentage of sampled firms into active firms
2006	22,447	12,397	6171	49.78
2007	23,466	13,108	6477	49.41
2008	24,346	14,148	7191	50.83
2009	22,649	13,001	8072	62.09
2010	22,989	13,779	8309	60.30
2011	23,742	13,178	8485	64.39
2012	24,572	14,024	9344	66.63
2013	23,247	15,277	9837	64.39
2014	24,480	16,507	9535	57.76
2015	2,5726	17,754	8916	50.22

Sources: Croatian Bureau of Statistics (2007–2008, 2010–2013 and 2015–2016), Number and structure of business entities, First Release, No. 11.1.1/4., https://www.dzs.hr/ (accessed 20 November 2018).
Croatian Bureau of Statistics (2009 and 2014), Statistical information, https://www.dzs.hr/hrv/publication/stat_info.htm (accessed 20 November 2018).
Amadeus Database, Bureau Van Dijk.