The impacts of intellectual capital and financial factors on the competitiveness of Spanish firms in food and beverage industry before and after the COVID crisis

Recebimento dos originais: 12/03/2024
Aceitação para publicação: 22/01/2025

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Abstract

This paper aims to explore the influence of intellectual capital and financial factors on firms' competitiveness in food and beverage industry with considering the impacts of the COVID crisis. The value added intellectual coefficient method is employed to measure intellectual capital with using the ordinary least squares as the regression model. The results show the positive effects of intellectual capital factors on profitability no matter whether it is in the COVID crisis. In addition, the positive effects of intellectual capital efficiency and human capital efficiency tend to increase in the COVID crisis. Intellectual capital factors are non-significant in the models for market share. Capital employed efficiency that represents the efficiency of physical and financial capital is significant in both the models for profitability and market share. Regarding financial factors, their impacts are clearly observed on both profitability and market share. Therefore, the findings suggest that: for the firms in food and beverage industry as typically low-technology manufacturing sectors, intellectual capital factors influence competitiveness from the perspective of profitability instead of market share, whereas physical and financial capital as well as financial factors impact on competitiveness from the angles of both profitability and market share. This paper contributes to the empirical studies of competitiveness from firm level and differentiates the impacts of intellectual capital factors and financial factors on the competitiveness of the firms in food and beverage industry as a stabilizer for economy during the recent COVID crisis.

Keywords: Intellectual capital factors. Competitiveness. Food and beverage industry.

1. Introduction

Competitiveness is an important topic that is focused on by both academic researchers as well as business owners and managers, because of the close relationship between competitiveness and a firm's success (Sariannidis *et al*., 2019). A number of studies focus on

the ways to raise competitiveness. Intellectual capital as one of the most valuable resources containing the knowledge, skills, and abilities of employees is directly related to the market share, competitiveness, and sustainable development of a firm (Gross-Gołacka *et al.*, 2020; Puzynya *et al.*, 2022). As noted by Vukašinović and Djordjević-Boljanović (2013), researchers give more weight to the importance of knowledge in creating new values after the global economic crisis. Hence, it is necessary to explore the impacts of intellectual capital on the competitiveness of firms with considering the influence of crisis.

As pointed out by Mattas and Tsakiridou (2010), during the crisis period most industries suffer losses and then cause unemployment, whereas food industry works as a stable job-provider and as an important pillar of economy under adverse economic conditions; food industry can also galvanize the economy and accelerate its recovery. According to the data from Informe Económico (2021; 2022) reported by FIAB (Federación Española de Industrias de Alimentación y Bebidas), the nominal productions of food and beverage industry in Spain in 2019, 2020, and 2021 were respectively 144975, 137537, and 154393 millions of Euros, which had kept on increasing from 2009 to 2019 and got a decrease in 2020 due to the negative impact of the COVID crisis; the annual growth rates of GDP (gross domestic product) in Spain in 2019, 2020 and 2021 respectively were 2.1 percent, -10.8 percent, and 5.1 percent. From the above data, we can find that the growth of nominal production of food and beverage industry between 2019 and 2020 was -5.13 percent, which is much higher than the growth rate of GDP (-10.8 percent). Thus, the data here support the viewpoint of Petropoulos (2019) that the food industry is a power of resilience to the crisis.

The purpose of this paper is to analyze the influence of intellectual capital elements on the competitiveness of firms in food and beverage industry with observing the impacts of the COVID crisis. The main contribution of our study lies in understanding the change of the influential factors of intellectual capital before, during and after the COVID crisis, which can help managers know how to allocate the investments among the components of intellectual capital as well as financial elements to drive competitiveness especially in the crisis period. The remainder of this paper is structured as follows. Section 2 reviews the literature on intellectual capital and its influence on financial performance. Section 3 outlines the data and research methodology. Section 4 presents the findings and discussion. Section 5 concludes.

2. Literature Review

The importance of intellectual capital as an essential intangible resource for building sustainable competitive advantage has been realized by scholars and practitioners, while the

problems arise from no consensus on the definition of intellectual capital and the difficulties in measurement (Maditinos *et al*., 2011; Bontis *et al*., 2018). In fact, according to Albertini and Berger-Remy (2019), current financial-reporting systems, either the International Financial Reporting Standards (IFRS) or the Generally Accepted Accounting Principles (GAAP), are difficult to fully reflect intangible assets. In spite of the above mentioned difficulties in defining and measuring, most researchers investigate intellectual capital from three facets: human capital, structural capital and relational capital.

According to the resource-based theory, human capital is a crucial factor that can build competitive advantage and explain why firms perform differently, because knowledge embedded in human capital is valuable and imitable (Crook *et al*., 2011). Human capital can benefit to productivity and efficiency through cognitive skills generated from knowledge (Felício *et al*., 2014). With regard to structural capital, as pointed out by Beltramino *et al*. (2020), structural capital is also called organizational capital by scholars (which reflects the mechanisms and structures of an organization), and efficient structure, systems and processes can pave the way for individuals to release their knowledge store. Relational capital including the relationships with stakeholders as scarce, valuable, and inimitable strategic assets influences firms' performance through innovation and operational efficiency (Lopes-Costa and Munoz-Canavate, 2015), as relational capital could increase knowledge sharing within the relationship and increase learning and innovation (Kohtamäki *et al*., 2012).

For empirical studies, the value added intellectual coefficient (VAIC) model developed by Pulic (2004) as a proxy for intellectual capital performance is commonly used by authors to explore the influence of intellectual capital performance and companies' performance. Notwithstanding that, there are also some studies employing other methods in measuring intellectual capital performance (Morariu 2014). For instance, based on the survey and questionnaire method, Cohen and Kaimenakis (2007) find that some elements of intellectual capital positively influence the performance of small and medium-sized knowledge-intensive companies in Greek service sector. In Spain, Peña (2002) provides supportive evidence that some elements of human capital, organizational capital and relational capital are positively related to the success of Spanish start-up firms. Similarly, the research of Hormiga *et al*. (2011) also highlights the importance of the human capital and relational capital for the success of Spanish new firms in their first several years.

For the research using the VAIC method, there are also different findings for the data in different countries. Palazzi *et al*. (2020) find positive effects of financial and physical capital efficiency (CEE) and human capital efficiency (HCE) and a negative effect of

structural capital efficiency (SCE) on the performance of Italian manufacturing small and medium-sized enterprises (SMEs). In Romania the research results of Sumedrea (2013) show that profitability is positively affected by the value added intellectual capital coefficient (VAIC) and growth is impacted by the human capital (HCE) and structural capital (SCE) during the crisis period. Differently enough, Morariu (2014) claims that none of the three elements of intellectual capital (capital employed, structural capital, and human capital) relates to Romanian public companies' profitability.

Regarding the studies with considering the COVID crisis, Paoloni *et al*. (2022) explore the impacts of structural capital and relational capital on farm's sustainability and competitiveness before and during the COVID, while Agostini and Nosella (2023) investigate the influence of intellectual capital on the resilience of small and medium-sized enterprises after the COVID. Papíková and Papík (2022) use the VAIC model to observe the difference of the impacts of intellectual capital on profitability before and during the COVID crisis for the small and medium-sized enterprises. With the help of the VAIC model, the study of Ognjanovic *et al*. (2023) focuses on the influence of intellectual capital on the profitability and employee performance of hotels before and during the COVID crisis.

In spite of the above studies, limited research focuses on the firms in food and beverage industry with relating to intellectual capital during the COVID crisis. The importance of food and beverage industry shows not only in satisfying the basic needs of people's daily life but also in representing traditional manufacturing sectors with the features of large investments in machine and workforce. Thus, this paper approaches competitiveness studies under the background of the COVID crisis, and contributes to the related empirical studies on the elements of intellectual capital for keeping the competitiveness of a representative of traditional manufacturing sectors during a sudden crisis.

3. Research Methodology

The sample includes 1791 firms in food and beverage manufacturing sectors of Spain from Iberian Balance Sheet Analysis System (SABI) database (developed by Bureau Van Dijk). Specifically, the sampled firms require to report financial data in all the observed three years (2019, 2020, and 2021), and therefore we have 5373 observations. Here, the VAIC is used as the basic method to explore the influence of intellectual capital elements on firms' competitiveness. As pointed out by Kramaric *et al*. (2021), the VAIC model is composed of the following equations. Value added (VA) is the sum of operating profits (OP), employee

costs (EC), depreciation expenses (DP), and amortization expenses (AM).

$$VA = OP+EC+DP+AM$$

Human capital efficiency (HCE) is calculated by value added (VA) divided by the total salaries and wages (HC).

$$HCE = VA/HC.$$

Structural capital (SC) is calculated by value added (VA) less total salaries and wages (HC).

$$SC = VA – HC$$

Structural capital efficiency (SCE) is calculated by structural capital (SC) divided by value added (VA).

$$SCE = SC/VA$$

Intellectual capital efficiency (ICE) is calculated by adding up human capital efficiency (HCE) and structural capital efficiency (SCE).

$$ICE = HCE + SCE$$

Capital employed efficiency (CEE) is calculated by value added (VA) divided by total assets reduced for intangible assets (CE).

$$CEE = VA/CE.$$

Value added intellectual coefficient (VAIC) is the sum of ICE (HCE + SCE) and CEE.

$$VAIC = ICE + CEE = HCE + SCE + CEE$$

The main explanatory variables include VAIC, ICE, HCE, SCE, and CEE. Control variables contain size (the natural logarithm of total assets), leverage (total liabilities to total assets), liquidity (current ratio that is calculated as current assets to current liabilities), assets structure (tangible fixed assets to total assets), and crisis dummy (that identifies 2020 as the crisis year). In addition to the above, the interactions between the VAIC-related variables and the crisis dummy are created, where the crisis dummy is respectively interacted with VAIC, ICE, HCE, SCE and CEE.

According to Sariannidis *et al*. (2019), competitiveness can be measured from the financial or marketing perspectives. Therefore, following Konstantinidis *et al*. (2022), we choose two most important indicators of competitiveness as dependent variables, namely profitability and market share. Profitability is calculated by the ratio of profits before tax to sales, while market share is calculated by the sales of a firm to the total turnover of food and beverage industry of Spain in a year. Following Konstantinidis et al. (2022), we control the scopes of market share (between 0 and 1) and return on sales (between -1 and 1). Here, the ordinary least squares regression (OLS) model is employed as the research method. Three types of models are designed as follows. First, the models for year-by-year regressions

separately for profitability and market share are shown in formulas 1, 2, 3, 4, 5 and 6. Second, the models for the pooled data with crisis dummy as individual variable are shown in formulas 7, 8, 9, 10, 11, and 12. Third, the models for the pooled data with crisis dummy as interacting variable are shown in the formulas 13, 14, 15, 16, 17, and 18.

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \varepsilon_{it} \quad (1)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \varepsilon_{it} \quad (2)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7 TANGIBILITY + \varepsilon_{it} \quad (3)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \varepsilon_{it} \quad (4)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \varepsilon_{it} \quad (5)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7 TANGIBILITY + \varepsilon_{it} \quad (6)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \alpha_6 CRISIS + \varepsilon_{it} \quad (7)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \alpha_7 CRISIS + \varepsilon_{it} \quad (8)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7 TANGIBILITY + \alpha_8 CRISIS + \varepsilon_{it} \quad (9)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \alpha_6 CRISIS + \varepsilon_{it} \quad (10)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \alpha_7 CRISIS + \varepsilon_{it} \quad (11)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7\ TANGIBILITY + \alpha_8 CRISIS + \varepsilon_{it} \quad (12)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \alpha_6 INTERACTION + \varepsilon_{it} \quad (13)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \alpha_7 INTERACTION + \varepsilon_{it} \quad (14)$$

$$PROFITABILITY_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7 TANGIBILITY + \alpha_8 INTERACTION + \varepsilon_{it} \quad (15)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 VAIC + \alpha_2 SIZE + \alpha_3 LEVERAGE + \alpha_4 LIQUIDITY + \alpha_5 TANGIBILITY + \alpha_6 INTERACTION + \varepsilon_{it} \quad (16)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 ICE + \alpha_2 CEE + \alpha_3 SIZE + \alpha_4 LEVERAGE + \alpha_5 LIQUIDITY + \alpha_6 TANGIBILITY + \alpha_7 INTERACTION + \varepsilon_{it} \quad (17)$$

$$MARKET\ SHARE_{it} = \alpha_0 + \alpha_1 HCE + \alpha_2 SCE + \alpha_3 CEE + \alpha_4 SIZE + \alpha_5 LEVERAGE + \alpha_6 LIQUIDITY + \alpha_7 TANGIBILITY + \alpha_8 INTERACTION + \varepsilon_{it} \quad (18)$$

4. Results

4.1. The results of the models for the year-by-year regressions

Table 1, 2, and 3 respectively represent the regression results for profitability in 2019, 2020 and 2021. Table 4, 5, and 6 respectively report the regression results for market share in 2019, 2020 and 2021. Here, the positive effects of VAIC, ICE, HCE, SCE, and CEE are confirmed by the models at the 1 percent level for profitability. By contrast, VAIC, ICE, HCE, and SCE are not statistically significant in the models for market share, whereas CEE is positive and statistically significant at the 1 percent level.

In both the models for profitability and market share, firm size shows a positive effect at the statistical significance of 1 percent level. Leverage and tangibility are negative and statistically significant at the 1 percent level in the models for profitability. In the models for market share, the impact of leverage is positive and significant with a lower magnitude in 2019 compared to 2020 and 2021, while tangibility mostly shows a statistically significant and negative effect.

In the models for profitability, the coefficients of VAIC, ICE, HCE, and SCE tend to decrease in 2021 compared to 2020 and 2019, whereas the coefficient of size is lowest in 2020. The absolute values of the coefficients of CEE and leverage are a little lower in 2020 than they are in 2019 and 2021, while that of tangibility is obviously higher in 2020 than it is in 2019 and 2021. The magnitude of liquidity is higher in 2020 than it is in 2019 and 2021 with a positive effect on profitability. Therefore, for profitability, the impacts of intellectual capital factors tend to be kept during the crisis and reduce after the crisis. On the contrary, the impacts of financial factors tend to change much during the crisis.

Differently enough, in the models for market share, the impacts of intellectual capital factors are not statistically significant in all the three observed years. The positive coefficients of firm size and leverage are nearly kept unchanged, whereas the negative effect of liquidity tends to decrease from 2019 to 2021. The statistically significant level of firm size is kept at 1

percent, while that of leverage is lower in 2019 compared to 2020 and 2021. The negative effect of tangibility tends to be a little lower in 2020 than in 2019 and 2021. Thus, though with some fluctuations, the influence of financial factors on market share is much more obvious than that of intellectual capital factors.

Table 1: Results of the year-by-year regressions for profitability with VAIC as independent variable

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.015***	19.244	0.000	0.016***	20.304	0.000	0.013***	19.084	0.000
SIZE	0.013***	10.087	0.000	0.005***	3.965	0.000	0.014***	11.235	0.000
LEVERAGE	-0.102***	-12.762	0.000	-0.083***	-10.053	0.000	-0.100***	-13.069	0.000
LIQUIDITY	0.002	1.412	0.158	0.003**	2.392	0.017	0.001	0.990	0.323
TANGIBILITY	-0.026***	-3.192	0.001	-0.039***	-4.549	0.000	-0.025***	-3.121	0.002
CONSTANT	-0.083***	-4.790	0.000	-0.012	-0.678	0.498	-0.093***	-5.591	0.000
R Square	0.348			0.315			0.356		
Adjusted R-Square	0.347			0.313			0.354		

Note: Dependent variable is profitability. Source: Authors' own calculation.

Table 2: Results of the year-by-year regressions for profitability with ICE and CEE as independent variables

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
ICE	0.015***	18.870	0.000	0.016***	19.863	0.000	0.013***	18.798	0.000
CEE	0.085***	12.611	0.000	0.084***	11.391	0.000	0.090***	12.831	0.000
SIZE	0.015***	11.672	0.000	0.007***	5.457	0.000	0.016***	13.126	0.000
LEVERAGE	-0.097***	-12.435	0.000	-0.080***	-9.912	0.000	-0.093***	-12.500	0.000
LIQUIDITY	0.002**	2.047	0.041	0.004***	2.894	0.004	0.002*	1.723	0.085
TANGIBILITY	-0.036***	-4.383	0.000	-0.048***	-5.633	0.000	-0.036***	-4.619	0.000
CONSTANT	-0.124***	-7.135	0.000	-0.053***	-2.918	0.004	-0.139***	-8.347	0.000
R Square	0.386			0.346			0.397		
Adjusted R-Square	0.384			0.344			0.395		

Note: Dependent variable is profitability. Source: Authors' own calculation.

Table 3: Results of the year-by-year regressions for profitability with HCE, SCE and CEE as independent variables

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
HCE	0.012***	14.265	0.000	0.013***	14.148	0.000	0.011***	14.230	0.000
SCE	0.033***	8.793	0.000	0.033***	9.215	0.000	0.024***	8.223	0.000
CEE	0.086***	12.933	0.000	0.082***	11.245	0.000	0.089***	12.792	0.000
SIZE	0.015***	11.723	0.000	0.007***	5.450	0.000	0.016***	12.944	0.000
LEVERAGE	-0.095***	-12.354	0.000	-0.076***	-9.440	0.000	-0.090***	-12.126	0.000
LIQUIDITY	0.002**	1.966	0.049	0.004***	2.907	0.004	0.002*	1.909	0.056
TANGIBILITY	-0.034***	-4.228	0.000	-0.049***	-5.851	0.000	-0.036***	-4.637	0.000

CONSTANT	-0.128***	-7.434	0.000	-0.055***	-3.056	0.002	-0.139***	-8.368	0.000
R Square	0.394			0.355			0.402		
Adjusted R-Square	0.392			0.353			0.400		

Note: Dependent variable is profitability. Source: Authors' own calculation.

Table 4: Results of the year-by-year regressions for market share with VAIC as independent variable

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.0000818	0.836	0.403	0.0000284	0.314	0.754	-0.0000289	-0.348	0.728
SIZE	0.005***	28.493	0.000	0.004***	29.577	0.000	0.004***	30.240	0.000
LEVERAGE	0.002*	1.941	0.052	0.002**	2.478	0.013	0.002**	2.187	0.029
LIQUIDITY	-0.000347**	-2.237	0.025	-0.000292**	-2.063	0.039	-0.000280*	-1.938	0.053
TANGIBILITY	-0.002*	-1.832	0.067	-0.002	-1.573	0.116	-0.002*	-1.856	0.064
CONSTANT	-0.050***	-23.275	0.000	-0.049***	-24.628	0.000	-0.050***	-25.112	0.000
R Square	0.316			0.332			0.342		
Adjusted R-Square	0.315			0.330			0.340		

Note: Dependent variable is market share. Source: Authors' own calculation.

Table 5: Results of the year-by-year regressions for market share with ICE and CEE as independent variables

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
ICE	0.0000308	0.317	0.751	-0.0000277	-0.309	0.757	-0.0000728	-0.884	0.377
CEE	0.005***	6.299	0.000	0.006***	6.955	0.000	0.006***	6.776	0.000
SIZE	0.005***	29.367	0.000	0.005***	30.689	0.000	0.005***	31.307	0.000
LEVERAGE	0.002**	2.364	0.018	0.003***	2.786	0.005	0.003***	2.798	0.005
LIQUIDITY	-0.000292*	-1.900	0.058	-0.000245*	-1.749	0.081	-0.000217	-1.520	0.129
TANGIBILITY	-0.003**	-2.509	0.012	-0.002**	-2.343	0.019	-0.003***	-2.751	0.006
CONSTANT	-0.053***	-24.322	0.000	-0.053***	-25.898	0.000	-0.053***	-26.335	0.000
R Square	0.331			0.350			0.359		
Adjusted R-Square	0.329			0.347			0.357		

Note: Dependent variable is market share. Source: Authors' own calculation.

Table 6: Results of the year-by-year regressions for market share with HCE, SCE and CEE as independent variables

	2019			2020			2021		
Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
HCE	-0.0000103	-0.093	0.926	-0.0000801	-0.753	0.452	-0.0000586	-0.613	0.540
SCE	0.000398	0.826	0.409	0.000339	0.824	0.410	-0.000175	-0.488	0.625
CEE	0.005***	6.329	0.000	0.006***	6.910	0.000	0.006***	6.779	0.000
SIZE	0.005***	29.359	0.000	0.005***	30.679	0.000	0.005***	31.268	0.000
LEVERAGE	0.002**	2.387	0.017	0.003***	2.862	0.004	0.002***	2.758	0.006
LIQUIDITY	-0.000294*	-1.914	0.056	-0.000245*	-1.750	0.080	-0.000219	-1.531	0.126
TANGIBILITY	-0.003**	-2.479	0.013	-0.002**	-2.376	0.018	-0.003***	-2.751	0.006

CONSTANT	-0.053***	-24.327	0.000	-0.053***	-25.911	0.000	-0.053***	-26.329	0.000
R Square	0.331			0.350			0.359		
Adjusted R-Square	0.329			0.347			0.356		

Note: Dependent variable is market share. Source: Authors' own calculation.

4.2. The results of the models for the pooled data with crisis dummy as individual variable

Table 7 and 8 separately report the regression results for profitability and market share regarding the pooled data with crisis dummy as individual variable. In the pooled regressions for profitability, all the variables are statistically significant at the 1 percent level. Specifically, VAIC-related variables (VAIC, ICE, HCE, SCE, and CEE) as well as size and liquidity are positively related to profitability, while leverage, tangibility and crisis are negatively associated with profitability.

In the pooled regressions for market share, intellectual capital variables (VAIC, ICE, HCE and SCE) as well as crisis dummy are statistically insignificant, whereas CEE, size, leverage, liquidity, and tangibility are statistically significant at the 1 percent level. Specifically, CEE, size and leverage are positively related to market share, while liquidity and tangibility are negatively associated with market share.

Table 7: Results of the pooled regressions for profitability with VAIC as independent variable

Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.015***	33.755	0.000						
ICE				0.014***	33.117	0.000			
HCE							0.012***	24.609	0.000
SCE							0.030***	15.077	0.000
CEE				0.086***	21.237	0.000	0.086***	21.309	0.000
SIZE	0.011***	14.317	0.000	0.013***	17.162	0.000	0.012***	17.076	0.000
LEVERAGE	-0.095***	-20.609	0.000	-0.090***	-20.033	0.000	-0.087***	-19.500	0.000
LIQUIDITY	0.002***	2.801	0.005	0.003***	3.878	0.000	0.003***	3.982	0.000
TANGIBILITY	-0.030***	-6.242	0.000	-0.040***	-8.408	0.000	-0.040***	-8.472	0.000
CRISIS	-0.005***	-2.669	0.008	-0.005***	-2.814	0.005	-0.005***	-2.676	0.007
CONSTANT	-0.060***	-6.013	0.000	-0.103***	-10.222	0.000	-0.105***	-10.472	0.000
R Square	0.334			0.371			0.378		
Adjusted R-Square	0.334			0.370			0.378		

Note: Dependent variable is profitability. Source: Authors' own calculation.

Table 8: Results of the pooled regressions for market share with ICE and CEE as independent variables

Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.0000247	0.474	0.635						
ICE				-0.0000254	-0.492	0.623			
HCE							-0.0000492	-0.821	0.412
SCE							0.000155	0.655	0.512
CEE				0.006***	11.563	0.000	0.006***	11.557	0.000
SIZE	0.004***	50.890	0.000	0.005***	52.659	0.000	0.005***	52.626	0.000
LEVERAGE	0.002***	3.812	0.000	0.002***	4.586	0.000	0.002***	4.632	0.000
LIQUIDITY	-0.000307***	-3.623	0.000	-0.000252***	-3.005	0.003	-0.000252***	-2.997	0.003
TANGIBILITY	-0.002***	-3.024	0.003	-0.002***	-4.372	0.000	-0.002***	-4.373	0.000
CRISIS	0.000222	1.042	0.298	0.000212	1.009	0.313	0.000215	1.024	0.306
CONSTANT	-0.050***	-42.021	0.000	-0.053***	-44.072	0.000	-0.053***	-44.077	0.000
R Square	0.329			0.345			0.345		
Adjusted R-Square	0.328			0.344			0.344		

Note: Dependent variable is market share. Source: Authors' own calculation.

4.3. The results of the models for the pooled data with crisis dummy as interacting variable

Table 9 and 10 separately report the regression results for profitability and market share of the pooled data with crisis dummy as interacting variable. In the pooled regressions with interacting variable for profitability, regarding the VAIC-related variables, the interacting variables of VAIC, ICE, and HCE with crisis dummy are statistically significant, while the interacting variables of SCE and CEE with crisis dummy are statistically insignificant. For financial variables, the interacting variables of size, leverage and liquidity with crisis dummy are statistically significant, while the interacting variable of tangibility with crisis dummy is statistically insignificant.

Here, some changes in the year-by-year regressions are supported by the regressions with interacting variables. For the VAIC-related variables, the positive and significant effects of interaction variables between VAIC and crisis dummy, between ICE and crisis dummy, as well as between HCE and crisis dummy support the increase in the positive effects of VAIC, ICE, and HCE during the crisis year, which is also shown as the increase in the coefficient during the crisis year in the year-by-year regressions. For financial variables, because of the difference in the signs of the coefficients between the original variables and their interaction variables, the positive effect of size and the negative effect of leverage are reduced during the crisis year, and this is in line with the observed change of the coefficient in the year-by-year

regressions. In addition, the positive effect of liquidity also increases during the crisis year due to the same sign of the interacting variable and the individual variable, which is clearly observed as the change of the magnitude of coefficient in the year-by-year regressions.

By contrast, in the pooled regressions with interacting variables for market share, all the interacting variables are statistically insignificant. The results here to a large extent correspond to the results of the year-by-year regressions, where most independent variables do not show large changes in magnitude.

Table 9: Results of the pooled regressions for profitability with the interacting variables of crisis dummy

Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.014***	26.265	0.000						
VAIC×CRISIS	0.003***	2.886	0.004						
ICE				0.013***	25.741	0.000			
ICE×CRISIS				0.003***	2.817	0.005			
HCE							0.012***	19.499	0.000
HCE×CRISIS							0.002*	1.692	0.091
SCE							0.028***	11.524	0.000
SCE×CRISIS							0.006	1.495	0.135
CEE				0.084***	17.179	0.000	0.085***	17.346	0.000
CEE×CRISIS				0.005	0.581	0.561	0.003	0.351	0.726
SIZE	0.012***	14.997	0.000	0.013***	17.678	0.000	0.013***	17.562	0.000
SIZE×CRISIS	-0.003***	-4.348	0.000	-0.003***	-4.232	0.000	-0.003***	-4.133	0.000
LEVERAGE	-0.106***	-19.403	0.000	-0.100***	-18.776	0.000	-0.098***	-18.442	0.000
LEVERAGE×CRISIS	0.032***	3.664	0.000	0.029***	3.405	0.001	0.031***	3.622	0.000
LIQUIDITY	0.001	1.072	0.284	0.002**	1.993	0.046	0.002**	2.111	0.035
LIQUIDITY×CRISIS	0.003**	2.168	0.030	0.003**	2.092	0.036	0.003**	2.029	0.043
TANGIBILITY	-0.029***	-4.965	0.000	-0.039***	-6.732	0.000	-0.038***	-6.671	0.000
TANGIBILITY ×CRISIS	-0.004	-0.382	0.703	-0.003	-0.352	0.725	-0.006	-0.580	0.562
CONSTANT	-0.062***	-6.166	0.000	-0.104***	-10.376	0.000	-0.106***	-10.616	0.000
R Square	0.338			0.374			0.381		
Adjusted R-Square	0.336			0.372			0.380		

Note: Dependent variable is profitability. Source: Authors' own calculation.

Table 10: Results of the pooled regressions for market share with the interacting variables of crisis dummy

Independent variables	Coefficients	t	Significance	Coefficients	t	Significance	Coefficients	t	Significance
VAIC	0.0000215	0.341	0.733						
VAIC×CRISIS	8.527	0.078	0.938						
ICE				-0.0000251	-0.401	0.688			

ICE×CRISIS				-1.985	-0.018	0.986			
HCE							-0.0000364	-0.504	0.614
HCE×CRISIS							-0.0000434	-0.336	0.737
SCE							0.0000639	0.222	0.825
SCE×CRISIS							0.000276	0.546	0.585
CEE				0.006***	9.387	0.000	0.006***	9.391	0.000
CEE×CRISIS				0.000279	0.279	0.780	0.000241	0.241	0.809
SIZE	0.004***	48.701	0.000	0.005***	50.361	0.000	0.005***	50.301	0.000
SIZE×CRISIS	-0.0000172	-0.209	0.834	-8.295	-0.101	0.920	-0.0000107	-0.129	0.897
LEVERAGE	0.002***	3.002	0.003	0.002***	3.778	0.000	0.002***	3.794	0.000
LEVERAGE× CRISIS	0.000412	0.396	0.692	0.000165	0.160	0.873	0.000227	0.220	0.826
LIQUIDITY	-0.000317***	-3.056	0.002	-0.000256**	-2.502	0.012	-0.000256**	-2.493	0.013
LIQUIDITY×C RISIS	0.0000289	0.170	0.865	0.0000134	0.080	0.936	0.0000120	0.071	0.943
TANGIBILITY	-0.002***	-2.659	0.008	-0.003***	-3.756	0.000	-0.003***	-3.748	0.000
TANGIBILITY ×CRISIS	0.000344	0.297	0.767	0.000349	0.300	0.764	0.000310	0.266	0.790
CONSTANT	-0.050***	-42.031	0.000	-0.053***	-44.078	0.000	-0.053***	-44.080	0.000
R Square	0.329			0.345			0.345		
Adjusted R-Square	0.328			0.344			0.344		

Note: Dependent variable is market share. Source: Authors' own calculation.

5. Discussion

The regression results generally indicate completely different impacts of intellectual capital factors including VAIC, ICE, HCE, and SCE on profitability and market share as the two important pillars of the competitiveness of a firm. On the one hand, all the VAIC-related variables are positive and statistically significant at the 1 percent in all the models for profitability with differences in coefficients. Specifically, the coefficients of CEE are highest among the VAIC-related variables. The coefficients of SCE are higher than HCE. On the other hand, in all the models for market share intellectual capital factors (VAIC, ICE, HCE, and SCE) do not show significant impact, though CEE is positive and statistically significant at the 1 percent.

The findings here about the statistically significant impacts of intellectual capital factors on profitability are generally supported by many empirical studies. In line with the research results of Sumedrea (2013) and Costa *et al*. (2022), our study shows that profitability is positively related to the VAIC. In addition, we also find that the impact of VAIC is higher in the crisis year than it is in the non-crisis years on the basis of both the change of its coefficient

in the year-by-year regressions and the statistically significant interacting variable with the crisis year dummy in the interacting models. According to D'Amato (2021), VAIC includes the efficiency of both the tangible and intangible assets. Hence, it is necessary to further analyze the components of VAIC in order to separate the tangible and intangible elements.

After decomposing VAIC into ICE and CEE, our findings suggest a positive effect of ICE on profitability, which is consistent with the findings of Radić (2018) and Ramírez *et al*. (2021). Through observing the change of the coefficient of ICE in the year-by-year regressions as well as the statistically significant interacting variable with the crisis year dummy in the interacting models, we find an increase trend in the impact of ICE in the crisis year compared to the non-crisis years.

In line with the research of Javornik *et al*. (2012), Zéghal and Maaloul (2010), and Ljumović *et al*. (2022), we find a positive effect of CEE on profitability. Theoretically, it is reasonable for CEE to take a positive effect on profitability. As pointed out by Sirmon and Hitt (2009), from the theoretical perspective less investments in physical capital may result in older technology and less efficient equipment and then limit production efficiency. In addition, based on the change of the coefficient of CEE in the year-by-year regressions, we also observe a decreasing trend in the impact of CEE in the crisis year compared to the non-crisis years. However, this observed trend is not supported by the interacting models, since the interacting variable between CEE and the crisis year dummy is statistically insignificant.

In terms of HCE and SCE, the findings here about the positive effects of HCE and SCE on profitability are in accordance with the findings of Ramírez *et al*. (2021), Papíková and Papík (2022), and Nawaz and Ohlrogge (2023). In particular, due to the change of the coefficient and the statistically significant interacting variable of HCE with the crisis year dummy, we observe an increasing trend of the impact of HCE in the crisis year compared to the non-crisis years. By contrast, according to the statistical insignificance of the interacting variable of SCE with the crisis year dummy, the impact of SCE does not change largely between the crisis and non-crisis years.

For financial factors, generally they are statistically significant in both the models for profitability and market share, though the magnitudes of some factors are lower in the models for market share compared to the models for profitability. Firm size is statistically significant and positively related to both profitability and market share. In fact, this positive effect is not a surprising result, thanks to the benefits from economies of scale (Becker-Blease *et al*. 2010). Empirically, the positive relationship between size and profitability is supported by many

studies, such as, Baños-Caballero *et al*. (2012), Yazdanfar and Öhman (2016) and Anton and Nucu (2021). And it is reasonable for the firms with larger size to have higher ability to produce and then to occupy more market share.

The negative effect of leverage on profitability found here is also in line with many studies, such as, Boțoc and Anton (2017) and Jaworski and Czerwonka (2022). According to Deari *et al*. (2022), the negative relationship between leverage and profitability shows that the interest funds caused by higher leverage (more debt) tend to reduce profitability. We also find that the effect of leverage on market share is statistically significant and positive, which can be to explained by Mateev and Anastasov (2010) about the positive effect of leverage on the growth of revenues.

With regard to tangibility, we find that it is negatively related to both profitability and market share. The negative effect of tangibility on profitability is in line with the findings of D'Amato (2021). The negative effects can be explained by the characteristics of food and beverage industry as low-technology manufacturing industry. For low-technology manufacturing industry, it is not necessary to invest too much on tangible fixed assets, as low-technology manufacturing firms usually do not rely heavily on developing and escalating machine as well as equipment compared to labor force. On the other hand, in terms of liquidity, we observe different effects of it to profitability and market share. It is positively related to profitability, whereas its association with market share is negative. The positive effect of liquidity on profitability is in line with the studies of Deari *et al*. (2022) and Yazdanfar and Öhman (2016). According to Goddard *et al*. (2005), liquidity can help firms to against sudden changes of external environment, and high liquidity can decrease the risk caused by external shocks. Therefore, our findings suggest that this positive effect is mainly shown on profitability. On the contrary, higher liquidity usually means more cash reserves, which may reduce the costs on labor force and then negatively impact on market share.

6. Conclusion

This paper investigates and compares the impacts of intellectual capital factors and financial factors on the two important elements of firm's competitiveness, which are profitability and market share. Generally, with regard to the first factor of competitiveness (profitability), our findings indicate statistically significant and positive effects of intellectual capital efficiency, human capital efficiency, structural capital efficiency and capital employed efficiency on profitability no matter whether it is in the COVID crisis year. We also find that,

on the basis of the results of the interacting models with the crisis year dummy, while the positive effects of intellectual capital elements (especially intellectual capital efficiency and human capital efficiency) tend to increase in the COVID crisis year, the positive effects of structural capital efficiency and capital employed efficiency seem to be not impacted obviously by the COVID crisis. Therefore, the increase in the positive effect of intellectual capital efficiency in the crisis year is mainly driven by the increase in human capital efficiency.

The explanation of the increase in human capital efficiency in the crisis year can be found in the research of Yilmaz and Şahin (2021), who point out that the outbreak of COVID-19 led to a large reduction on the employment in food and beverage industry. Thus, the importance of human capital efficiency is more protrudent in the crisis year; however, when comparing the coefficients of the VAIC-related variables in the models for profitability, human capital efficiency shows the lowest whereas capital employed efficiency shows the highest. This finding to some extent corresponds to the research results of Carew and Florkowski (2010), that is, the productivity of food and beverage manufacturing sectors is impacted more by physical capital than R&D (research and development) knowledge capital.

Regarding the second factor of competitiveness (market share), all the VAIC-related variables are non-significant except for capital employed efficiency. The findings about the impacts of intellectual capital variables on market share are completely different to the findings on profitability. Therefore, our findings suggest that the comprehensive competitiveness of firms in food and beverage industry is partially influenced by intellectual capital factors, that is, they only influence profitability instead of market share. By contrast, financial factors as well as physical and financial capital employed exert significant impacts on both profitability and market share, which means that physical and financial elements take more extensive effects on the comprehensive competitiveness of firms in food and beverage industry. This could be explained by the features of food and beverage industry as low-technology manufacturing industry that limit the impact of intellectual capital elements.

In terms of the influence of the COVID crisis, we find that the impacts are only observed in the models for profitability rather than market share. In particular, both the effects of intellectual capital elements and the financial factors are influenced by the crisis; the crisis dummy variable per se only takes significant and negative effect on profitability instead of market share. This can be explained by the important role of food and beverage industry even if during the crisis, that is, the reduction of the nominal production of food and beverage industry is much less than the reduction of GDP in the crisis year in Spain.

In a nutshell, the research results of this paper contribute to the empirical studies on the competitiveness of food and beverage industry from the perspectives of both intellectual capital and financial factors with considering the impacts of the COVID crisis. Although intellectual capital factors positively impact on profitability much, they exert little influence on market share. Hence, compared to intellectual capital factors, financial and physical factors take more comprehensive effects on the competitiveness of the firms in food and beverage industry; this should be noted by the managers in food and beverage firms when endeavoring to increase comprehensive competitiveness. The limitations of this study mainly come from the availability of data. The data here only cover the recent COVID crisis. Future research could consider to extend the time line of the data, if possible, to compare previous crises.

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