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The Influence of Intellectual Capital on the Financial Performance of Spanish New Firms

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ABSTRACT

Using the ordinary least squares regression, this paper explores the influence of intellectual capital on the financial performance of manufacturing new firms in Spain. The research is designed into three tiers for finding the differences: comparing the economic downturn period with the upturn period; comparing the high-tech new firms with the low-tech new firms; comparing the impacts in the current period with in the future period. The results show that: first, intellectual capital influences firms' financial performance in both the short-term period and long-term period; second, human capital works as the most influential component of intellectual capital with a positive effect in the models for current return and for future return; third, compared to the model for current return, in the model for future return there are more variables showing changes of their impacts between the downturn and upturn periods; fourth, macro-economic situations tend to affect more on the factors for high-tech new firms than low-tech ones. Therefore, the findings can help the managers of new firms better utilize their intellectual capital elements to drive financial performance.

INTRODUCTION

With knowledge becoming a powerful driver of economic growth, intellectual capital has been explored by many scholars (Demartini and Beretta, 2020). According to the resource-based theory, intellectual capital is viewed as a useful strategic resource; and strategic resources can help firms build a sustainable competitive advantage and then enhance financial performance (Zéghal and Maaloul, 2010). Specifically, intellectual capital is important for generating new products and services, new technologies and new strategic resources, which are the elements of long-term competitive advantage (Cenciarelli et al., 2018).

For new firms, the failure rate is quite high, which may be because of a lack of business experience and facing with strong market competition; however, intellectual capital can loosen the difficult conditions that a new firm would face in its initial years (Peña, 2002). It is an important task for new firms to acquire

different types of resources, especially intangible resources employed as intellectual capital in order to survive and develop (Hormiga et al., 2011). This paper tries to identify important elements of intellectual capital for the development of new firms in different macro-economic situations and for different types of firms with different technology-intensity.

1. METHODOLOGY

For comparing the new firms founded in the downturn and the upturn period, we choose the firms incorporated in 2008, 2009, and 2010, as well as in 2014, 2015, and 2016 in Spanish manufacturing industries from Iberian Balance sheet Analysis System (SABI) database (developed by Bureau Van Dijk). The data is observed for three years after the incorporation year, and the firms with missing data and outliers in the observing period are excluded from the sample. In particular, considering that the data in the incorporating year may not cover a whole financial year, we only observe the three years after the incorporating year.

We use the value added intellectual coefficient (VAIC) method. According to Sumedrea (2013), Kozera-Kowalska (2020), Palazzi et al. (2020), and Kramaric et al. (2021), the VAIC model (Pulic, 2004) reflects the value creation efficiency of the resources with the advantage of using financial data and then making comparison between different firms' performance easy; it is shown by a series of steps including the value added (VA), human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). First, the value added (VA) is obtained as the sum of operating profit (OP), employee costs (EC), depreciation expenses (DP), and amortization expenses (AM).

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

Second, the human capital efficiency (HCE) represents the contribution of human resources to the value added, which is computed as value added (VA) divided by the total employee costs (HC):

$$HCE = VA/HC.$$

Third, the structural capital efficiency (SCE) measures the amount of value added generated by the structural capital (SC), which is calculated by the ratio between the structural capital (SC) and value added (VA):

$$SCE = SC/VA,$$

where SC is calculated by subtracting HC costs from VA.

Fourth, the intellectual capital efficiency (ICE) is the sum of human capital efficiency (HCE) and structural capital efficiency (SCE).

$$ICE = HCE + SCE$$

Fifth, the efficiency of financial and tangible capital (CEE) is calculated as the ratio between VA and capital employed (CE):

$$CEE = VA/CE,$$

where VA is the value added, and CE includes tangible assets, financial assets, and current assets.

Finally, the VAIC is the sum of ICE (or HCE plus SCE) and CEE, which represents the total efficiency of using intellectual capital as well as physical and financial capital:

$$VAIC = HCE+SCE+ CEE.$$

Referring to the research of Javornik et al. (2012), ordinary least squares regression model is used respectively for the new firms incorporated in the downturn period and in the upturn period; specifically, a firm's VAIC as well as its three components (HCE, SCE, and CEE) are separately put into the regression models as explanatory variables, together with firm size (the natural logarithm of total assets), leverage (total liabilities to total assets), and liquidity ratio (current assets to current liabilities) as the control variables. In order to test the impacts in short-term and long-term periods, with return on assets (ROA) as the dependent variable, the regression model is designed into two parts: the first part is to regress the ROA

with the independent variables in the same year; the second part is to regress the ROA in the third year with the independent variables in the first year.

In addition, given that the effect of intellectual capital on corporate performance is influenced by the technology intensity (Palazzi et al., 2020), we also consider to classify the sample on the basis of the technology intensity. According to the technological intensity, Eurostat has a classification of the manufacturing industry on the basis of NACE Rev.2, which includes four categories (high-technology, medium-high-technology, medium-low-technology, and low-technology). Here, we simplify the classification into two categories: that is, high-tech group includes high-technology and medium-high-technology firms and low-tech group includes medium-low-technology and low-technology firms.

2. RESEARCH RESULTS

2.1 The regression results for the return in the current period model

The results of the ordinary least squares regressions for the return in the current period (Table 1 and 2) clearly indicate that the VAIC has a positive and significant effect on the profitability of both the high-tech and low-tech new firms in both the upturn and downturn periods. This is consistent with the finding of Kramaric et al. (2021) that the VAIC is positively related to ROA. For the three components of the VAIC, the HCE and the CEE are statistically significant with a positive effect on the profitability of both the high-tech and low-tech new firms in both the upturn and downturn periods. The SCE also has a positive and statistically significant impact on profitability for the low-tech new firms (at the significant level of 0.01), while for the high-tech new firms the SCE with a positive effect shows statistical significance only in the upturn period (at the significant level of 0.05).

For the positive effect of HCE and CEE, we also observe that the absolute value of the coefficient for CEE tends to be higher than that for HCE. This implies that the physical and financial capital can contribute to profitability to a higher extent than human capital; this is in line with the finding of Palazzi et al. (2020), that is, the positive effect of CEE on profitability is strong. Therefore, for both the high-tech and low-tech new firms, the physical and financial assets are the basis for them to generate products and then create profits. The positive effect of HCE (human capital efficiency) on firm's performance, in fact, is supported by many empirical studies. Here our findings show that this is also the case for new firms. When new firms use their human capital efficiently, the profitability would increase. Our results also confirm the viewpoint of McDowell et al. (2018) that knowledge is generated by individuals, and human capital works as one of the most important assets for a firm to build a competitive advantage.

The SCE (structural capital efficiency) also has a positive and significant impact on profitability especially for the low-tech new firms. The positive effect of SCE on profitability is also supported by Ramírez et al. (2021); here our finding further confirms that the new firms in low-tech industries with better structural capital efficiency can generate more profits. Generally speaking, compared to HCE, the effect of SCE shows instability, which is also observed by Holienka and Pilková (2014). An obvious difference between the upturn and the downturn periods is that the SCE is statistically significant in the upturn period, rather than in the downturn period for the high-tech new firms. As pointed out by Pelle and Végh (2015), the 2008 crisis resulted in shrinkage in the investments in intellectual properties and intangible assets. Therefore, for new firms in high-tech industries, they may reduce the investments in R&D and then the innovation activities, which may negatively influence the SCE (because R&D as well as innovation belong to the structural capital of firms, according to Zéghal and Maaloul (2010) and De Castro and Sáez (2008).

Another finding about the HCE and the SCE is that their coefficients (being statistically significant at the level of 0.01) are lower in the upturn period for the low-tech new firms. The reason behind may be that in the upturn period it is easy for low-tech new firms to enlarge the scale of production (for instance through bank credit, trade credit or other external financing ways) to occupy more market share, which is driven by the increase in the market demand, and thus entrepreneurs invest more in physical assets instead of intangible assets.

Regarding the control variables, for both the high-tech and low-tech new firms, leverage (with the highest explanatory power) and liquidity show a negative and statistically significant effect on profitability in all

the regressions of the current return models in both the downturn and the upturn periods. The negative correlation between leverage and profitability is also confirmed by Eckbo and Kisser (2021); according to Asimakopoulos et al. (2009) and Baños-Caballero et al. (2012), higher leverage would result in more borrowing costs and repayments of debt, which would consume resources and then negatively influence profits. The negative effect of liquidity is explained by Bolek et al. (2021) that the trade-off relationship between profitability and liquidity reflects the decision of a company to maximize earnings and minimize risk.

On the contrary, firm size shows a positive and significant impact on profitability especially for the low-tech new firms in both the downturn and upturn periods. A beneficial effect of firm size is also supported by the research of Yazdanfar and Öhman (2014) and Kramaric et al. (2021). Theoretically, new firms may suffer liability of smallness (Aldrich and Auster, 1986), and larger firm size would be closer to efficient scale, thus reducing the gap between size and the minimum efficient scale and then decreasing cost disadvantage (Audretsch and Mahmood, 1995). The result that a positive effect of firm size is mainly reflected for the low-tech new firms (instead of the high-tech new firms) may demonstrate that the effect of minimum efficient scale mainly exist in low-tech industries.

Table 1. The results for the high-tech new firms of the current return model

High-tech group	*Downturn cohorts*			*Upturn cohorts*		
Independent variables	*Coefficient*	*t*	*P>|t|*	*Coefficient*	*t*	*P>|t|*
VAIC	0.023***	12.56	0.000	0.026***	15.00	0.000
SIZE	-0.002	-0.70	0.486	-0.003	-1.09	0.277
LEVERAGE	-0.408***	-35.29	0.000	-0.462***	-37.99	0.000
LIQUIDITY	-0.006***	-4.08	0.000	-0.009***	-6.38	0.000
CONSTANT	0.297***	11.74	0.000	0.360***	15.75	0.000
Number of observations	1,932			2,349		
F-test	F(4, 1927) = 404.21; Prob > F = 0.0000			F(4, 2344) = 471.45; Prob > F = 0.0000		
R-squared	0.4562			0.4458		
Adjusted R-squared	0.4551			0.4449		
Independent variables	Coefficient	t	P>|t|	Coefficient	t	P>|t|
HCE	0.046***	15.83	0.000	0.047***	16.59	0.000
SCE	0.0004	0.18	0.859	0.006**	2.54	0.011
CEE	0.097***	13.78	0.000	0.088***	13.87	0.000
SIZE	0.008**	2.33	0.020	0.005	1.64	0.101
LEVERAGE	-0.382***	-35.24	0.000	-0.413***	-34.46	0.000
LIQUIDITY	-0.005***	-3.28	0.001	-0.006***	-4.24	0.000
CONSTANT	0.142***	5.49	0.000	0.200***	8.17	0.000
Number of observations	1,932			2,349		
F-test	F(6, 1925) = 363.50; Prob > F = 0.0000			F(6, 2342) = 387.17; Prob > F = 0.0000		
R-squared	0.5312			0.4980		
Adjusted R-squared	0.5297			0.4967		

Note: ROA is the dependent variable. Source: Authors' own calculation.

Table 2. The results for the low-tech new firms of the current return model

Low-tech group	*Downturn cohorts*			*Upturn cohorts*		
Independent variables	Coefficient	t	P>|t|	Coefficient	t	P>|t|
VAIC	0.021***	29.34	0.000	0.020***	32.36	0.000
SIZE	0.006***	3.98	0.000	0.014***	9.51	0.000
LEVERAGE	-0.373***	-82.76	0.000	-0.374***	-104.48	0.000
LIQUIDITY	-0.005***	-6.65	0.000	-0.005***	-7.38	0.000
CONSTANT	0.232***	22.48	0.000	0.216***	23.59	0.000
Number of observations	11,418			16,434		
F-test	F(4, 11413) = 2361.63; Prob > F = 0.0000			F(4, 16429) = 3488.45; Prob > F = 0.0000		
R-squared	0.4529			0.4593		
Adjusted R-squared	0.4527			0.4591		
Independent variables	Coefficient	t	P>|t|	Coefficient	t	P>|t|
HCE	0.058***	37.94	0.000	0.030***	31.46	0.000
SCE	0.005***	6.13	0.000	0.003***	3.63	0.000
CEE	0.058***	22.49	0.000	0.051***	27.75	0.000
SIZE	0.012***	7.97	0.000	0.021***	14.37	0.000
LEVERAGE	-0.351***	-81.07	0.000	-0.370***	-104.93	0.000
LIQUIDITY	-0.004***	-5.70	0.000	-0.004***	-6.94	0.000
CONSTANT	0.108***	9.90	0.000	0.134***	13.79	0.000
Number of observations	11,418			16,434		
F-test	F(6, 11411) = 1940.09; Prob > F = 0.0000			F(6, 16427) = 2556.88; Prob > F = 0.0000		
R-squared	0.5050			0.4829		
Adjusted R-squared	0.5047			0.4827		

Note: ROA is the dependent variable. Source: Authors' own calculation.

2.2 Regression results for the return in the future period model

In the model of the impacts on the return in the future period (Table 3 and 4), the VAIC is positively related to ROA for the low-tech new firms. For the three components, ROA is positively influenced by the HCE in all the regressions of the future model, except for the high-tech new firms in the downturn period. The CEE with a positive effect shows statistical significance only for the low-tech new firms in the upturn period, whereas the SCE is not statistically significant in any regression.

In terms of the control variables, leverage shows significantly negative association with future profitability in all regressions. The coefficient of liquidity is negative and statistically significant (with high level of significance) in the regressions for the high-tech new firms in the downturn period and the low-tech new firms in the upturn period. The coefficient of firm size is positive and statistically significant in the regressions for the low-tech new firms, while it is negative and statistically significant in the regressions for the high-tech new firms in the downturn period.

Generally spanking, in the model of future performance, the control variables tend to show a higher impact on ROA than the intellectual capital components do. However, we also observe a positive and statistically significant effect of HCE in most regressions of the future return model. This finding is to some extent similar to the research results of Palazzi et al. (2020) who find that the HCE impacts more in the

long period. They also point out that with time increasing the contribution of human resources increases because of the learning process from experience and knowledge accumulation. Thus, investing in the human capital can benefit new firms in the long term. Regarding the statistical insignificance of the HCE in the downturn period for high-tech new firms, this may be because of the shrinkage in the investments in intangible assets in the crisis period (Pelle and Végh, 2015).

Another noteworthy point is the unstable long-term effects of firm size. The long-term positive effect of firm size on low-tech firms may reflect the long-term effect of efficient scale on low-tech firms. On the other hand, the long-term negative effect of firm size on high-tech firms in the downturn period may be explained by Burger et al. (2017) that shrinkage in size for young and small firms can help to maintain profits during the crisis period when facing with the shock of demand.

Table 3. The results for the high-tech new firms of the future return model

High-tech group	*Downturn period*			*Upturn period*		
Independent variables	*Coefficient*	*t*	*P>|t|*	*Coefficient*	*t*	*P>|t|*
VAIC	0.003	0.80	0.426	0.003	0.91	0.361
SIZE	-0.019***	-2.76	0.006	-0.010	-1.58	0.114
LEVERAGE	-0.202***	-8.51	0.000	-0.155***	-5.49	0.000
LIQUIDITY	-0.008***	-2.78	0.006	-0.006*	-1.77	0.076
CONSTANT	0.280***	5.49	0.000	0.213***	4.17	0.000
Number of observations	644			783		
F-test	F(4, 639) = 19.28; Prob > F = 0.0000			F(4, 778) = 8.41; Prob > F = 0.0000		
R-squared	0.1077			0.0415		
Adjusted R-squared	0.1021			0.0365		
Independent variables	Coefficient	t	P>|t|	Coefficient	t	P>|t|
HCE	0.007	1.57	0.118	0.015***	2.67	0.008
SCE	-0.007	-1.07	0.287	-0.005	-1.19	0.233
CEE	0.007	0.50	0.614	0.009	0.58	0.563
SIZE	-0.018**	-2.54	0.011	-0.009	-1.34	0.179
LEVERAGE	-0.195***	-8.01	0.000	-0.138***	-4.68	0.000
LIQUIDITY	-0.008***	-2.76	0.006	-0.005	-1.48	0.139
CONSTANT	0.263***	4.73	0.000	0.172***	2.92	0.004
Number of observations	644			783		
F-test	F(6, 637) = 13.45; Prob > F = 0.0000			F(6, 776) = 7.00; Prob > F = 0.0000		
R-squared	0.1124			0.0514		
Adjusted R-squared	0.1041			0.0440		

Note: the dependent variable is the ROA in the third year, while the independent variables are in the first year.

Source: Authors' own calculation.

Table 4. The results for the low-tech new firms of the future return model

Low-tech group	*Downturn period*			*Upturn period*		
Independent variables	*Coefficient*	*t*	*P>|t|*	*Coefficient*	*t*	*P>|t|*
VAIC	0.005**	2.40	0.016	0.005***	4.67	0.000
SIZE	0.012***	3.26	0.001	0.009***	2.77	0.006
LEVERAGE	-0.104***	-7.06	0.000	-0.160***	-14.73	0.000
LIQUIDITY	-0.003	-1.50	0.134	-0.006***	-3.38	0.001
CONSTANT	-0.024	-0.90	0.366	0.108***	5.03	0.000
Number of observations	3,806			5,478		
F-test	F (4, 3801) = 21.42; Prob > F = 0.0000			F (4, 5473) = 73.64; Prob > F = 0.0000		
R-squared	0.0220			0.0511		
Adjusted R-squared	0.0210			0.0504		
Independent variables	Coefficient.	t	P>|t|	Coefficient.	t	P>|t|
HCE	0.010***	3.44	0.001	0.004***	2.88	0.004
SCE	-0.001	-0.41	0.682	0.0003	0.19	0.852
CEE	0.007	1.10	0.271	0.041***	9.67	0.000
SIZE	0.013***	3.18	0.001	0.019***	5.44	0.000
LEVERAGE	-0.097***	-6.49	0.000	-0.156***	-14.37	0.000
LIQUIDITY	-0.003	-1.34	0.180	-0.005***	-3.02	0.003
CONSTANT	-0.042	-1.40	0.160	0.024	1.03	0.302
Number of observations	3,806			5,478		
F-test	F (6, 3799) = 15.62; Prob > F = 0.0000			F (6, 5471) = 63.53; Prob > F = 0.0000		
R-squared	0.0241			0.0651		
Adjusted R-squared	0.0225			0.0641		

Note: the dependent variable is the ROA in the third year, while the independent variables are in the first year.

Source: Authors' own calculation.

CONCLUSION

New firms usually are limited to getting access to resources and may suffer financial constraints. Therefore, it is important for new firms to identify and use intellectual capital as well as its physical assets efficiently to enhance firm performance. The purpose of this paper is to examine the influence of intellectual capital elements (using the VAIC model) and some traditional financial factors on new firms' financial performance. After the regression analysis separately for the current return and the future return, we have reached a series of results.

First of all, the effect of the VAIC model is confirmed by our findings, as a positive effect of the VAIC is supported by the regressions for both the high-tech and low-tech new firms in the current return model and the regressions for the low-tech new firms in the future return model. Thus, our findings support the statement of Cenciarelli et al. (2018), that is, the impact of intellectual capital on a firm's financial performance is not just in the short-term period but also in the long-term period.

After the general effect of the VAIC, we turn to the two elements of the intellectual capital in the VAIC model (the HCE and the SCE). Specifically, our results indicate that the HCE shows a higher impact on new firms' financial performance than the SCE does. This confirms the statement of Laghi et al. (2022) that human capital is the core of intellectual capital. The pivotal role of human capital as the most influential component of intellectual capital is also highlighted by De Castro and Sáez (2008).

In fact, not just in the current return model, the positive effect of the efficiency of human capital is also confirmed in the future return model, which is to some extent close to the finding of Cenciarelli et al. (2018) that human capital is closely related to future profits through innovation and strategic renewal. Hence, it is highly suggested that the managers and owners of new firms should seek for talented employees with the needed skills and knowledge (McDowell et al., 2018), which can benefit their new firms in both the current period and the future period.

The CEE with a positive effect shows strong explanatory power in the current return model, which stresses the importance of efficiently utilizing physical and financial assets for new firms to generate profits. For the three control variables, they show significant effects in both the current return model and the future return model, thus indicating the impacts of traditional variables in both the short-term and long-term periods. In particular, a negative effect of leverage and liquidity is clearly observed in both the current and future return models. As for firm size, though its impact is generally instable, it is clear that for the low-tech new firms it is a positive indicator.

With regard to the differences between the downturn period and the upturn period, it is obvious that there are more variables showing changes of their impacts in the future return model compared to the current return model. In fact, it is not surprising to observe greater differences in the future period, because as a general rule the uncertainty tends to become larger in the future period.

In the current return model the differences between the downturn and upturn periods are manifest for the SCE and firm size for the high-tech new firms. There are an increase in the explanatory power of the SCE and a decrease in the explanatory power of firm size from the downturn period to the upturn period. Generally speaking, the results here in the current return model tend to support no great changes on the impacts of the intellectual capital.

In the future return model, from the downturn period to the upturn period, obvious differences are shown in the HCE for the high-tech new firms, the CEE for the low-tech new firms, and liquidity for the low-tech firms with an increase in their impacts as well as firm size for the high-tech new firms and liquidity for the high-tech firms with a decrease in their impacts. On the basis of the above facts, it is clear that there are more variables changing their explanatory powers in the high-tech group between the downturn and the upturn periods than in the low-tech group. Hence, the results support that macro-economic situations tend to affect more on the profit-impacting factors for the high-tech new firms.

In fact, according to Buenechea-Elberdin et al. (2018), the differences are obvious between high-tech firms and low-tech firms in the knowledge used, innovation types, and production; the knowledge used in high-tech firms tends to be more complex (for instance, shown as more underlying components), while low-tech firms tend to rely on knowledge from external sources because of lacking internal innovation capabilities. In the downturn period, it is possible that the new firms in high-tech industries suffer more serious financial constraints, thus resulting in reduction in R&D investments and less innovation activities. On the other hand, the innovation in low-tech firms is not as complex as it is in high-tech firms, which make the new firms in low-tech industries not need too many funds investing in innovation.

In a nutshell, this paper examines the impacts of the intellectual capital and some financial factors on the financial performance of new firms. Though there are many empirical studies exploring this problem, little research has focused on new firms. Therefore, this paper firstly contributes to the empirical literature on the effects of intellectual capital from the perspective of new firms. Secondly, the research results of this paper can help the managers of new firms find the differences of the influence of the elements of intellectual capital in different macro-economic situations (the downturn and upturn periods) for different types of new firms (low-tech and high-tech). Finally, the impacts of intellectual capital on future financial performance is also studied by this paper, which is the third contribution. A limitation of this paper is that we did not take the data of the current COVID crisis into the research, as we have not observed the whole impact of the COVID crisis. Hence, future research could compare the COVID crisis with the previous global financial crisis and the European sovereign debt crisis regarding the different roles of intellectual capital.

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