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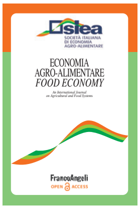

Are small and medium-size food industry firms profitable? Explaining differences in their performance: The case of the Valencia Region

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Abstract

The main aim of this study was to determine the factors that influenced profitability of companies involved in the Valencia food industry between 2006 and 2015. For this, macro-economic, sector and company variables were the key elements used in the statistical analysis, together with their dependence on the economic cycle in indicating the present state of the sector in the Valencia Region. The panel data was obtained from the SABI data base and combined with transverse data and time series. Economic and financial profitability are both influenced by certain common factors, especially the sales margin. The higher the margin the higher the profit, although this relationship also depends on where the business company is located. Rotation of assets also contributes to raising profits in times of economic expansion. The Economic Crisis saw profits fall in 2009 and 2012, two of its worst years. Finally, differences were also found between large and small enterprises.

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Introduction

The food chain is one of Spain's most important economic sectors. Despite its importance, previous studies that analyze company profits drivers mainly focus on whole economies or entire manufacturing sectors, while the evidence on regional food firms is still scarce. Nevertheless, the new regional urban economics and economic geography research (Brakman *et al.*, 2009; Duranton *et al.*, 2015) have pointed out the importance of intra-regional differences for profitability (Tamminen, 2016). This question especially attracts our interest to the Valencia Region (see Map 1), where the food industry has established itself at the top of the sector as a powerful source of job creation, employing 14% of the population[1], whose survival depends on the companies' ability to make a profit. This paper addresses the following gap research: what are the key business attributes that can explain the differences in performance between food companies within the Valencia Region?

Our data extend the empirical evidence on the regional determinants of profitability. We focused on the explanatory macroeconomic, sector and entrepreneurial factors that influence profitability. The first of these has to do with the general economic framework in which the firms operate, which are common to all the businesses in the same economic region and equally affect all the companies in a certain area. The second is related to the business activity's different organizational structures and technological conditions and influence both the business strategies and the results. The third is linked to the company's intrinsic characteristics, such as size, the available resources, and its capacity for indebtedness, fundamental variables in explaining firm profitability (Zouaghi *et al.*, 2017).

1. The largest sub-sectors in the food industry in Valencia, according to data from 2015, were in order of importance: the meat industry, fruit and vegetable preserves, bread, cakes and flour products (these four representing 57% of the turnover). As regards their relative weight in the national total, the most significant commodities were flour products (25.6%) and preserved fruit and vegetables (17.9%). In overall terms, food industry in Valencia Region, with a total turnover of €9,400 m, made up 8.6% of total sales sector in Spain. As regards added value, the GAV of the food, drinks and tobacco industry in Valencia represented 9.1% of the Spanish total for this industry in 2015, similar its percentage contribution to the total GDP. Comparing the productivity (GAV/worker) of the Valencia food industry with the Spanish figure, we get a ratio of 60.3/55.7. This higher productivity is found basically in fruit and vegetable preserves, flour products, mineral water and alcoholic drinks, and fish products. According to the latest figures from the Valencia Statistics Institute, the food industry represents approximately 9.4% in GDP of Valencian economy, 11% of the total enterprises in the Community of Valencia, employs 14% of the working population (more than 34,000 people employed) and comprises 14% of total net sales (Grupo Cooperativo Cajamar, 2017).

Map 1 - Valencia Region in Spain

The classical theory of industrial organization or Industrial Economics assumes that the industry's characteristics that determine the scope of entry barriers and competition are the main determinants of a company's performance (Wedge & Al-Laham, 2008). The literature on strategic management, particularly the Theory of Resources and Capabilities, emphasizes the importance of the specific resources of the company as determinants of profitability, so that differences in company performance arise due to differences in the endowment of these resources, which include tangible production factors, i.e. financial and physical, and intangible factors such as technology and reputation (Claver *et al*., 2002; Goddard *et al*., 2005). The divergence between these two schools of thought lies in whether the industry effect or the company effect plays the main role in explaining a company's results. While Industrial Economics highlights the importance of industrial factors in business performance, the Theory of Resources and Capacities maintains that an organization's internal resources and capacities are the main factors that determine variations in the results. Inspired by Schmalensee (1985), the joint consideration of both the structure of the sector and corporate resources as the determining factors of business results has led to the development of one of the main lines of research in terms of profitability.

Regarding the bibliographic background on profitability in the food industry, the works of Schumacher and Boland (2005a, 2005b) and Chaddad

& Mondelli (2013) are outstanding examples regarding the U.S. food industry. Using variance decomposition methods, Schumacher and Boland showed that the industry effect is more important than the company effect. However, Chaddad & Mondelli applied a hierarchical linear model to determine the impact of both effects, finding that the company effect exceeds the industry effect and that variables such as the intensity of corporate R&D and industry capital were the main drivers of company earnings.

In this framework, important studies on the European food industry include the works of Hirsch & Gschwandtner (2013) and Hirsch & Hartmann (2014). The former implemented a panel model showing that persistence of profits in the E.U. food industry is significantly lower than other manufacturing sectors and identified company size as the main driver of profits. For their part, using a hierarchical linear model, Hirsch & Hartmann provided evidence of company size and industry concentration as the dominant drivers of profitability. Analyzing both the U.S. and the E.U., Gschwandtner & Hirsch (2018) through the dynamic panel estimator confirmed that the persistence of profits in food processing is lower than in other manufacturing sectors and that the specific drivers of company profitability are the size and financial risk, followed by certain characteristics of the industry such as its rate of concentration and growth.

As regards the Spanish case, Schmalensee's school of thought (1985) has been followed by authors such as Claver *et al.* (2002), Pereira *et al.* (2011), Alarcón & Sánchez (2013) and Zouaghi *et al.* (2017), among others. According to the region studied, these research groups used different data sources, the objective of the study and the preference of the analysts, although most of the data were extracted from the companies' annual accounts and mercantile registers. Among the most frequently used databases are the Spanish Balance Analysis System (SABI in Spanish), the Vigo Custom-Free Consortium database, The Bank of Spain's Central Balances, and the Ministry of Industry's Survey of Business Strategies. The Principal Component Analysis, panel estimator approaches, and hierarchical linear modelling or ANOVA were the main statistical methods. These studies concluded that the company effect had a stronger influence on profitability than the industrial effect. Grau & Reig (2015) showed the effect of the Great Recession on business performance.

Most of the studies cited consider entire economies or are restricted to companies operating in specific countries' manufacturing sectors. In other words, there are still few studies that address the local perspective. Therefore, the purpose of this work was to provide evidence of intra-regional differences for profitability, following the line of previous work on the subject in the E.U. to measure the factors involved in profitability. The common aspects of these studies are obtaining panel data and measuring fixed-effect models (Kocisova, 2014; Capasso *et al.*, 2015; Abulescu *et al.*, 2016), or by combining different explanatory variables (Amadieu & Viviani, 2010; Soboh *et al.*, 2011; Notta & Vlachvei, 2014; Voulgaris *et al.*, 2014).

In this context, this study aimed to evaluate the factors that determine profitability in the Valencia food industry in the period from 2006 to 2015, with the following specific objectives:

1. Identify the main components of economic and financial profitability; variables such as years, economic cycle, net turnover, operating profits, number of employees, sub-sector, location, legal characteristics, external commerce, and yearly results, among others, have been considered to explain differences in the evolution of profitability.
2. Use multivariate methods on panel data to estimate the factors that determine the companies' economic and financial profitability in the Valencia food industry and their importance in the years 2006 and 2015.

One of this paper's main contributions is that it verifies the health of a strategic sector of the Valencian industry, vital for its economic development, and provides a deeper vision of the most influential attributes in individual companies' performance at the local level (i.e., within the region). It also proposes a method of collecting and analyzing business data, repeatable in time and space, thus constituting a solid and reliable source of business information that can be used to estimate and track Spanish local, regional, and national results.

The remainder of the paper is organized as follows. Section 1 summarizes the meta-sample construction and research method used and presents the meta-sample's key descriptive statistics. Section 2 gives the regression model and sensitivity tests results, while Section 3 discusses the key implications of our findings and our conclusions.

1. Materials and methods

Company data are drawn from the SABI balance sheet database, generated by Bureau van Dijk. Initially, all the active firms operating in processing food and drinks in Valencia with observations available during the period 2006 to 2015[2] were selected (428 companies). After removing extreme and inconsistent values, a total of 414 actives companies made up the sample. The commonly

2. The 10-year period between 2006 and 2015 was selected because it includes expansive and recessive cycles of the Spanish economy, representing the Great Recession as well as the years before and after. It was not possible to incorporate annual accounts for 2016 because when the data was collected, some companies had not registered them in the Mercantile Registry.

used dependent variables chosen to explain the results were as follows (Hirsch & Hartmann, 2014; Gaganis *et al.*, 2015; Zouaghi *et al.* 2017)[3]:

- **Economic Profitability or Return on Assets (ROA)**: dependent variable calculated as pre-tax profits divided by total assets, expressed as a decimal.
- **Financial profitability or Return on Equity (ROE)**: dependent variable calculated as net profits divided by capital, expressed as a decimal.

Most previous research on firm profitability has focused on the industry- and firm-specific factors (Goddart *et al.*, 2005; Grant & Nippa, 2006; Chaddad & Mondelli, 2013; Hirch & Hartmann, 2014). The explanatory variables that can influence profitability were thus selected from the Industrial Economy, and Theory of Resources and Capacities perspective (the descriptive statistics of the quantitative variables are shown in Table 1), including company size, market share, growth, age, or financial risk were identified as specific determinants (Yurtoglu, 2004; Chaddad & Mondelli, 2013):

- Corporate characteristics such as net turnover (NT), number of employees (NE) and total assets (TA), (representing company size according to E.U. company size classification recommended in 96/280/CE), earnings before taxes (EBT), earnings before interest and taxes (EBIT), profits before interest, taxes, depreciation and amortization (EBITDA), net profits (NP), own capital or net wealth (OC), financial leverage (FL), rotation of assets (RASS), sales margin (SMAR), fiscal effect (FE), legal standing (LS, a qualitative variable that takes the value of 1 in case of a joint-stock company and 0 if limited company), and exporting activity (EXP).
- The effect of macroeconomic fluctuations can be incorporated by means of year effects. Macroeconomic factors evaluate how far the financial crisis impacted agri-food firm profitability. They are described by a qualitative variable (YEAR) that takes the value of 1 in an expanding economy and 0 in a recession[4].
- The location or territorial effect is contained in two qualitative variables (CAS and AL) that distinguish between Valencia, Castellón and Alicante.
- The sector effect, by 8 qualitative variables (SUB10X), distinguishes between the nine subsectors involved in the Valencia food industry, according to the National Economic Activity Classification (NEAC)[5].

3. Gschwandtner & Hirsch (2018) offer a critical discussion of its use in profitability measurement.

4. Economic cycles, initially expressed in quarters, are in growth or recession if GDP rises or falls during two consecutive quarters, are given in years since the econometric model is based on annual periods. Real GDP was used as the reference to determine rises and falls in the value of production allowing for inflation.

5.According to the NEAC, the subsectors of the Valencia food industry are as follows: 101. Meat processing and meat products; 102. Fish and seafood preserves; 103. Processed and preserved fruit and vegetables; 104. Vegetable oils and animal fats; 105. Milk products; 106. Cereals and starch products; 107. Bread and pasta; 108. Other food products; 109. Animal feeds.

Table 1 - Descriptive statistics

Variable	Definition	Mean	S. Deviation
Dependent variables			
ROA	**Economic Profitability o Return on Assets**: variable calculated as pre-tax profits divided by total assets, expressed as a decimal	0.038	0.103
ROE	**Financial Profitability o Return on Equity**: variable calculated as net profits divided by own capital, expressed as a decimal	0.035	0.222
Explanatory variables			
Firm-level			
NT	Net turnover	5558255	13400000
NE	Number of employees	28.27	58.02
TA	Total assets	4020692	9481670
EBT	Earnings before taxes	295675.7	1160321
EBIT	Earnings before interest and taxes	330652.5	1164356
EBITDA	Earnings befere interest, taxes, depreciation and amortization	516933,4	1691015
NP	Net profits	211618.8	782243
OC	Own capital	1949624	5564140
FL	Financial leverage	2.27	20.668
RASS	Rotation of assets (RASS=NT/TA)	1.727	1.126
SMAR	Sales margin (SMAR=EBT/NT)	0.028	0.086
FE	Fiscal effect (FE=EBT/EBIT)	0.768	1.089
LS	Legal standing (qualitative variable that takes value 1 if joint stock company and 0 if limited company)		
EXP	Exporting activity (qualitative variable that takes value 1 if the company exports and 0 otherwise)		
Sector-level			
SUB10X	8 qualitative variables that distinguish between the nine subsectors involved in the Valencia food industry, according to NEAC		
Macroeconomic-level			
YEAR	Qualitative variable that takes value 1 in an expanding economy and 0 in recession		
Territory-level			
CAS	Province of Castellón (qualitative variable that takes value 1 if company is located in Castellón and 0 otherwise)		
AL	Province of Alicante (qualitative variable that takes value 1 if company is located in Alicante and 0 otherwise)		

Note: N=4140, n=414, T=10.

Source: Compiled by the authors on Stata.

Table 2 refers to the representation of each subsector and each province in the sample of companies.

Table 2 - Number of companies in the sample by subsector and province

Subsector	**Province of Valencia**	**Province of Alicante**	**Province of Castellón**	**Total Subsector**
101. Meat processing and meat products	31	23	8	**62**
102. Fish and seafood preserves	7	7	2	**16**
103. Processed and preserved fruit and vegetables	23	12	4	**39**
104. Vegetable oils and animal fats	5	2	1	**8**
105. Milk products	13	11	4	**28**
106. Cereals and starch products	13	3	2	**18**
107. Bread and pasta	61	46	21	**128**
108. Other food products	48	50	11	**109**
109. Animal feeds	2	1	3	**6**
Total Province	**203**	**155**	**56**	

Source: Compiled by the authors.

Econometric model with panel data

The data set thus obtained for each company combines transversal and temporal dimensions and allows econometric models to be used that can detect hidden heterogeneity between companies or in time. This is a short or micro-panel since the number of companies is greater than the number of periods and is balanced since the number of periods is the same for all companies. Due to its higher number of observations, the panel data provide more information, less collinearity among explanatory variables, more degrees of freedom and more efficient estimations. They also make it possible to construct more complex behavioural models than transversal or time series models. Considering the limitations of the ANOVA or COV techniques used in most previous studies (Misangyi *et al.*, 2006; Hirsch *et al.*, 2014), this paper tests the application of an econometric model with panel data.

The general model was considered as follows:

$$Y_{it} = \alpha_{it} + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it}$$

Where $I = 1, \dots, N$ y $t = 1, \dots, T$; $X_1, X_2, \dots, X_k$ are the explanatory k variables; $\beta_1, \beta_2, \dots, \beta_k$ are the parameters; i represents the companies; t

represents time; u_{it} is the random perturbation that detects the heterogeneity caused by the company effects and/or time of non-observable variables; and α_{it} represents the model intercept, which can vary between companies and/or through time. The estimation techniques depend on the consideration given to the independent term. The three models used in the present study were those most frequently cited of the existing panel models (Gujarati & Porter, 2009):

1. Grouped ordinary least squares model. In this case, NxT observations are grouped, and regression is estimated without allowing for the transversal or time-series data. The independent term is considered to be constant for all companies and periods, i.e. $\alpha_{it} = \alpha$, obtaining the grouped model:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it}$$

The model assumes that the regression coefficients are the same for all companies and that explanatory variables are non-stochastic, and if they were to be so, they would not be related to the perturbation term. The perturbation terms are also independent and identically distributed in a normal distribution with a mean of zero and constant variance. Its disadvantage is that it hides any heterogeneity among companies and does not indicate if the dependent variable's response to the explanatory variables with time is the same for all companies. Therefore, it is highly likely that the perturbation term will be related to some regressors and as a result, the heterogeneity among companies may induce autocorrelation, so that the model estimators will not be the optimal ones.

2. Grouped ordinary least squares model with variable dichotomy of fixed effects. NxT observations are grouped, but each cross-sectional unit is allowed to have its own dichotomous variable (intercept). There are N α_i terms, called fixed effects, one for each company in the individual fixed-effect models. The sub-index *i* is used to indicating that intercepts may differ due to inter-company differences. The Intercept α_i does not vary with time. Coefficients of regressors do not vary between companies or with time.

$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it}, u_{it} \sim N(0, \sigma v^2)$$

The temporal fixed-effect model can consider variables that are constant among companies but change with time. There are T fixed time effects in this model, α_t varies in time but not among companies. The sub-index *i* is used to indicating that intercepts may differ in time. Regressor coefficients do not vary among companies or with time.

$$Y_{it} = \alpha_t + b_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it}, u_{it} \sim N(0, \sigma v^2)$$

The excess of dichotomous variables with large numbers of companies is the main disadvantage of this model, together with its multicollinearity, which can hinder estimations, and also the fact that perturbations u_{it} can present heteroscedasticity among companies or autocorrelation in time.

Dichotomous variables are added to the model to allow the fixed effect intercept to vary among the companies in time. To estimate the fixed-effect model, we here introduced nine dichotomous variables (DV_t), one for each year, to find any differences in the effects over time on economic and financial profitability.

3. Random effects model. This model assumes that α_{it} is a random variable that can be broken down into a constant part α, and another random part ε_i, which depends on company i but is constant in time. Substituting in the general model, we obtain:

$$\begin{aligned} Y_{it} &= \alpha_{it} + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it} \\ &= \alpha + \varepsilon_i + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + u_{it} \\ &= \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} \dots + \beta_k X_{kit} + W_{it} \end{aligned}$$

Where $W_{it} = \varepsilon_i + u_{it}$, ε_i is the component of the cross-sectional error, and u_{it} is the combination of the component of the temporal and cross-sectional error. The perturbations ε_i and u_{it} comply with the hypothesis $\varepsilon_i \sim N(0,\ \sigma_E^2)$ $u_{it} \sim N(0,\ \sigma\upsilon^2)$, i.e. the perturbation components are not related to each other nor are they cross-sectionally related in time.

Robust estimation of models. Since the panel data have a cross-sectional time dimension, perturbations can be expected to be heteroscedastic and correlated. To solve this, we will need a robust covariance matrix estimator, which can be used in the grouped model, in the fixed effects model and the random-effects model. In the present study, we used the robust estimator proposed by Arellano & Álvarez (2003) for panel data with Large N and Small T.

Models selection. Following Gujarati & Porter (2009) and Wooldridge (2011), to decide the right estimator we used: F contrast of multiple constraints to choose between the grouped ordinary least squares model and the fixed effects model; Lagrange de Breusch-Pagan multiplier contrast to choose between the grouped ordinary least squares model and the random-effects model; and Hausman contrast to choose between the fixed effects model and the random-effects model.

2. Results

The models described in the Methods section were tested and validated, including their interaction terms to optimize the capture of significant differences in returns and enhance their explanatory power. The most applicable model was then individualized after verifying its robustness, the results of which are offered in this section. Since the classic regression model hypothesis was not satisfied, the estimators of the grouped ordinary least squares model and the fixed effects model were not optimal, so that the results obtained by the t and F contrasts were not valid. In the fixed-effects model, this problem could be solved by a robust covariance matrix estimator. The Hausman contrast was used to choose between the robust model with variable dichotomy of fixed effects and the random-effects model[6].

2.1. *ROA Estimation Model*

As can be seen in Chart 1, since the P-value associated with the Chi-square test is less than the 5% significance level, the null hypothesis is rejected, so that the most suitable model to explain ROA is the robust model with variable dichotomy of fixed effects, whose significant results are shown in Table 3 and Charts 2 and 3.

Chart 1 - Hausman Contrast for ROA

Hausman contrast
H_0: the random-effects model is the right one since its estimators are consistent (null hypothesis)
H_1: the fixed effects model is the right one
Asymptotic contrast statistic: Chi-square (13) = 50.6307 with P-value = 2.32306e-006

Source: Compiled by the authors on Gretl.

6. Note that some independent variables that directly determine economic and financial profitability were proposed in the model (since they influence the calculation). As it was seen that these variables did not possess a high degree of multicolinearity, this did not invalídate the model; a large number of regressors were selected considered to be fundamental in determining profitability, so that it was decided to include them in the regression model to decide which one was significant and estimate its degree of significance in the industry under study. As a result, the models described below were validated and everything was found to be correct.

Table 3 - Robust model of fixed effects for ROA

	Coefficient	**Standard Deviation**	**Statistic t**	**P-value**
NT	2,15E-04	3,56E-05	60.451	<0.0001
TA	-2,81E-04	3,89E-05	-72.214	<0.0001
SMAR	0.688144	0.121798	56.499	<0.0001
EBITDA	6,47E-04	2,64E-04	24.547	0.0145
CAS*SMAR	0.407767	0.159872	25.506	0.0111
EXP*SMAR	0.441809	0.151596	29.144	0.0038
YEAR*RASS	0.0135938	0.00234179	58.049	<0.0001
SUB109*NE	0.00402927	0.00154413	26.094	<0.0001
DV 4	-0.0186556	0.00294512	-63.344	0.0250
DV 5	0.0102098	0.00453967	22.490	0.0097
DV 7	-0.00652927	0.00154413	-26.094	0.0094
Mean of dependent variable		0.038022	**D.T. of dependent variable**	0.102612
Sum of squares of waste		1.299.650	**D.T. of regression**	0.059147
R-square MCVF (LSDV)		0.701783	**R-square 'intra'**	0.534598
Log-likelihood		6.056.600	**Akaike criterion**	-11263.20
Schwarz criterion		-8573609	**Hannan-Quinn criterion**	-10311.48
Rho		0.204554	**Durbin-Watson**	1.336.026

Source: Compiled by the authors on Gretl.

Variables included in the model or those with significant coefficients at a level of $\alpha = 5\%$ are considered. The model is conjointly significant, as can be seen from Charts 2 and 3. The coefficient of determination is 0.702, indicating that the estimated regression model explains 70.2% of the ROA variability.

Chart 2 - Contrast of overall significance of the robust model with dichotomous variable of fixed effects for ROA

Joint contrast of regressors (except the constant)
Contrast statistic: F (11. 413) = 39.9466
With P-value = P(F(11. 413) > 39.9466) = 2.8348e-058

Source: Compiled by the authors on Gretl.

Chart 3 - Robust contrast of different intercepts per group

Null hypothesis: the groups have a common intercept Contrast statistic: Welch F (413, 1248.0) = 7.45971 With P-value = P(F(413, 1248.0) > 7.45971) = 6.86553e-168

Source: Compiled by the authors on Gretl.

The equation of the selected model is:

$$ROA = \beta_1 NT_i + \beta_2 TA_i + \beta_3 SMAR_i + \beta_4 EBITDA_i + \beta_5 CAS{*}SMAR_i + \beta_6 EXP_i{*}SMAR_i + \beta_7 YEAR{*}RASS_i + \beta_8 SUB109{*}NE_i + \beta_9 DV4 + \beta_{10} DV5 + \beta_{11} DV7 + u_i$$

According to this equation, every additional €100,000 of NT increases ROA by 0.022%, i.e., the firm's activity generates more profits than costs. Every additional €1m of TA reduces ROA by 0.281%, i.e., when the firm's investments or economic structure is increased, ROA is reduced. Therefore, to control assets, only the fixed assets necessary to complete the production cycle must be maintained, and the optimal stock levels must be kept that do not compromise the demand. Each additional €1m of EBITDA increases ROA by 0.647%.

Every additional percentage unit of SMAR increases ROA by 68.814% for a company in Valencia that does not export, while one that does export increases ROA by 112.995% (0.68814 + 0.44181). As regards non-exporting companies in Castellón the increase is 109.590% (0.68814 + 0.40776) and 153.770% (0.68814 + 0.40776 + 0.44180) for exporters. When the markets are enlarged geographically, exporters have a higher margin. Since the ALI*SMAR interaction term's parameter is not statistically significant, there are no differences between the marginal results of firms in Valencia and those in Alicante. Each additional RASS unit increases the difference between the expected ROA in a year of growth versus a year of recession by 1.359%, i.e., in phases of economic growth, rotation provides slightly higher ROA than in recessions, despite the inelastic demand associated with the sector.

Every additional employee increases the difference between the expected ROA by 0.403% in firms belonging to the Subsectors 109 and 101. Producers of meat products (101) in Valencia are usually on a smaller scale than animal feed producers (109) and the profits per employee are higher in the larger, more automated companies. In the remaining subsectors, the interaction parameters are not statistically significant at the 5% confidence level; they do not show relevant differences with Subsector 101 firms due to being of a similar size.

In the years studied, the difference between expected ROA in 2009 and 2012 with regard to 2006 should be highlighted, which is reduced by 1.866% and 0.653%, respectively. At that point in time, the region's economic situation could be described as a large-scale crisis, and 2009 and 2012 were among the worst years. Even so, the difference between expected ROA in 2010 and 2006 increased by 1.021%, and in the remaining years, no significant differences were detected, confirming the anti-cyclical nature of the food sector.

2.2. *ROE Estimation Model*

As can be seen in Chart 4, since the P-value associated with the Chi-square test has a significance level less than 5%, the null hypothesis is rejected and therefore the most suitable model to explain ROE is the robust model with a dichotomous variable of fixed effects. The results can be seen in Table 4 and Charts 5 and 6.

Chart 4 - Hausman Contrast for ROE

Hausman Contrast
H_0: ransom effects model is the correct one since its estimators are consistent (null hypothesis)
H_1: fixed effects model is the correct one
Asymptotic contrast statistic: Chi-square (18) = 56.2577 with P-value = 8.11495e-006

Source: Compiled by the authors on Gretl.

All the variables included in the model have significant coefficients at a level of $\alpha = 5\%$, and the model is also conjointly significant, as can be seen in Charts 5 and 6. The coefficient of determination is 0.554, which indicates that the estimated regression model explains 55.4% of ROE variability.

Table 4 - Robust fixed effects model for ROE

	Coefficient	Standard Deviation	Statistic t	P-value
CONST	-0.0866778	0.0210314	-41.213	<0.0001
RASS	0.0430677	0.0143126	30.091	0.0028
SMAR	125.961	0.255272	49.344	<0.0001
FL	0.00540052	0.00197477	27.348	0.0065
CAS*SMAR	124.972	0.456205	27.394	0.0064
YEAR*RASS	0.0290911	0.00442713	65.711	<0.0001
SUB106*NP	1,72E-02	6,24E-03	27.546	0.0061
$SMAR^2$	0.698097	0.196884	35.457	0.0004
$RASS^2$	-0.00550246	0.00130788	-42.072	<0.0001
DV 3	-0.0204723	0.0076181	-26.873	0.0075
DV 4	-0.0362286	0.00852164	-42.514	<0.0001
DV 6	-0.033453	0.00910141	-36.756	0.0003
DV 7	-0.0194333	0.00823527	-23.598	0.0188
Mean of dependent variable		0.035019	**D.T. of depndent variable**	0.221989
Sum of squares of waste		9.097.661	**D.T. of regression**	0.156511
R-square MCVF (LSDV)		0.553963	**R-square 'intra'**	0.325113
Log-likelihood		2.028.541	**Akaike criterion**	-3205082
Schwarzcriterion		-5.091.620	**Hannan-Quinn criterion**	-2251117
Rho		0.083614	**Durbin-Watson**	1.615.163

Source: Compiled by the authors on Gretl.

Chart 5 - Contrast of overall significance of the robust model with dichotomous variable of fixed effects for ROE

Joint contrast of regressors (except the constant)
Contrast Statistic: F (12, 413) = 21.135
With P-value = P(F(12, 413) > 21.135) = 3.22352e-036

Source: Compiled by the authors on Gretl.

Chart 6 - Robust contrast of different intercepts by groups

Null hypothesis: the groups have a common intercept
Contrast statistic: Welch F (413, 1248.0) = 11.2185
With P-value = P(F(413, 1248.0) > 11.2185) = 6.74913e-242

Source: Compiled by the authors on Gretl.

The equation of the selected model is:

$$ROE = \beta_0 + \beta_1 RASS_i + \beta_2 SMAR_i + \beta_3 FL_i + \beta_4 CAS*SMAR_i + \beta_5 YEAR*RASS_i + \beta_6 SUB106*NP_i + \beta_7 RASS_i^2 + \beta_8 SMAR_i^2 + \beta_9 DV3 + \beta_{10} DV4 + \beta_{11} DV6 + \beta_{12} DV7 + u_i$$

In the above equation, the negative intercept can be interpreted as a measure of opportunity cost (8.67%). Each additional RASS unit increases ROE by 3.207% (0.043 – 0.011) in recession years and 6% (0.043 + 0.029 – 0.011) in growth years. It should be noted that during recessions financing is more expensive than during growth. As ROE is a quadratic function of rotation with a negative coefficient, this indicates that the maximum point would be reached after which ROE decreases as rotation increases. Thus, in a growth year, ROE would begin to decline at rotation values over 655.71% and 391.35% during a crisis. These values are difficult to reach, even for firms that apply the cost leader strategy. Each additional SMAR unit increases ROE by 264.681% (125.061% + 139.620%) in firms outside Castellón, while for those in Castellón, the increase is 389.653% (125.061 + 124.972 + 139.620). However, there are no differences between the marginal propensities of a firm in Alicante and another in Valencia. ROE is also a quadratic function of the margin, with a positive coefficient, so that after a minimum point, ROE commences to rise with a rising margin.

Each additional FL percentage unit increases ROE by 0.540% so that choosing external financing seems to be a reasonable growth strategy. Every €1m of additional NP increases the difference between a firm's expected ROE in Subsector 106 and another in 101 by 17.20%. The meat sector (101) applies differentiation strategies with a higher profit margin than the cereals and starch products sector (106), which is much more competitive and offers a wider range of manufactured products.

The Great Recession seriously hindered access to external financing and made it more expensive, generating lower profitability on self-funds and making it difficult for some firms to repay these loans. The difference between the expected ROE of a firm in 2008, 2009, 2011 and 2012 as compared to 2006 declined by 2.047%, 3.623%, 3.345% and 1.943% respectively. Despite this, the loss of ROE was less drastic than in other sectors, due to the food sector being more resistant to cyclical economic variations.

Discussion and conclusions

Profitability is undoubtedly the most widely used measure of a firm's value-creating capacity. It can be expressed in two different ways: economic profitability, which evaluates the efficient management of company assets, no matter how they are financed, and financial profitability, which quantifies the value transferred to the enterprise's owners. The business management literature has often studied the factors determining a firm's profits and why some firms earn more than others. However, there are a series of factors that influence profitability that can be divided into three categories: a) macroeconomic factors attributable to the general economic and social situation in which the firms operate and are common to all firms alike; b) factors that refer to different organizational structures and technological characteristics pertaining to the sector and influence company strategies and results; c) business factors related to the particular characteristics of the company, such as its size, resources available and indebtedness capacity.

In this context, this work aimed to identify the factors that determine the ROA and ROE of firms involved in the Valencia food industry and determine their importance. This sector is without any doubt Valencia's most powerful industry and is inextricably linked to the region's economic development, both for the volume of its sales and the number of jobs it generates.

The sample of firms was obtained from the SABI database for the years 2006 to 2015, both inclusive, and was composed of active business firms involved in producing all types of foodstuffs with data available on their performance in each of the years of the study. From the analytical panel data methods tested, the robust model by ordinary minimums squares with a dichotomous variable of fixed effects was selected, in which ROA and ROE were the dependent variables. The explanatory variables were chosen from the elements most likely to determine profitability: firstly, corporate characteristics, net turnover, number of employees, and total assets (representative of company size according to the classification criteria of the UE's recommendation 96/280/CE), EBT, EBIT, EBITDA, net profits, self-funds, financial leverage, asset rotation, sales margin, fiscal effects, legal standing, and export activities; secondly, the macroeconomic factors, included by a quantitative variable with a value of 1 in an expanding economy and 0 in a recession; thirdly, the effect of location or territory, contained in two qualitative variables that divided the locations into provinces (Valencia, Alicante and Castellón), and finally the sector effect, from eight qualitative variables that distinguished between the nine subsectors that compose the food industry, according to the NEAC.

Regarding the general question contained in the paper's title, the data indicate that the first measure of profitability (ROA) has a mean value of 3.8%. This figure differs from that given for the country's whole by the Bank of Spain's *Central de Balances*, which calculates a somewhat higher mean ROA for the food sector. This difference can be partly explained by the fact that the sample chosen in the present work did not include the extreme values of the biggest firms in the sector, which have the best economic performance but are also those that most distort the results (extreme values distort the sample). Another explanation is that the average size of the Valencia food industry firms is smaller than in other regions. ROE was found to have a mean value of 3.5%, slightly lower than the ROA. The lower ROE of the Valencia food industry is because the companies obtain returns on their investment that are lower than the cost of outside financing, i.e., they have a lower indebtedness capacity. The ROE also differs from that given by the *Central de Balances*, which gives higher ROE than ROA for the whole of Spain, which indicates that the cost of debt is lower than the ROA obtained from industrial production, i.e., it has leverage higher than 1. According to the present study findings, in the Valencia Region, the cost of debt is greater than the profits earned from business, which means that ROA is higher than ROE. As mentioned previously, this can be explained by the fact that we excluded the largest food-producing companies in Valencia, which have the largest capacity for indebtedness.

The findings provide evidence that the firm effect can explain the profitability of the food industry, macro-economic situation, territory effect and sector effect, although the firm effect is without a doubt the most important and dominates all the others. These results are in agreement with similar earlier studies in the literature, in which most agree that the Theory of Resources and Capacities plays the leading role in explaining business profitability (Hough, 2006; Ketelhöhn & Quintanilla, 2012, Zouaghi *et al.*, 2017).

The empirical results obtained indicate that ROA and ROE are both influenced by the sales margin (profit from each monetary unit sold); the higher the margin, the higher ROA and ROE, which was found to be especially true in the province of Castellón. Similar to previous studies (Zouaghi *et al.*, 2017), the findings suggest that location does matter. According to Zouaghi *et al.* (2017), this is due to factors such as the distance to the nearest airport, the proximity to technological centres or universities, the degree of urbanization or the levels of regional education, which have a positive and significant impact for food industry firms in the Valencia Region. In this sense, Goldszmidt *et al.* (2011) found that the territorial effects are even higher for nonmanufacturing sectors such as agriculture than manufacturing firms. Asset rotation (number of monetary units sold by monetary units invested) helped increase both profitability measures during economic expansion. Similarly, the Great Recession reduced profits in 2009 and 2012, when the crisis reached its lowest depths.

ROA can also be explained by the company's size, EBITDA, and export activities due to their contribution to raising the margin (Yurtoglu, 2004). The influence of company size on ROA has a positive relationship with net turnover and a negative one with total assets, both with a minimum effect that practically cancels each other. EBITDA and exporting activities positively influence higher profitability. It should be noted that in the subsector 109, whose larger companies make animal feed products, ROA rises with the number of employees. In spite of this, this inter-relationship is not considered conclusive and that the reason for the positive size-ROA relationship is only valid for large scale companies. Therefore, there is no optimal dimension of the Valencia food firms, and the expected positive relationship between size and profitability does not seem to be met (Law of Proportional Effect). In general, these results contradict the previous empirical evidence, which detected a positive relationship between company size and profitability (Misangyi *et al.*, 2006; Pindado & Alarcón, 2015, Zouaghi *et al.*, 2017). As regards the time effect, ROA was higher in 2010 than in 2006, the reference year, and allowed the losses made in 2009 to be recovered.

ROE can also be explained by asset rotation (in all years, although more marked in years of growth) and financial leverage (the higher the indebtedness capacity, the higher the ROE). The impact of financial leverage is positive. This result contradicts several previous empirical studies (e.g., Hirsch & Hartmann, 2014; Zouaghi *et al.*, 2017), but is in line with the classical risk theory. And the higher the net profits, the higher the ROE in subsector 106 (cereals and starch products). As regards the time effect, as shown by Chaddad & Mondelli (2013), the economic crisis seems to have lowered ROE more than ROA, which declined in 2008, 2009, 2011 and 2012. In addition, in line with Zouaghi et al. (2017), the impact of the financial crisis is low. This indicates that the food sector is a rather crisis-proof sector due to static demand for food products (Lienhardt, 2004).

The implications of our findings are as follows. Low profit margins on sales characterize the agri-food industry. The most effective recommendation for increasing future company profits is to modify sales prices in search of a higher commercial margin, i.e., choosing a product differentiation strategy based on innovation, accompanied by better management of relationships with clients and after-sales service could help to improve profits. Also, although with a less marked effect, improved asset rotation strategies could be useful, bearing in mind that both strategies are alternative ways of raising profits, since the higher the margin, the lower the rotation and vice versa. Since this sector is work-intensive, the cost of this strategy would be definitive, since, with such small margins, it is practically impossible for so many small companies to compete and innovate successfully. This change in strategy would help to raise profits and ensure the viability of the sector. There should be no doubts when choosing the company strategy. Strategic heterogeneity reduces profitability, and the cost leader strategy generates few profits for small companies. Therefore, it is recommended that food companies opt for differentiating their products from the competition, since this approach is more appropriate for survival in competitive markets and satisfying the preferences of the most demanding customers.

The food industry is a highly saturated market characterized by high competition for retailer shelf space, implying that innovations play a major role in firms' staying in the market. It would also be advisable that the firms in the sector unite their resources and invest in R&D in order to introduce the latest technology into their production systems to improve their efficiency. It is essential for them to invest in innovation to improve productivity. Also, better coordination is required among producers and transformers to carry out joint research projects to improve sector competitiveness with the help of public organizations and business associations. There is also a lack of horizontal cooperation among these firms, and as the average size of the firms in the sector is quite small; in most cases, the owner/manager does not have enough training to manage marketing strategies efficiently.

However, there are possible opportunities available in the use of appellations of origin, tax rebates for cooperatives, grants from public bodies, etc., which would give products an official seal of quality and expand to new markets at home and overseas, without forgetting food safety requirements. This is the path that the sector must take to meet the needs of their most demanding consumers for the healthiest products from an environmentally friendly production system. The agri-food industry is one of the Spanish economy's strongest sectors both in turnover and in the number of jobs it provides. It is vital to maintain a competitive position to expand internationally both inside and outside the EU. Thus, the sector can be described as being in a good position to face whatever comes in the present economic situation.

This paper has certain limitations: firstly, since the sample was composed of regional firms, the economic-financial interpretation of the situation could differ from a sample composed of firms from all over the country. Secondly, the data available does not always allow some possibly relevant variables to be included in the empirical analysis, especially intangible variables such as technology and reputation. Thirdly, due to the huge volume of data, although divergence could be analyzed among subsectors, it was not possible to carry out this process among the companies themselves.

Possible future lines of research could include the study of a sample from the whole of Spain to confirm the principal results and identify possible divergences among the different regions (Autonomous Communities). It would also be interesting to measure the productivity of the food industry and its subsectors, including the relationship between sales per working hour and profits per working hour in order to find the most cost-efficient subsectors. The scope of each effect within the subsectors could be separated and measured to estimate each one's representative magnitude in economic and financial performance. Econometric model alphas could also be awarded to each firm in a subsector to determine divergences in profitability. The dynamic modelling approach could be applied and compared with the robust fixed-effect model (Hirsch & Gschwandtner, 2013). Finally, it would be desirable to compare the agri-food sector with other sectors to determine their similarities and divergences, plus all the factors involved in their success or failure.

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