

Los ciclos del empleo de las cooperativas en España. ¿Importa la localización regional?

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Resumen. Este artículo presenta un análisis territorial de las cooperativas desglosado a nivel de Comunidades Autónomas (CCAA). Tres son los principales objetivos. En primer lugar, investigar si el ciclo del empleo de las cooperativas muestra una relación diferente con respecto al ciclo económico dependiendo de la localización regional de las cooperativas. En segundo lugar, evaluar si cuanto mayor es la tradición cooperativa de la CCAA, mayor es el desacoplamiento entre el ciclo económico y las fases cíclicas de las cooperativas. Por último, descubrir si, dentro de las diferentes CCAA, las cooperativas que sobrevivieron a la crisis de 2008 comparten algunos patrones comunes. Nuestros resultados muestran que (1) más del 50% de las CCAA logran un grado medio de relación pro-cíclica y que solo un pequeño grupo de ellas presenta una relación contra-cíclica; (2) el empleo de las cooperativas exhibe un cierto grado de resiliencia; y (3) las cooperativas que sobrevivieron a la crisis eran empresas maduras, de pequeño tamaño, con índices financieros adecuados, pero con un margen de beneficio negativo.

Palabras clave: Cooperativas; Región; Ciclo económico; Sincronización; Empleo; Crisis.

Claves Econlit: J54; L23; L31.

[en] Cooperative employment cycles in Spain. Does regional localization matter?

Abstract. This paper presents a territorial analysis of the cooperatives within various Spanish regions. The purpose is threefold. The first objective is to investigate whether the cooperatives' employment cycle shows a different relationship regarding the business cycle and whether this depends on the regional localization of the cooperatives. The second is to evaluate whether the greater the cooperative tradition, the greater the decoupling between business cycle and cooperatives' cyclical phases. The third objective is to find out if, within the different Spanish regions, those cooperatives that survived the 2008 crisis share some common patterns. Our results show that (1) more than 50% of the regions achieve a medium degree of a pro-cyclical relationship and that only a small group of regions presents a counter-cyclical relationship; (2) the cooperatives' employment exhibits a certain degree of resilience; and (3) the cooperatives that survived the crisis were mature, small-sized firms with adequate financial ratios but with a negative profit margin.

Keywords: Cooperatives; Region; Business cycle; Synchronization; Employment; Crisis.

Summary. 1. Introduction. 2. Cooperatives descriptive analysis. 3. Data and methodology. 4. Results. 5. Conclusions. 6. References.

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1. Introduction

Spain has a long tradition with regard to cooperatives. They remain an important economic engine which derives not so much from their contribution to the Spanish macroeconomic data (they account for roughly 0.6% of the added value, and generate, in average, a bit more than 1% of employment) but because they represent a new organizational model whose goals go further towards maximizing profits. The cooperatives attempt as much as possible to satisfy the needs of their members and align their purposes with those of the business (Birchall and Ketilson, 2009; Carini and Carpita, 2014).

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We can find a great amount of literature that stresses the higher resilience of the cooperatives rather than capitalist companies, particularly in times of crisis. Various pieces of scholarship, such as the work of Basterretxea and Storey (2018); Fusco and Migliaccio (2018); Musson and Rousselière (2018), review several studies that confirm that employee ownership yields positive effects in terms of satisfaction and motivation, which would improve productivity and commitment.⁴ In the face of economic shocks, employees are more accepting towards changes in their work conditions, and more willing to find ways to reduce costs and to enhance their relationship with their customers. These measures would be necessary to increase cooperatives' chances of survival and to maintain their employment levels.

The greater flexibility of cooperatives to adjust via hours worked rather than number of workers confers greater labour stability and, together with elements such as gender equality, non-discrimination and inclusion, increases the quality of employment (Calderón and Calderón, 2012; Roelants, Dovgan, Eum and Terrasi, 2012). The larger stability in the work facilitates investment in human capital and the improvement of the skills of the workers, which in turn leads to good results of the company (Park, Kruse, and Sesil, 2004). On the other hand, it is observed that their decision-making strategies are more likely to introduce opportunities for the incorporation of employment input and to seek a balance between human capital and business opportunities (Lampel, Bhalla, and Jha, 2014). Cooperatives are more selective at the time of hiring and more reluctant at the time of firing, which reduces the incentive to expand operations simply to take advantage of the opportunities of the expansive phases, but also makes them less vulnerable to contractions (Díaz and Marcuello, 2010; Lampel, Bhalla, and Jha, 2012; Román, 2014). These facts could confirm the existence of counter-cyclical behaviour of the cooperatives' employment with respect to the business cycle.⁵

In relation to this, there are two important fields that deserve to be analysed. Firstly, there is a large consensus about the fact that cooperatives' employment resilience differs according to their geographic location (Borda-Rodríguez, Johnson, Shaw and Vicari, 2016; Costa and Carini, 2016; Fakhfakh, Perotin, and Gago, 2012; Musson and Rousselière, 2018; Soboh, Lansink, and Van Dijk, 2014). In this sense, some papers suggest that the resilience of the cooperatives is better than other companies' models in territories with a long cooperative tradition, such as Spain (Díaz-Fonca and Marcuello, 2015; Roelants et al., 2012).

Secondly, studies such as those by Cantanero, González-Loureiro, and Puig (2017), Musson and Rousselière (2018), Sala-Ríos, Torres-Solé, and Farré-Perdiguer (2018), and Sala Ríos, Torres Solé, and Farré Perdiguer (2015) demonstrate that the 2008 crisis increased the pro-cyclical link between cooperatives' employment and the business cycle. The intensity of the crisis and its systemic character undermined the reasons that position cooperative employment as better able to deal with downturns.

This paper is related to both fields and has three main objectives. The first is to investigate if cooperatives' employment cycles demonstrate different relationships with respect to the business cycle depending on the regional localization of cooperatives. The second is to analyse whether the greater the cooperative tradition, hereafter referred to as "cooperative culture", the greater the decoupling between business cycle and cooperatives' cyclical phases. Finally, if, as the literature states, the 2008 crisis implied that cooperatives became more sensitive to the business cycle, we want to analyse what factors helped cooperatives to survive. The objective is to find out if in the different Spanish regions, those cooperatives that survived show common patterns in their economic, financial, internal and locational features.

These objectives will allow to draw conclusions on how the greater cooperative tradition of a region could explain the greater or lower degree of synchronization between the cooperatives' employment cyclical phases and the business cycle. Likewise, since the crisis of 2008 is within the analysis period and, according to Sala Ríos et al. (2015), the cooperatives' employment succumbed to its depth, the regional cyclical phases that we will identify, will enable to analyse the degree of idiosyncrasy or homogeneity showed among regions in this crisis period.

We contribute to the existing literature by supplying an accurate overhaul of the Spanish cooperatives at the regional level that has not yet been performed. We introduce territoriality as a determinant factor of the analysis. We also add different knowledge to the existing literature. First, we are going to deduce whether different cyclical behaviours exist depending on the regional cooperatives' localization. Second, we are going to find out the extent to which the long Spanish cooperative tradition matters to achieving a counter-cyclical behaviour. Third, we adopt the cluster analysis method to infer clusters that define the regional homogeneities and divergences relating to the cooperatives that survived the profoundest recession within our period of study.

⁴ Other research has pointed out the neutral or negative effects of the cooperative model. Basterretxea and Storey (2018) perform a literature review.

⁵ A review of the relationship between cooperatives' employment cycles and business cycles in Spain is available in the work of Suárez and Torné (2018).

The paper is organized as follows. Section 2 outlines a descriptive analysis of Spanish cooperatives. Section 3 describes the data used and the study methodology. Section 4 presents the results. We conclude in section 5.

2. Cooperatives descriptive analysis

The Spanish economy's long cooperative tradition dates back to the guilds of merchants that sought to support and help each other protect themselves. In the mid-19th century, cooperatives were established throughout the Spanish territory. In the early 1930s the first statistics show that more than 500 cooperatives were created. In those years, the creation and expansion of agricultural cooperatives was linked to the influence of the Catholic cooperative movement. However, the arrival of the regime of Franco meant that cooperatives were under guardianship and were used as instruments of economic and social policy, especially agricultural ones. The 1950s saw a revival of cooperatives; the importance of these years is due in part to the Mondragon Cooperative Corporation, nowadays one of the largest and most successful cooperative groups in the world (Bretos, Errasti, and Marcuello, 2018), which began its activity in the País Vasco region.

Throughout the 1960s and 1970s, the cooperative sector increased in importance, but they were still largely associated with the agricultural sector because cooperatives were not seen as a possible axis of industrial development (Díaz-Foncela and Marcuello, 2013; Morales, 2003). In those years, three regions stand out for having a concentration of more than 50% of the number of active cooperatives: these are Andalucía, Cataluña, and C. Valencia (Morales, 2003). The development of cooperatives in some regions was linked to the lack of a business model which undermined the capacity to develop business activity. The creation of cooperatives was seen as a way to industrialize the countryside without having to contribute large amounts of capital and with minimal risk. Regions such as Murcia or Castilla la Mancha are an example of this, which were especially focused on winegrowing cooperatives.

Over time, the number of cooperatives and the activities in which they were active expanded. In the early eighties, the growth of the European cooperative movement and measures of legislative and financial support granted cooperatives a significant role in the fight against unemployment. Morales (2003) distinguishes between three great cooperative models. The first were cooperatives that emerged from failed companies, especially in urban areas (phoenix bird). The second acted as subsidiary adjustment mechanisms to adapt capitalist companies to the economic situation (induced cooperatives). Finally, there were cooperatives that were created as the only option for depressed rural areas (symbolic cooperatives). In the mid-1980s, the European Union supposed the expansion of markets, reducing their relevance. The incorporation of Spain into the EEC had different sectorial impacts but, in general, agricultural cooperatives with greater exporting aptitude were those which adapted more quickly to European regulations (Román, 2014).

In the early 1990s, the economic downturn, legislative adjustment at the regional level, and a high dependence on government aid brought about a new increase in the number of cooperatives. In contrast, the economic expansion between 2000 and 2007 relegated the cooperative movement to the background. The 2008 crisis, which created millions of unemployed and growing social needs, brought cooperatives into the spotlight once again as an alternative to capitalist companies (Divar Garteiz-Aurrecoa, 2013). This evolution agrees with the fact that the creation of cooperatives is counter-cyclical; however, Pérotin (2006) points out that this behaviour is not so clear for the exit. Ben-Ner (1988) indicates that the counter-cyclical pattern exists despite being partially offset by the fact that cooperatives are also created in expansive phases and their survival could be vulnerable to contractions. There is no doubt that the issue deserves attention. In this sense, this study addresses the relationship between cooperatives and business cycles in Spain at the stage of expansion and subsequent crisis (2003–2019); the study's novelty is that we do so at the regional level. In order to improve the contextualization of the results and before dealing with the main objectives of the study, we present the main data of the cooperatives at the regional level.

Throughout the period 2003–2019, the variables that we examine present those fluctuations typical of a period of this length; however, they maintain the trend. It is for this reason, and to take into account the 2008 crisis (which is subject of study in this paper), that we present the data corresponding to a pre-crisis year (2005), a crisis year (2009), and a post-crisis year (2014). We begin the analysis with a general perspective based on the information provided by the average of these three years.

Table 1 shows that Andalucía and Cataluña provide roughly 40% of the number of cooperatives and added value (AV). These two regions plus C. Valencia comprise 54% of the workers. According to the data (average) of Table A1.1 in Appendix 1, Castilla y León has the lowest ratio of workers per cooperative (6) which implies small-sized cooperatives. By contrast, the highest ratio is obtained by C. Valencia (21). The figures from Navarra and País Vasco (20) also stand out – in País Vasco this is due to the idiosyncrasy granted by the Mondragon Cooperative Corporation.

Table. 1. Percentage weight of each region of total Spain¹

	Cooperatives²	Sales figures	Added value (AV)	Employment
Andalucía	25.76	25.17	21.93	22.31
Aragón	3.45	4.17	2.96	2.43
Asturias	1.53	1.46	1.14	1.24
Baleares	0.86	0.80	0.88	0.88
Canarias	1.98	2.89	2.25	2.43
Cantabria	0.56	0.46	0.39	0.50
Castilla la Mancha	6.47	5.28	4.82	4.43
Castilla y León	7.15	6.29	5.26	3.90
Cataluña	14.10	12.74	20.87	12.96
C. Valencia	10.66	11.30	16.96	19.03
Extremadura	4.02	4.45	3.08	2.48
Galicia	4.50	6.17	4.35	3.07
C. Madrid	5.26	11.76	7.54	5.65
C. Murcia	6.14	6.38	6.84	6.49
Navarra ³	1.30			2.13
País Vasco ³	5.53			9.50
La Rioja	0.73	0.70	0.72	0.57

1. 2005-2009-2014 average

2. Number of quotation centres

3. The fiscal data of País Vasco and Navarra are excluded because they have a special regional regime that allows them to have an independent Spanish Tax Agency, so it is not possible to obtain their fiscal figures.

Source: Ministry Labour and Social Economy (MLSE) and own elaboration

Table A1.2 in Appendix 1 shows that, by economic sector, Andalucía and Castilla y León account for over 50% of the total primary sector cooperatives, while Andalucía, C. Valencia, and Murcia together have almost 80% of the employment. Related to other sectors, Andalucía and Cataluña show, in general, the greatest weight over the total, both for establishments and employment. It should be noted, however, that the industrial employment of País Vasco is attributable to the presence of Mondragon.

If we analyse the weight of each sector over the total of the region (Table A1.3 in Appendix 1), we can see that Castilla y León stands out in number of primary sector cooperatives, representing 41.31% of total, percentage that, for the Spanish economy as a whole is, approximately, 14%. La Rioja and Castilla la Mancha, with percentages of 42.03% and 37.20%, respectively, are well above the industry average of the Spanish economy as a whole (20%). Murcia juts out in construction (16.27%) and Baleares and Madrid in services (83.84% and 81.59%).

Regarding employment, Murcia and C. Valencia stand out above the total of the Spanish economy in the primary sector (33.28% and 29.28%), Navarra and La Rioja in industry (34.14% and 32.69%), Extremadura and Murcia in construction (8.17% and 6.86%), and, finally, Baleares and Madrid in the services sector (92.59% and 91.15%). Although the cooperative movement does not take a leading role in these two regions, a certain ideological dimension linked to cooperative values is observed (Sabín, Fernández and Bandrés, 2013), which has led to the birth of cooperatives focused mainly on the service sector. This is because, on the one hand, Madrid has an important presence of administration and services and, on the other hand, because Baleares is a major tourist destination which requires a large number of service companies.

In the rest of the regions, we find a mismatch between the weight of the number of cooperatives and that of the workers. When centres stand out above the workers, this mismatch implies the existence of a high number of small cooperatives. This is especially significant in the Castilla y León primary sector and in the C. Valencia industry sector. In contrast, when workers stand out above the centres, this mismatch implies a larger average dimension of cooperatives. This would be the case for the service sector in most regions.

The analysis above conforms to the study by Pérez and Valiente (2017) which points out cooperatives' sectorial and regional diversity. As the authors state, major homogeneity is found in the services sector, even though it is not possible to argue that a behaviour-only pattern exists.

Table A1.1 in Appendix 1 shows the effects of the 2008 crisis. In 2014, there were more than 5,000 cooperatives and almost 24,000 workers less than when compared with 2005. Andalucía and Cataluña, two

regions with strong cooperative roots, were the ones where the number of establishments dropped the most (1,896 and 1,125, respectively). Employment fell more generally among the regions, although it should be emphasized that in Andalucía the number of workers decreased by more than 8,000, and in C. Valencia the number of workers decreased by more than 5,000. Catalonia was the region that lost the most sales and AV, which is an even more remarkable fact because in 2014 many regions had already recovered their pre-crisis values. The data of Table A1.1 in Appendix 1 shows that employment and establishments were the variables most sensitive to the crisis; in contrast, sales and AV better resisted the onslaught of the crisis.

3. Data and methodology

3.1. Data

Throughout the study, the territorial breakdown used is the hierarchy of two NUTS levels established by Eurostat (NUTS-2), which means that we work with 17 Spanish regions: Andalucía; Aragón; Asturias; Baleares; Canarias; Cantabria; Castilla la Mancha; Castilla y León; Cataluña; C. Valencia; Extremadura; Galicia; C. Madrid; C. Murcia; Navarra; País Vasco; and La Rioja.⁶

In the fourth section, we approach the interactions between the fluctuations in cooperatives' employment and the Spanish business cycle during the period of 2003-1Q through 2019-1Q. The business cycle indicator is GDP in real terms. The employment corresponds to cooperatives' employees registered in the General Social Security Regime, and the Special Autonomous Regime is excluded. The sources of the data are the Spanish National Statistics Institute (INE) for GDP and the Ministry Labour and Social Economy (MLSE) for cooperatives' employment. Variables are at a quarterly frequency, seasonally adjusted, and in log levels.

The analysis of cooperatives that survived the 2008 crisis works with cooperatives active in 2014 – once the recession was over. The information is obtained from the Iberian Balance Analysis System (SABI) database. The initial sample included information of 6,343 active cooperatives. We cleaned the sample by removing cooperatives with irregularities (for example, missing values or negative sales values). After this filtering, we obtained information on 4,123 cooperatives.

3.2. Methodology

3.2.1. First objective: The relationship between the cooperatives' employment and business cycles

Our first goal is to investigate whether there are significant (a-)symmetries between cooperatives' regional employment cycles and the business cycle. We do so in two steps. First, we identify the cyclical phases of the business cycle (GDP), the Spanish cooperatives' employment (CE) and the cooperatives' regional employment (CRE). Second, we analyse the level of synchronization between the GDP and CE/CRE.

Based on the pioneering work of Burns and Mitchell (1946), the cyclical phases of the business cycle can be identified via different approaches. Our study uses the deviation cycle approach (Lucas, 1977). The cyclical component is calculated as the deviation of the original series with respect to the trend using the Hodrick-Prescott filter (HP). The cyclical component fluctuations determine the cycle and its turning points: peaks (P) and troughs (T). We identify two phases in the cycle: expansion and contraction.

Different methodologies are available to identify turning points. Our study is based on one of the most widely used methodologies, namely, the Bry and Boschan (1971) algorithm. We work with the adaptation of Harding and Pagan (2002) for quarterly data. The software employed is known as BUSY, and was developed by the European Commission (Fiorentini and Planas, 2003).

The number of months separating the peak and the subsequent trough (trough and peak) is defined as the contraction (expansion) duration. The amplitude of the expansion (contraction) approaches the gains (losses) of the production/employment, and it is calculated as the percentage change between the value of the cyclical component in the peak (trough) and the value in the previous trough (peak).

To analyse the synchronization between business cycle and CE/CRE, we hypothesized that cooperatives show different relationships with respect to the business cycle depending on their regional localization. We perform the analysis using three different methodologies.

The first one is the Cohen's kappa coefficient (K). It allows us to measure the degree of agreement between categorical data. The formula for two raters is:

⁶ We do not include Ceuta and Melilla because cooperatives are not significant, and this could distort certain results.

$$K = \frac{p_o - p_e}{1 - p_e}$$

p_o = the relative observed agreement among raters.

p_e = the hypothetical probability of chance agreement.

We define S_{it} (S_{jt}) as a binary variable that takes the value one (1) when the cycle i (j) is in expansion, and zero (0) when it is in contraction. For each CRE, we calculate K between its S_{it} (S_{jt}) and the S_{it} (S_{jt}) of the GDP.

The K is always less than or equal to 1. A value of 1 implies perfect agreement, and lower values imply less than perfect agreement. The negative value means that the agreement is less than would be expected just by chance. Its statistical significance does not allow us to make any affirmation about what is considered a high or low agreement. Then, to establish the relative strength of synchronization associated with K , we follow Landis and Koch's (1977) rating scale (Table 2).

Table 2. Cohen's kappa coefficient (K). Degree of agreement.

K	Strength of agreement
< 0.00	Poor (P)
0.00 – 0.20	Slight (S)
0.21 – 0.40	Fair (F)
0.41 – 0.60	Moderate (M)
0.61 – 0.80	Substantial (Su)
0.81 – 1.00	Almost perfect (AP)

Source: Own elaboration

The second synchronization index follows the work of Harding and Pagan (2002), who proposed this concordance index (I):

$$I_{ij} = T^{-1} \left[\sum_{t=1}^T (S_{it} S_{jt}) + \sum_{t=1}^T (1 - S_{it})(1 - S_{jt}) \right]$$

where S_{it} (S_{jt}) is already defined and T is the number of observations. The index varies between one (perfect concordance) and zero (total absence of concordance). The values of I have been split into six intervals following the same procedure as K (Table 3).

Table 3. Concordance index (I). Degree of agreement.

I	Strength of agreement
0.00 – 0,17	Poor (P)
0.18 – 0.33	Slight (S)
0.34– 0.50	Fair (F)
0.51 – 0.67	Moderate (M)
0.68 – 0.84	Substantial (Su)
0.85 – 1.00	Almost perfect (AP)

Source: Own elaboration

The main advantage of these two synchronization indicators is that they are very easy to interpret. Furthermore, values of I that approach zero lead us to intuit a counter-cyclical relationship. However, their most important disadvantage is that they do not provide information on whether the co-movements are statistically significant. For this reason, another synchronization methodology has to be applied. We follow Harding and Pagan (2006), who propose a robust test of the hypothesis that cycles are either unsynchronized or perfectly synchronized. By concentrating upon the relationship between two cycles, S_{it} and S_{jt} , the authors demonstrate that the estimation of the correlation coefficient ($\hat{\rho}_s$) is a natural measure

of the degree of synchronization. To estimate (ρ_s) , the authors recommend using the GMM method because it produces a robust standard error. Then, the moment condition can be written as:

$$E \left[\left(\sigma_{si}^{-1} (S_{it} - \mu_{si}) \sigma_{sj}^{-1} (S_{jt} - \mu_{sj}) \right) - \rho_s \right] = 0$$

where μ_s is the mean and σ_s the standard deviation of the series S_{it} and S_{jt} . The estimator can be written as:

$$T^{-1} \sum_{t=1}^T \left[\hat{\sigma}_{si}^{-1} (S_{it} - \hat{\mu}_{si}) \hat{\sigma}_{sj}^{-1} ((S_{jt} - \hat{\mu}_{sj})) - \hat{\rho}_s \right] = 0$$

In order to assess the statistical significance using the t-ratio, the Newey and West (1987) heteroskedastic and autocorrelation estimation procedure (HAC) with Bartlett weights is used.

3.2.2. Second objective: the “cooperative culture”, the cooperatives’ cyclical phases and business cycle

Our second goal is to analyse whether the greater the cooperative tradition, hereafter referred to as “cooperative culture”, the greater the decoupling between business cycle and cooperatives’ cyclical phases. To analyse it, we assimilate “cooperative culture” with significant levels of cooperatives’ employment in the territory and then, in order to find out the results, we classify the regions into different ranges of “cooperative culture” according to the following rules:

1. We work with the average data for the whole period.
2. For each region, we calculate the percentage of the total cooperatives’ employment over the total employment of that region (region-weight).
3. For each region, we calculate the weight of the cooperatives’ employment over the average of the Spanish cooperatives’ employment (cooperatives-weight).

We assume that the term “cooperative culture” comprises different aspects and that using employment as a proxy variable involves some weaknesses. Among these, we want to highlight, on the one hand, the fact that the participation of the employees in the cooperative can be carried out in different ways. They can be partner-worker or exclusively employees - , in the latter case, their involvement in the “cooperative culture” could be lower. On the other hand, there might be a certain bias in favour of regions with a greater presence of labour-intensive activities, such as agriculture, in which the “cooperative culture” does not necessarily have to be extended among the workers. Despite this, we have chosen to use employment in our analysis for two main reasons. The first one, since this study deals with the analysis of the cycles of cooperative employment in Spain, our aim is to contrast the cyclical phases of employment between the different regions considering the relative importance that such variable has. Secondly, and as indicated by Díaz-Foncela and Marcuello (2014), in order to compare the evolution of cooperatives, the use of a stock variable, like the level of employment, is more appropriate than a flow variable like, for example, the number of cooperatives.

3.2.3. Third objective: The 2008 crisis, patterns of surviving cooperatives and regional clusters

The cyclical phases found in the analysis of the first objective let us know the length and the depth of the 2008 Spanish crisis, and allow us to deal with the third hypothesis of this work: in the different Spanish regions, those cooperatives that survived the 2008 crisis show common patterns in their economic, financial, internal, and locational features.

We carried out a cluster analysis to gather the most homogeneous regions depending on the values of certain variables related to the active cooperatives once the recession was over. Those variables fall into one of these three criteria: economic-financial; cooperatives’ internal traits; and territorial.

The variables selected are the follows:

1 Group: Economic-financial criterion

The study of the cooperatives’ performance cannot be limited to a simple consideration of traditional business ratios, because cooperatives have social purposes and some institutional specificities that cannot be overlooked. However, to ignore the profitability indicators and leave out economic or financial criteria is not adequate, because cooperatives have to operate to guarantee their long-term survival (Costa, Andreus, Carini and Carpita, 2012; Lajara-Camilleri and Mateos-Ronco, 2012; Lauermann, Moreira, Souza and

Piccoli, 2018). The financial and economic variables have been chosen to evaluate the long-term viability of cooperatives.

1.1. Liquidity ratio: (current assets-stocks)/(current liabilities)

1.2. Debt ratio (%): [Debts/(Total assets)]*100

1.3. Solvency ratio (%): (Shareholders funds/Total assets)*100

1.4. Profit margin (%): (Profit before tax/turnover)*100

2 Group: Internal traits criterion

There is a wide consensus about the fact that the cooperatives' performance differs based on activity, size and longevity (Borda-Rodriguez et al., 2016; Costa et al., 2012; Costa and Carini, 2016; Fakhfakh, et al. 2012; Martínez-Victoria, Sánchez-Val, and Arcas-Lario, 2018; Musson and Rousselière, 2018; Nwankwo, Ogbodo, and Ewuim, 2016). We gather indicators of these three fields.

2.1. Activity

The cooperatives' economic activities have been assigned using the statistical classification of economic activities in the European Community: NACE Rev. 2.

2.2. Size

To define the cooperatives' size, we focus on the number of employees. Following the definition provided by the European Commission,⁷ we define four categories: micro, small, medium and large cooperatives (Table 4).

Table. 4. Cooperatives' size

Category	Number of Employees	Categorical variable
Micro	< 10	1
Small	< 50	2
Medium	< 250	3
Large	≥ 250	4

Source: Own elaboration

2.3. Longevity

Economic literature proposes a number of ways to measure firm age.⁸ In this study, it is defined as the number of years since they began their activity until the year 2014, without considering those firms that began their activity in the recession phase (2008-2013). The youngest cooperatives are those created in the beginning of 2007, which would be eight years old. We adapt the proposition of Ayyagari, Demirguc-Kunt and Maksimovic (2011) and define three age groups (Table 5).

Table. 5. Age groups

Age groups
Young firm (less than 12 years)
Mid age firm (13 to 17 years)
Mature firm (more than 17)

Source: Own elaboration

3 Group: Territorial criteria

3.1. "Cooperative culture"

It is necessary to include this territorial indicator in order to identify the role that the location economies play in the definition of the patterns of the clusters (Table 6).

⁷ Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty Text with EEA relevance.

⁸ See, for instance, the work of Arafat and Mohtar (2014) for a review of some measures used by the economic literature.

Table. 6. “Cooperative culture”

Grade of “cooperative culture” ¹	Categorical variable
High (HCC)	1
Medium (MCC)	2
Low (LCC)	3

1. Classification according to the results of the analysis of cooperative culture (Table 9)

Source: Own elaboration

3.2. Urbanization economies

It could be possible that the regional location played a role in the survival rates because of the effects of urbanization economies. The advantages of this kind of agglomeration economies derive from the urban location of firms. They include, for instance, proximity to a market, the availability of an abundant multi-functional work force, infrastructural network or public goods, aspects that are typical of widely populated areas (Audretsch and Feldman, 2004; Harrison, Kelley, and Gant, 1997; Isard, 1956). In order to capture such an influence, we included a dummy variable that takes the value of 1 if the cooperatives are located in a large city, and zero in any other case.⁹

In all, we have a sample of 9 variables belonging to 4,123 active cooperatives with a known regional localization. Since the cluster analysis gathers regions, we take each variable and calculate the regional average to construct a new sample that we use to carry out the clustering process (except for in the case of the NACE Rev.2 data, because it does not make sense to calculate the regional average). We have created three variables: NACE1, NACE2 and NACE3. In each region, the value of NACE1 is the number of NACE Rev.2 that gathers the highest percentage of cooperatives. NACE2 gathers the second-highest percentage, and NACE3 the third-highest.

4. Results

4.1. First objective: The relationship between the cooperatives’ employment and business cycles

The results of the turning point analysis are presented in Appendix 2. On average, CE tends to be longer than the business cycle in contraction phases and shorter in expansion phases (Table A2.2). In Table A2.3, we can see that regarding GDP, CE leads in the peaks and is largely matching in the troughs. In addition, our results suggest that the amplitude of the GDP is greater than the CE, both in the contraction and in the expansion phases (Table A2.4). These outcomes do not differ from results presented by other scholars (Díaz and Marcuello, 2010; Román, 2014; Sala Rios, Farré Perdiguer, and Torres Solé, 2014; Sala Rios et al., 2015).

We go further and investigate the relationship between business cycle and CRE. The features of the regional cycles indicate a noticeable regional diversity. In Table A2.2, we can see that the duration of the contraction phases ranges from 6 months (Castilla y León, La Rioja) to 21 months (Cantabria), and the duration of the expansion phases ranges from 5 months (Canarias) to 36 months (Asturias). The differences with respect to CE are more evident in the average lead/lag data (Table A2.3). We can see important lags both in the expansion and the contraction phases. The amplitude (Table A2.4) also shows important differences. However, as in the CE, the amplitude of the GDP expansion and contraction phases is greater than the CRE. From this result, it can be deduced that during upward episodes, the capacity of the economy to generate cooperatives’ employment is lower than its own capacity for growth. The opposite occurs in the contraction phases, where CRE results are better than that of GDP, which means that there exists a certain degree of resilience.

Table 7 summarizes the synchronization information. The phases of the CE are quite well aligned with business cycle (the concordance index is around 68%), and the t-ratio is almost statistically significant ($\alpha=0.05$). However, the regional synchronization indices show substantial differences.

Regarding the t-student, the most noteworthy is on the one hand, that Aragón, C. Madrid, Navarra and La Rioja present counter-cyclical behaviour, although not statistically significant. On the other hand, the values of Andalucía, Canarias, Cantabria and Extremadura are significantly pro-cyclical.

⁹ To determine which cities can be considered as large cities, we follow the Law of Large Cities or Law of Measures for the Modernization of Local Government (Law 57/2003, of December 16).

Table. 7. Synchronization indicators

	Cohen's kappa coefficient (<i>K</i>)	Cooperatives' employment-GDP Concordance index (<i>I</i>)	t-student
Andalucía	0.37	0.69	2.161125
Aragón	0.00	0.49	-0.072960
Asturias	0.04	0.52	0.217122
Baleares	0.09	0.52	0.249196
Canarias	0.40	0.71	2.280997
Cantabria	0.37	0.69	2.265295
Castilla la Mancha	0.25	0.63	1.65972
Castilla y León	0.13	0.57	0.801926
Cataluña	0.29	0.63	1.479784
C. Valencia	0.27	0.63	1.626022
Extremadura	0.53	0.75	3.636126
Galicia	0.32	0.66	1.866326
C. Madrid	-0.09	0.45	-0.641050
C. Murcia	0.03	0.51	0.078614
Navarra	0.01	0.49	-0.051135
País Vasco	0.09	0.54	0.405286
La Rioja	-0.15	0.42	-0.981203
CE	0.34	0.68	1.904479

Source: Own elaboration

With respect the other two indices, Table 8 orders the regions mixing the *K* and the *I* intervals.

Table. 8. Region's position depending on *K* and *I* intervals

<i>I</i> <i>K</i>	F	M	Su
P	C. Madrid La Rioja		
S	Aragón Navarra	Castilla y León Asturias Baleares Murcia País Vasco	
F		Castilla la Mancha Cataluña C. Valencia Galicia	Andalucía Canarias Cantabria CE
M			Extremadura

Source: Own elaboration

We define:

P(*K*)-F(*I*): low synchronization

S(*K*)-F(*I*): medium-low synchronization

S(*K*)- M(*I*): medium synchronization

F(*K*)-M(*I*): medium synchronization

F(*K*)-Su(*I*): medium-high synchronization

M(*K*)-Su(*I*): high synchronization

Based on this information, we define five regional groups:

1. High-significant, pro-cyclical: Extremadura
2. Medium-high significant, pro-cyclical: Andalucía, Canarias, Cantabria and CE

3. Medium-non-significant, pro-cyclical: Castilla y León, Asturias, Baleares, Murcia, País Vasco, Castilla la Mancha, Cataluña, C. Valencia and Galicia
4. Medium-low-non-significant, counter-cyclical: Aragón, Navarra
5. Low-non-significant, counter-cyclical: C. Madrid and La Rioja

The second group, which gathers only three regions (18%), includes those whose relationship between their CRE and the business cycle is the most similar to that of CE. The analysis indicates that 23% of the regions show a high-medium-significant degree of synchronization, and around 53% reach a medium-non-significant degree. We can also see that roughly 23% of them present a counter-cyclical relationship. These results confirm that cooperatives' cycles demonstrate different relationships with respect to business cycles depending on the regional localization of cooperatives, but also that there is a prevailing medium-pro-cyclical relationship.

These results fit with the Díaz-Foncea and Marcuello (2015) study. These authors examine regional determinants that influence the rise of cooperatives and compare them with those that influence the capitalist companies. Although Pérotin (2006) indicates that there is not a great difference between the reasons for creating cooperatives and those for creating capitalist firms, Díaz-Foncea and Marcuello find important differences. With respect to the significant variables, the growth of GDP per capita and the wage level positively influence both capitalist firms and cooperatives. Instead, the unemployment rate presents an opposite effect. The rate has a positive sign on cooperatives (higher regional unemployment means higher creation of cooperatives and, therefore, cooperative employment) and a negative sign on capitalist firms (higher unemployment means lower creation of firms). Such outcomes could explain the cyclical behaviour that we have found in regions such as Extremadura, Andalucía, or Canarias. In these regions, the first two variables reach values that are close to, or not very different from, those of Spain as a whole. In contrast, their unemployment rate is high, both in the expansion and contraction phases – a fact that reduces the positive effect of its changes on the creation of cooperatives.

On the other hand, Díaz-Foncea and Marcuello (2015) find a positive and significant effect of a strong service and industrial sectors in a region on the creation of capitalist companies which is not observed in cooperatives. This would partly explain the counter-cyclical behaviour observed in some regions. Madrid presents a high weight of the cooperative service sector. Aragón, Navarra, and La Rioja show a higher weight of the cooperative industrial sector than that of Spanish economy (Table A1.3 in Appendix 1). Given that these variables are not determinants for cooperatives, in these regions cooperatives may expand more independently of the business cycle. Furthermore, the sales figures of Madrid and Aragón reach a relatively higher share over the number of cooperatives than in other regions (Table A1.1 in Appendix 1). We have already indicated the greater resilience of this variable to downturns. All of the above point to a greater decoupling regarding the business cycle.

4.2. Second objective: the “cooperative culture”, the cooperatives' cyclical phases and business cycle

Next, we analyse the second goal of our study. Drawing upon the results of scholars who argue that the number of cooperatives in a region promotes better resilience (Arando, Peña, and Verheul, 2009; Díaz-Foncea and Marcuello, 2014, 2015; Grávalos and Pomares, 2001; Smith, 2003), we ask: does the presence of a “cooperative culture” in a region mean higher decoupling regarding the business cycle?

We assimilate “cooperative culture” with significant levels of cooperatives' employment in the territory. The presence of “cooperative culture” is linked to the definition of agglomeration economies, in line with the work of Marshall (1890), which entail advantages such as the availability of specialized labour, the availability of intermediate goods and the ease of exchanging knowledge about products, processes and innovations¹⁰. Such advantages would allow greater cooperative resilience and strengthen the theory of higher decoupling.

According to the rules mentioned in the methodology section, we plot an XY-graph, where in the x-axis represents the region-weight (Spanish economy = 1.16%, so 1.16 crosses the y-axis), and the cooperatives-weight is represented in the y-axis (1 crosses the x-axis).

¹⁰ Agglomeration economies are usually divided into two groups: location economies and urbanization economies. The former is defined from the original vision of Marshall. The latter are associated with location externalities linked to urban areas (Pablo-Martí and Muñoz-Yebra, 2009).

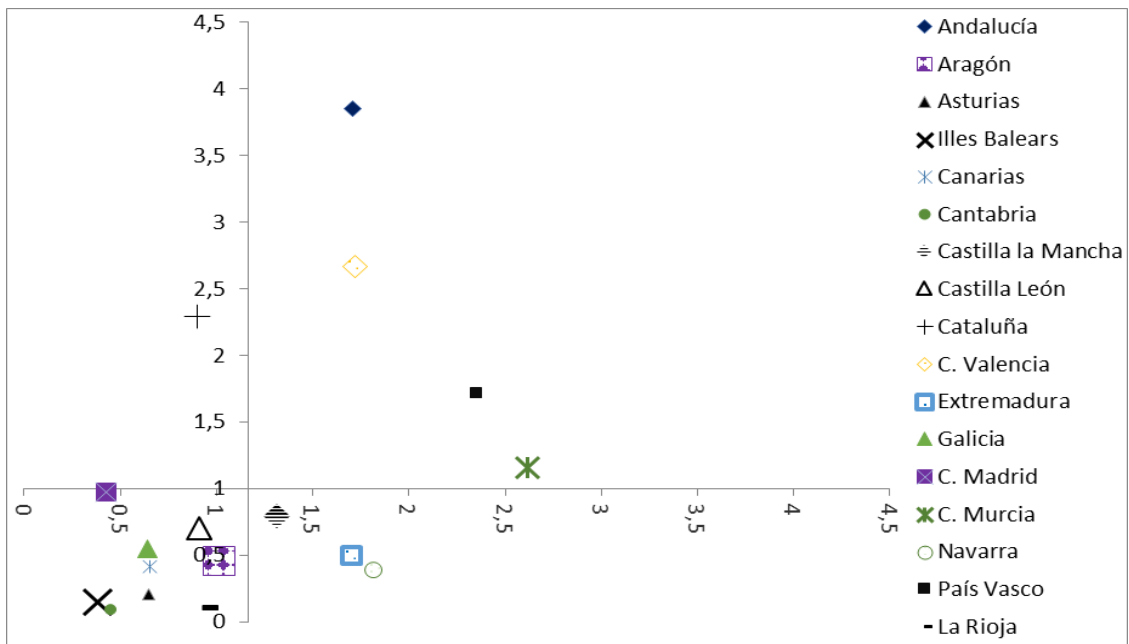


Figure. 1. “Cooperative culture” according to region
Source: Own elaboration

Table 9 defines each quadrant.

Table. 9. Grade of “cooperative culture”

Quadrant	Interpretation	Grade of “cooperative culture”
Upper-right	Advantages both in region- and in cooperatives-weights	High (HCC)
Bottom-right	Advantages in region- and disadvantages in cooperatives-weights	Medium (MCC)
Upper-left	Advantages in cooperatives- and disadvantages in region-weights	Medium (MCC)
Bottom-left	Disadvantages both in region- and in cooperatives-weights	Low (LCC)

Source: Own elaboration

We classify the regions in three levels (Table 10).

Table. 10. “Cooperative culture” according to region

“Cooperative culture” levels	Regions
HCC	Andalucía, C. Valencia País Vasco Murcia
MCC	Castilla la Mancha Extremadura Navarra Cataluña
LCC	Aragón C. Madrid La Rioja Castilla y León Galicia Canarias Asturias Baleares Cantabria

Source: Own elaboration

According to the literature, the “cooperative culture” would be linked to a decoupling with respect to the business cycle. However, comparing the current and the previous section results, we can see that the HCC regions, Andalucía, C. Valencia, País Vasco and Murcia, reach a considerable level of symmetry with respect to the business cycle, and it is even significant in the case of Andalucía. Furthermore, regions classified as MCC, such as Extremadura or Cataluña, reach pro-cyclical synchronization values that are not consistent with their “cooperative culture”. On the other hand, between the regions within the low level of “cooperative culture”, we can find Madrid and La Rioja, whose counter-cyclical relationship regarding the business cycle denotes a wide decoupling.¹¹

These results lead us to affirm that in the period of study, the presence of “cooperative culture” in a region did not mean higher decoupling regarding the business cycle. The localization economies (Marshall, 1890) did not guarantee greater resilience of the employment in the face of recessions.

We observe that the result agrees with Díaz-Foncea and Marcuello (2014), at least in the short term. Cooperatives’ employment is pro-cyclical in regions with high or medium cooperative development, while regions with low cooperative development do not show any significant relationship with total employment.

4.3. Third objective: The 2008 crisis, patterns of surviving cooperatives and regional clusters

As demonstrated by the phases of the business cycle (Table A2.1 in Appendix 2), the Spanish 2008 crisis lasted from Q4-2007 to Q1-2017, taking the “W” form. The Q2-2009 trough was followed by a peak in Q3-2010, which yielded a new contraction that was much deeper than the previous one. In this sense, our calculations confirm this greater intensity – the amplitude of the first “V” (Q4-2007 to Q2-2009) is -123.1 – while the amplitude of the second “V” (Q3-2010 to Q2-2013) is -377.2. The study of Sala Rios et al. (2015) demonstrates that although cooperatives’ employment remained resilient during the first recession phase, it succumbed during second one. In the same vein, our estimations of the amplitude in the contraction phases show that in the second contraction phase (Q3-2010/Q2-2013), the amplitude of the cooperatives’ employment is the greatest, standing at -169.31.

It is worth asking whether in the different Spanish regions, those cooperatives that survived the second contraction phase show common behaviour patterns. To undertake this third objective, we applied the cluster methodology to gather the most homogeneous regions depending on the values of the variables defined in the previous section. The analysis has been performed using the SPSS software. Agglomerative hierarchical cluster analysis, Euclidean squared distance and Ward’s clustering algorithm have been used as the clustering procedure. All variables have been standardized using a z-score.

¹¹ These results present some divergences from those found by Suárez and Torné (2018), especially relating to Andalucía, Navarra and País Vasco.

There are a number of methods to ascertain the appropriate number of clusters, but there is little consensus on which among them is most efficient. We use three approaches. The first is dendrogram evaluation. The second is the variance ratio criterion (VRC), introduced by Calinski and Harabasz (1974). For a solution with N objects and K clusters, the VRC is:

$$VRC_k = \frac{B_k}{(K-1)} \bigg/ \frac{S_k}{(N-K)}$$

where B_k is the overall between-cluster variation, and S_k the overall within-cluster variation with respect to all clustering variables.

The optimal solution of this criterion is the number of clusters that minimizes the ω_k value:

$$\omega_k = (VRC_{k+1} - VRC_k) - (VRC_k - VRC_{k-1})$$

The main limitation of this index is that the number of clusters cannot be fewer than three. To resolve this limitation, as well as to give higher robustness to the solution of the dendrogram and VRC index, we propose the third criterion based on a distinctive breaking point. We plot in the x-axis the different stage of the algorithm and in the y-axis the dendrogram rescaled distance. The cut-off point that helps to define the number of clusters is set where a sudden increase of the distance can be observed.

The three criteria lead us to affirm that five is the appropriate number of clusters (see Appendix 3). The assignment of clusters is nine in cluster 1, five in the cluster 2 and 1 in the remainder of clusters. Roughly 53% of the regions are sufficiently homogeneous to fall in the same cluster, and roughly 18% are not sufficiently homogeneous to be able to integrate them in the same cluster (Table 11).

Table. 11. Cluster membership

Region	5 clusters
Andalucía, Asturias, Canarias, Cataluña, C. Valencia, Extremadura, Murcia, Navarra, País Vasco	1
Aragón, Castilla la Mancha, Castilla y León, Galicia, La Rioja	2
Baleares	3
Cantabria	4
C. Madrid	5

Source: SPSS and own elaboration

Table 12 shows the mean values of the dependent variables for each group and the variance between groups/within-groups for each variable (F). With respect to the between/within variance, the highest rate corresponds to NACE1, followed by localization and debt ratio. The variability between groups remains significantly higher than within-group for NACE2, size and profit margin. Although the test must be interpreted with caution, it allows us to stress the relevance of these variables in the clustering process.

Table. 12. Mean values of dependent variables by cluster and variance by variable

Cluster Variable	Mean						F	Sig.
	1	2	3	4	5	Total		
Liquidity	2.895	4.778	4.432	1.525	1.930	3.402	3.100	0.057
Debt	28.508	27.152	33.910	9.139	29.369	27.338	6.762	0.004
Solvency	33.448	39.111	42.868	46.528	36.097	36.593	1.299	0.325
Profit margin	-2.222	-1.071	-19.893	-1.391	-0.937	-2.799	3.431	0.043
NACE1 ¹	46	1	46	10	85		323.643	0.000
NACE2 ¹	1	46	47	1	47		4.576	0.018
NACE3 ¹	10	10	49	46	46		0.963	0.463
Size	1.631	1.312	1.833	1.900	1.815	1.576	3.511	0.041
Longevity	29.405	31.038	31.099	34.695	26.004	30.096	0.696	0.609
Cooperative culture	1.889	2.600	3.000	3.000	3.000	2.294	1.695	0.215
Localization	0.182	0.142	0.000	0.200	0.630	0.187	7.216	0.003

1: The main activity in the cluster

Source: SPSS and own elaboration

The mean values indicate that cluster 1, the largest group, does not show extreme values. It only stands out because achieves the highest “cooperative culture” (lowest categorical variable). In general, their figures are lower than the total mean, except in the debt ratio and in the size. The economic activity of a large percentage of the cooperatives falls into the wholesale trade category (NACE Rev.2: 46), followed by crop and animal production (1) and manufacture of food products (10).

The second cluster has the highest liquidity ratio. It brings together mature-micro cooperatives with a relatively low negative profit margin. Their activities are, as in cluster 1, focused on the wholesale trade category, crop and animal production and manufacture of food products. They are located in regions with medium-high “cooperative culture” and few urbanization economies.

The rest of the clusters are idiosyncratic. Cluster 3, Baleares, is the most indebted, with the highest negative level of the profit margin. It is a region with low “cooperative culture” and null urbanization economies. Cantabria, cluster 4, shows the largest amount of extreme values. It has the lowest liquidity and debt ratio and the highest solvency. Overall, the region does not have “cooperative culture” but it has a medium level of urbanization economies. Their cooperatives are mature and small. Finally, cluster 5, C. Madrid, is not a “cooperative culture” region; however, it has important urbanization economies, and in fact, it has the highest level of these economies. Their cooperatives are the youngest and achieve the best profit margin, even though negative. It stands up in the education activities (NACE1=85), which is not found in any other region.

We want to point out that while it is true that the results allow us to identify differences and define the most important strokes of each cluster, it is also true that the features analysed do not make the cooperatives very different among the regions. Overall, the cooperatives that survived were mature firms, micro-small sized¹², not highly indebted, with elevated liquidity and solvency ratios and negative profit margins.¹³ Many of them were dedicated to service sector, although firms in the fields of crop and animal production and manufacture of food products also stand out.

It could be possible that the negative profit margin that all the clusters exhibit could affect the short-term cooperatives’ survival ratio. The answer is negative. The percentage of cooperatives active in 2014 who remained active in 2017, the last year with the most complete data set in SABI, is around 98%.

5. Conclusions

¹² This result should not come as a surprise, since, as in the rest of the Spanish productive structure, micro and small cooperatives prevail. In 2008, they gathered more than 90% (Sala-Ríos et al., 2018).

¹³ Although there is no optimal value for financial ratios, since they depend on the company and the sector, there is a broad agreement that the following are adequate values: liquidity ratio (0.8-1); debt ratio (40% -60%); solvency ratio (33% -35%).

In this paper, we have studied the relationship between business cycle and cooperatives' employment in Spain. The novelty inherent to our study is that we have done so at the regional level. We have also analysed whether the regions showed common features with respect to those cooperatives that survived the second contraction period within the 2008 crisis.

The synchronization analysis indicates that the Spanish economy as a whole presents significant pro-cyclical behaviour, which is not the case in a high percentage of regions. Regional differences regarding the relationship with the business cycle have been found. However, there is a predominant behaviour that indicates that more than 50% of the regions show a medium degree, although non-significant, of a pro-cyclical relationship. At the same time, the results also suggest that only a small group of regions present a counter-cyclical relationship.

It is worth noting that despite the scarce presence of regions with counter-cyclical movements, the results of the turning point analysis indicate that in the contraction phases, employment losses in cooperatives are lower than losses in eco-economic activity. Consequently, we can conclude that employment has a certain degree of resilience without being counter-cyclical.

We also provide evidence that localization economies (in the Marshall sense) have not provided a counter-cyclical relationship. The presence of regional "cooperative culture" has not meant higher decoupling of the cooperatives' employment regarding the business cycle. Therefore, "cooperative culture" has not guaranteed greater resilience of the cooperatives' employment during recessions.

In addition, we have also considered the crisis of 2008. Specifically, the second contraction phase within the crisis that took a "W" shape. We have investigated whether cooperatives that survived the second recession have common patterns that allow us to gather regions in homogeneous clusters. Our results indicate that there are three regions so idiosyncratic that it has been impossible cluster them with other regions. These are Balears, Cantabria and C. Madrid. On the other hand, we have found that the clusters that gather more regions do not present extreme values, and in general, they are lower than the mean. It should be noted that the features analysed do not point to significant differences among regions. Therefore, the cooperatives that survived were mature firms, micro-small sized, not indebted, with elevated liquidity and solvency ratios and negative profit margins. The activities that stand out are the service sector, crop and animal production and manufacture of food products.

Our results show that company age represents the experience and knowledge that allows older firms to perform better than newer firms (Arafat and Mohtar, 2014). The long-term continuous learning of the older cooperatives increases their possibilities to handle the financial structure and to survive. As we have highlighted, in the second onslaught of the crisis, longevity and adequate financial ratios were a guarantor of cooperative survival. However, as is deduced from the value of the amplitude in this phase, these factors were not a guarantor to preserve employment.

It is often said that the socioeconomic role played by the cooperatives is not linked with better economic-financial performance (Lauermann et al., 2018). In this sense, it is worth noting that all the clusters show a negative profit margin. This circumstance could affect the survival ratio, but we have calculated it in the short term, and it is not possible to support this assumption. However, when the data makes it possible, it will be interesting to investigate the extent to which this situation can hold in the long term.

Relating to this negative margin profit ratio, is also worth noting that Marín-Sánchez (2016) states that Spanish legislation makes it possible that cooperatives treat their financial information in such a way that the tax benefits that result from an alternation between exercises with losses and exercises with profits were maximized. In this way, the increase of the cooperatives with losses during the recession that concerns us could be managed with accounting and fiscal mechanisms that would make the profits-losses alternation a viable and legal strategy.

The results of this paper can help policy makers to design measures of economic policies. There is no doubt that the policy makers should focus on promoting and stimulating cooperatives, because it would help to generate greater societal well-being and progress. According our outcomes, localization matters, and consequently, measures should be designed to improve the competitive position of cooperatives according to their geographical location. It is important to give relevance to the economies of localization as a way to promote positive externalities. On the other hand, we have pointed out that the losses in cooperatives' employment are lower than that of the economic activity; however, the last crisis demonstrated that the cooperatives' employment is not counter-cyclical. The policy makers should also promote the spatial interactions among cooperatives in order to face future downturn periods.

We would like to emphasize that the major constraint of this study was insufficient official data. The lack of complete territorial and economic-financial information made it impossible to carry out part of the analysis with official statistics. In the last part of the study we had to use SABI, which is a widely accepted database with a significant amounts of information on various companies, but the reporting of information is

not homogeneous thorough the years, and there are many missing values. In this sense, in the cluster analysis, within the economic financial criteria, we thought that it was necessary to include the public aids to the cooperatives. However, this became impossible due to the large amount of lost values in the SABI database.

Future inquiries should try to widen the study in two interlinked fields. First, it is necessary to include some variables that approach the public interventions in cooperatives. We have recommended that policy makers take into account the economies of localization in their measures. However, we have not analysed the extent to which such measures exist, even though they would be inefficient/insufficient, or alternatively, they do not yet exist. On the other hand, the regulation of cooperatives also warrants a larger analysis. Given that the regulations on cooperatives are very broad and in some cases have significant regional divergences (Marín-Sánchez, 2016), future analysis should explore whether such divergence influences cooperatives' cyclical results and their survival rates. It would also be of interest to carry out a review of not only Spanish regulations, but also European regulations, in order to detect the degree of implementation of measures for development and verify if regulation has been a strength or weakness in periods of recession.

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Appendix 1

Table. A1.1. Cooperatives: main data

Region/Year	2005				2009			
	Cooperatives ¹	Sales figures ²	Added value (AV) ²	Employment ³	Cooperatives ¹	Sales figures ²	Added value (AV) ²	Employment ³
Andalucía	5,888	8,863.12	1,109.05	54,335	4,684	9,879.11	1,164.09	49,850
Aragón	746	1,399.70	146.86	6,491	639	1,698.08	150.86	5,175
Asturias	333	539.95	58.39	3,218	299	642.91	65.58	2,975
Baleares	158	339.94	43.37	2,175	170	322.71	45.98	2,405
Canarias	472	1,267.31	123.76	6,490	356	1,161.53	118.53	5,425
Cantabria	117	199.13	14.20	1,185	96	182.84	24.61	1,086
Castilla la Mancha	1,386	2,011.68	256.13	10,970	1,218	2,070.54	250.75	9,576
Castilla León	1,385	2,373.31	278.23	9,751	1,376	2,460.87	279.65	9,083
Cataluña	3,291	6,308.06	1,235.43	30,094	2,514	4,604.39	949.71	28,731
C. Valencia	2,383	3,830.72	754.25	45,392	1,969	4,867.96	866.87	43,354
Extremadura	821	1,717.70	152.97	6,524	747	1,798.01	170.91	5,216
Galicia	898	2,388.97	228.62	7,093	824	2,634.03	220.74	6,651
C. Madrid	1,100	5,193.91	351.00	12,101	981	4,408.52	361.78	13,293
Murcia	1,351	2,374.88	337.61	15,152	1,111	2,728.04	361.89	14,422
Navarra ⁴	239	-	-	3,986	230	-	-	4,871
País vasco ⁴	955	-	-	20,838	963	-	-	20,070
La Rioja	158	274.79	39.73	1,472	132	288.72	39.39	1,142
Total	21,681	39,083.16	5,129.62	237,267	18,309	39,748.26	5,071.33	223,325
Region/Year	2014				Average			
	Cooperatives ¹	Sales figures ²	Added value (AV) ²	Employment ³	Cooperatives ¹	Sales figure ²	Added value (AV) ²	Employment ³
Andalucía	3,992	11,832.88	1,111.89	46,162	4,855	10,191.70	1,128.34	50,116
Aragón	568	1,969.71	159.50	4,712	651	1,689.16	152.41	5,459
Asturias	233	587.24	52.13	2,190	288	590.03	58.70	2,794
Baleares	161	304.16	46.06	1,373	163	322.27	45.14	1,984
Canarias	291	1,086.13	105.66	4,470	373	1,171.66	115.98	5,462
Cantabria	103	172.81	21.98	1,081	105	184.93	20.26	1,117
Castilla la Mancha	1,052	2,328.32	237.51	9,294	1,219	2,136.85	248.13	9,947
Castilla y León	1,282	2,802.04	254.95	7,439	1,348	2,545.41	270.94	8,758
Cataluña	2,166	4,566.82	1,037.20	28,484	2,657	5,159.76	1,074.11	29,103
C. Valencia	1,674	5,034.93	997.66	39,512	2,009	4,577.87	872.92	42,753
Extremadura	704	1,886.16	151.63	4,946	757	1,800.63	158.50	5,562
Galicia	824	2,478.95	222.13	6,942	849	2,500.65	223.83	6,895
C. Madrid	890	4,685.42	452.01	12,674	990	4,762.62	388.26	12,689
Murcia	1,010	2,642.42	356.24	14,185	1,157	2,581.78	351.92	14,586
Navarra ⁴	264	-	-	5,474	244	-	-	4,777
País vasco ⁴	1,208	-	-	23,081	1,042	-	-	21,330
La Rioja	124	281.67	31.56	1,246	138	281.73	36.89	1,287
Total	16,546	42,659.67	5,238.11	213,265	18,845	40,497.03	5,146.35	224,619

1. Number of quotation centres 2. Thousand million euros 3. Number of employees 4. The fiscal data of País Vasco and Navarra are excluded because they have a special regional regime that allows them to have an independent Spanish Tax Agency; therefore, it is not possible to obtain their fiscal figures.

Source: Ministry Labour and Social Economy (MLSE) and own elaboration.

Table. A1.2. Percentage weight of each region over Spanish total¹

Region	Number of cooperatives ²				Employment			
	Primary sector	Industry sector	Construction industry	Services sector	Primary sector	Industry sector	Construction	Services sector
Andalucía	31.98	27.51	28.86	23.10	29.07	23.13	28.81	20.17
Aragón	2.99	3.68	3.50	3.48	1.11	2.93	3.09	2.59
Asturias	1.21	1.51	0.78	1.74	0.50	1.06	0.68	1.49
Baleares	0.38	0.25	0.38	1.28	0.11	0.23	0.38	1.24
Canarias	1.66	1.10	1.03	2.53	1.24	2.16	1.21	2.84
Cantabria	0.22	0.38	0.38	0.73	0.04	0.50	0.46	0.61
Castilla la Mancha	7.84	11.89	6.45	4.19	4.45	8.82	6.36	3.35
Castilla León	21.26	6.36	3.67	4.54	4.31	7.19	3.42	3.11
Cataluña	4.60	12.52	17.54	16.43	2.63	11.69	14.53	15.56
C. Valencia	9.42	8.70	10.21	11.73	35.92	6.93	9.45	18.28
Extremadura	4.06	5.04	3.31	3.76	1.99	3.77	5.24	2.15
Galicia	5.30	4.21	2.34	4.77	2.35	5.43	3.56	2.69
C. Madrid	0.73	2.34	4.22	7.58	0.49	1.94	3.71	7.78
Murcia	5.32	3.84	10.75	6.41	13.93	4.05	11.55	4.99
Navarra	1.55	1.50	0.57	1.28	1.36	5.02	0.43	1.77
País vasco	1.16	7.63	5.61	5.84	0.46	13.84	6.87	10.82
La Rioja	0.32	1.52	0.40	0.61	0.05	1.29	0.25	0.56

1. 2005-2009-2014 average

2. Number of quotation centres

Source: Ministry Labour and Social Economy (MLSE) and own elaboration.

Table. A1.3. Percentage weight of each sector over total of each region¹

Region	Number of cooperatives ²				Employment			
	Primary sector	Industry sector	Construction industry	Services sector	Primary sector	Industry sector	Construction	Services sector
Andalucía	17.25	21.59	10.42	50.74	20.22	15.00	4.98	59.81
Aragón	12.03	21.56	9.42	56.99	7.10	17.43	4.90	70.57
Asturias	10.98	20.00	4.74	64.28	6.23	12.35	2.12	79.30
Baleares	6.13	5.93	4.09	83.84	1.92	3.83	1.66	92.59
Canarias	11.62	11.26	4.83	72.30	7.89	12.85	1.92	77.34
Cantabria	5.38	13.92	6.33	74.37	1.19	14.62	3.55	80.64
Castilla la Mancha	16.85	37.20	9.27	36.68	15.58	28.82	5.54	50.06
Castilla León	41.31	17.98	4.77	35.94	17.15	26.66	3.38	52.80
Cataluña	4.53	17.97	11.57	65.94	3.15	13.05	4.32	79.47
C. Valencia	12.28	16.51	8.91	62.30	29.28	5.27	1.92	63.53
Extremadura	14.04	25.35	7.66	52.95	12.50	22.01	8.17	57.33
Galicia	16.34	18.89	4.83	59.94	11.90	25.58	4.48	58.04
C. Madrid	1.92	9.02	7.47	81.59	1.34	4.98	2.53	91.15
Murcia	12.04	12.64	16.27	59.04	33.28	9.03	6.86	50.84
Navarra	16.64	23.47	4.09	55.80	9.92	34.14	0.78	55.16
País Vasco	2.91	27.90	9.44	59.76	0.75	21.08	2.79	75.38
La Rioja	6.04	42.03	5.07	46.86	1.40	32.69	1.68	64.22
Total	13.89	20.22	9.30	56.59	15.52	14.46	3.86	66.16

1. 2005-2009-2014 average

2. Number of quotation centres

Source: Ministry Labour and Social Economy (MLSE) and own elaboration.

Appendix 2

Table. A2.1. Turning points: leads and lags with respect to the reference series (GDP)

	Trough	Peak	Trough	Peak	Trough	Peak
Reference Series (GDP)	Q3-2004	Q4-2007	Q2-2009	Q3-2010	Q2-2013	Q1-2017
Andalucía	-	0	0	+1	+4	-
Aragón	-3	-10	+2	+11	+6	+1
Asturias	-	-8	-4	-	-	+1
Baleares	+9	-	+7	-5	+3	+1
Canarias	-	-4	0	0	0	-
Cantabria	-	+3	-	-	+2	-3
Castilla la Mancha	-3	+2	-	-	-6	-
Castilla y León	+5	+2	+2	-	-	-
Cataluña	+1	-2	0	-1	-2	-12
C. Valencia	+2	-5	-	-	+3	-2
Extremadura	+1	+1	+2	+2	-2	-8
Galicia	-3	-	-	-2	+4	-7
C. Madrid	-2	+3	+7	-	-	-
C. Murcia	-1	-7	+8	+10	+4	-
Navarra	+6	+2	+3	+7	-	-
País Vasco	+2	-1	-1	+4	-11	-
La Rioja	+1	-6	-6	-	+10	-11
CE	-	-5	0	0	-1	-

Note: + (-) denotes a lag (lead) with respect to the reference series

Source: BUSY and own elaboration

Table. A2.2. Phases and cycles average duration (months)

	Contraction	Peak to Peak	Expansion	Trough to Trough
Reference Series	8.50	18.00	11.00	17.00
Andalucía	10.0	12.00	6.00	20.00
Aragón	12.00	23.50	10.00	21.50
Asturias	10.00	46.00	36.00	-
Baleares	6.33	15.50	9.33	15.00
Canarias	10.50	15.00	5.00	16.00
Cantabria	21.00	31.00	10.00	-
Castilla la Mancha	14.00	-	18.00	32.00
Castilla y León	6.00	-	10.00	16.00
Cataluña	7.50	13.33	6.33	14.00
C. Valencia	14.00	25.50	8.00	25.50
Extremadura	7.00	13.50	9.00	15.50
Galicia	17.00	21.00	14.50	42.00
C. Madrid	9.50	21.00	14.50	23.50
C. Murcia	13.00	28.00	7.00	19.50
Navarra	7.00	16.00	9.00	16.00
País Vasco	10.00	15.50	10.00	21.50
La Rioja	6.00	32.00	16.00	21.50
CE	10.50	16.00	5.00	15.00

Source: BUSY and own elaboration

Table. A2.3. Turning point sequences with respect to the reference series

Region	Average Lag			Median Lag		
	Peaks	Troughs	All	Peaks	Troughs	All
Andalucía	0.50	2.00	1.25	0.50	2.00	0.50
Aragón	0.67	1.67	1.17	-4.50	-0.50	1.50
Asturias	-3.50	-4.00	-3.67	-3.50	-4.00	-6.00
Baleares	-2.00	6.33	3.00	-2.00	5.00	2.00
Canarias	-2.00	0.00	-1.00	-2.00	0.00	0.00
Cantabria	0.00	2.00	0.67	0.00	2.00	-0.50
Castilla la Mancha	2.00	-4.50	-2.33	2.00	-4.50	-4.50
Castilla y León	2.00	3.50	3.00	2.00	3.50	2.00
Cataluña	-5.00	-0.33	-2.67	-7.00	-1.00	-1.50
C. Valencia	-3.50	2.50	-0.50	-3.50	2.50	0.00
Extremadura	-1.67	0.33	-0.67	-3.50	-0.50	1.00
Galicia	-4.50	0.50	-2.00	-4.50	0.50	-2.50
C. Madrid	3.00	2.50	2.67	3.00	2.50	0.50
C. Murcia	1.50	3.67	2.80	1.50	1.50	1.50
Navarra	4.50	4.50	4.50	4.50	4.50	4.50
País Vasco	1.50	4.00	3.00	1.50	0.50	0.50
La Rioja	-8.50	1.67	-2.40	-8.50	-2.50	-6.00
CE	-2.50	-0.50	-1.50	-2.50	-0.50	-0.50

Note: +(-) denotes a lag (lead) with respect to the reference series

Source: BUSY and own elaboration

Table. A2.4. Phases average amplitude

	Contraction	Expansion
Reference Series	-321,55	241,03
Andalucía	-276,08	178,80
Aragón	-226,81	186,23
Asturias	-177,31	125,68
Baleares	-50,35	61,46
Canarias	-299,89	45,03
Cantabria	-146,52	245,36
Castilla la Mancha	-80,05	82,71
Castilla y León	-316,80	199,79
Cataluña	-110,54	178,01
C. Valencia	-67,71	74,11
Extremadura	-128,26	3,81
Galicia	-6,40	69,26
C. Madrid	-100,01	271,08
C. Murcia	-20,79	48,58
Navarra	-149,81	132,94
País Vasco	-56,60	481,48
La Rioja	-431,45	147,74
CE	-86,56	92,78

Source: BUSY and own elaboration

Appendix 3

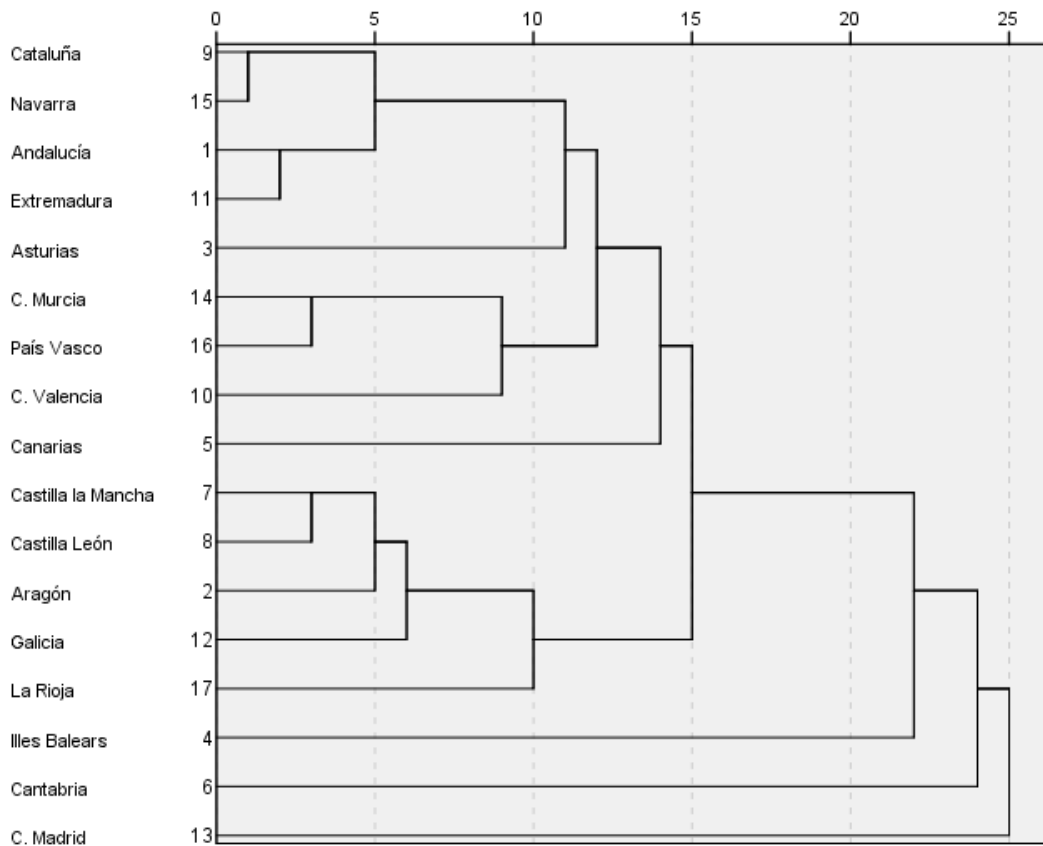


Figure. A2.1. Dendrogram using Average Linkage (Between groups)
(Rescaled distance Cluster Combine)
Source: SPSS and own elaboration

Table. A3.1. Agglomeration Schedule

Stage	Cluster combined		Coefficients	Stage cluster first appears		Next stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	9	15	3,827	0	0	5
2	1	11	5,078	0	0	5
3	14	16	6,342	0	0	8
4	7	8	7,189	0	0	6
5	1	9	8,609	2	1	10
6	2	7	8,691	0	4	7
7	2	12	10,716	6	0	9
8	10	14	13,175	0	3	11
9	2	17	14,974	7	0	13
10	1	3	16,169	5	0	11
11	1	10	17,678	10	8	12
12	1	5	18,981	11	0	13
13	1	2	20,881	12	9	14
14	1	4	28,186	13	0	15
15	1	6	30,592	14	0	16
16	1	13	32,782	15	0	0

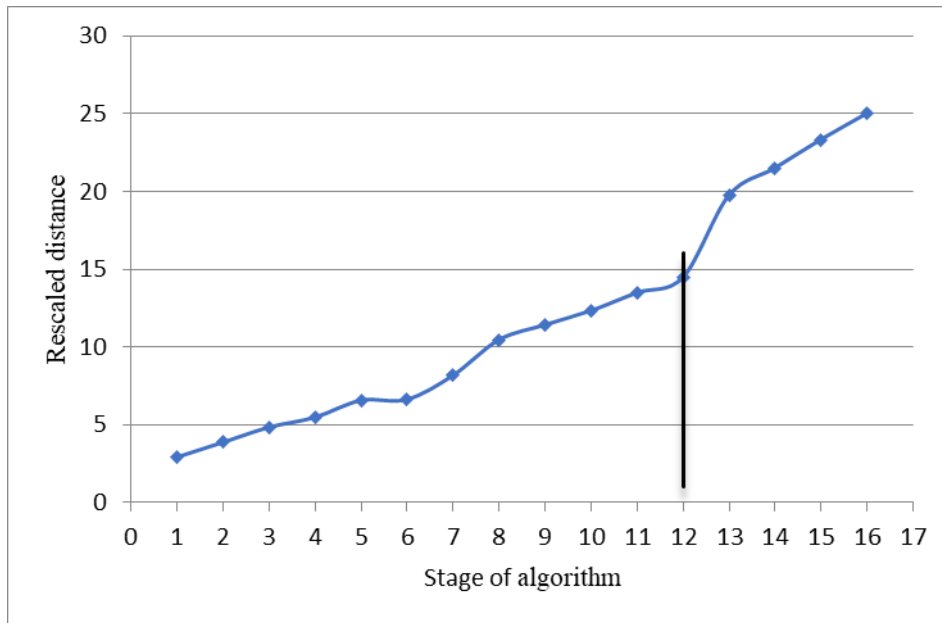
Source: SPSS and own elaboration

Table. A3.2. Variance Ratio Criterion (VCR)

Number of clusters	VCR	ω_k
2	37,146	
3	35,105	1,929
4	34,992	322,012
5	356,891	-410,615
6	268,176	44,083
7	223,544	20,717
8	199,629	1,929

Source: SPSS and own elaboration

Figure. A3.1. Rescaled distance evolution



Source: SPSS and own elaboration