

FIRM SIZE AND MOTIVATIONS TO CLUSTER IN ARAGON

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Abstract: Industrial cluster research has concentrated in examining the cluster effect on the territory, with few investigations dedicated to firm performance or motivations to cluster, limiting research to case studies and theoretical explanations.

Our paper examines eight clusters that operate in Aragon (Spain); a region more specialized in the industrial sector than the average of Spanish regions. The main purpose of this paper is to determine if depending on their size, clustered firms present different performance and/or have different motivations to cluster. By doing a descriptive analysis of the clusters, and by running a multinomial logistic regression in our models we want to determine if the four different categories of firm size (micro, small, medium or large) present different indicators of firm performance and motivations to cluster, so as to identify a pattern of performance and motivation to cluster in terms of firm size.

Findings provide firm executives and policy makers a better comprehension of the relationship between firm size, motivations, and performance of companies that belong to an industrial cluster. Our study presents new empirical evidence for clustering activities in Aragon (Spain), which, to the best of our knowledge, had not been previously analyzed.

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1. INTRODUCTION

Clusters represent the culmination of the investigation of industrial agglomeration. However, the cluster concept and its boundaries are still unclear and undetermined. In addition, cluster research has concentrated in examining the cluster effect on the territory, with few investigations dedicated to determine which are the motivations and performance characteristics a firm has when it decides to cluster, and limiting such research to case studies and theoretical explanations. The specific study of firm performance and motivations to cluster requires additional research that is not going to be treated in this paper.

The cluster concept (Porter, 1990, 1998, 2000) stands out among other existing types of geographical agglomeration (Gordon and McCann, 2000). However, cluster definitions are vague and lack of clear industrial or geographical boundaries (Martin and Sunley, 2003; Tallman et al. 2004; Malmberg and Power, 2005). Research on clusters has been mostly theoretical (Krugman, 1991; Malmberg and Maskell, 2002; Wolfe and Gertler, 2004; Maskell and Malmberg, 2007), limiting the empirical work to the analysis of case studies (Saxenian, 1994; Bramwell et al. 2008; Davis et al. 2009). These empirical studies have analyzed the achievement of competitive advantages derived from agglomeration and geographic concentration, knowledge sharing, innovation diffusion, and a holistic view of firm performance within clusters and in comparison with another clusters. Nonetheless, "knowledge of clusters is still highly fragmented, very descriptive, often qualitative and inconclusive on many points" (Arthurs et al. 2009: 265).

Therefore, there are many controversies regarding the cluster definition. After analyzing some cluster definitions, Martin and Sunley (2003) concluded that it was necessary to be more specific about the term. Moreover, many academics have indicated the need to standardize criteria about clusters (Sánchez Moral, 2009; Davis et al. 2006; Wolfe and Gertler, 2004).

Motivation to pursue our study of clusters has then been clearly determined, due to the continuous call for investigation made by relevant academics all over the world.

This paper's main objective is to present new empirical evidence for the relationship between firm size and clustering motivations and some indicators of firm performance in Aragon (Spain), which, to the best of our knowledge, has not been previously analyzed. We will examine the characteristics of those clusters located in Aragon, trying to ascertain if size is a determining factor of the companies that make up the cluster, to conclude whether companies have different motivations to cluster and different performance based on their size. We would like to determine if given the firm size of a company that wants to cluster we could expect its motivations to cluster and anticipate some indicators of performance.

In these objectives lies the newness of this investigation. Aragon region clusters have not been previously investigated, and neither have firm size and motivations for clustering and performance been jointly investigated.

This paper is structured as follows: initially, we analyze the cluster concept; secondly, we include those motivations companies have to cluster; on the third place, we describe those clusters active in Aragon; we then continue by describing the

database, the methodology used, the results obtained, to finish with some conclusions on the results achieved and with new possible ways of investigation.

2. CLUSTER DEFINITION

Firm concentration receives continuous attention from academics in numerous economic and other social sciences disciplines. One of these forms of agglomeration is known as cluster (Gordon and McCann, 2000). The cluster represents an improvement over other, more traditional, economic concepts (Davis et al. 2009).

We could find current clusters origins in the first forms of firm concentration, especially in the industrial districts. Marshall (1920), who is considered the father of the industrial district concept (Becattini, 2003), found that concentration generated many advantages for firms, such as the possibility to undertake higher investments, skill learning, new ideas, or different ways to operate. Inspired by marshallian theories, Becattini defines an industrial district as a “socio-economic entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area” (Becattini 1990: 39).

From an academic point of view, industrial agglomeration has reached its peak (Martin and Sunley, 2003; Tallman et al. 2004; Ketels, 2006) with the concept of industrial cluster (Porter, 1990, 1998), with subsequent additions of industrial localization theories, regional economy, and evolutionary theory (Asheim, Cooke and Martin, 2006). For Porter, clusters are “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions... in particular fields, that compete but also co-operate.” (Porter, 1998: 197).

Some authors consider Porter’s cluster concept as a modern adaptation of the traditional marshallian concept of industrial agglomeration (Martin and Sunley, 2003), to the extent that it is sometimes used as a synonym of industrial district (Molina-Morales and Martínez-Fernández, 2009; Niu, 2009). The approximation to clusters initiated by Porter has subsequently been widened by many other authors, such as Pirolo and Presutti, 2010; Mesquita, 2007; Ketels, 2006; Malmberg and Power, 2005; Tallman et al, 2004; Mc Evily and Zaheer, 1999; Pouder and St John, 1999, or Saxenian, 1994, among many others.

In conclusion, we can affirm that although there are various definitions of cluster, numerous controversies appear when it is time to identify a cluster (Martin and Sunley, 2003, Markusen, 2003; Moulaert and Sekia, 2003; Schmitz, 1995).

3. MOTIVATIONS TO CLUSTER.

There is not much academic literature on firms’ *ex-ante* motivations to cluster. However, there does exist thorough research on the benefits derived from membership to a cluster. We will presume that firm motivation is to achieve those advantages derived from the inclusion in an industrial cluster. We can classify these motivations into those that seek efficiency (Marshall, 1920; Becattini, 1990, 2002; Dei Ottati, 2002) and competitiveness (Porter, 1990), access to knowledge and innovation, market power

(via joint strategic planning or internationalization), and/or improvement of institutional (or political) relations.

On the first place, efficiency can be obtained as a pure consequence of geographical agglomeration. Concentration would result in the emergence of agglomeration economies that would be unattainable to businesses independently. These are economies that remain external to clustered firms, and even to the industry (Becattini and Musotti, 2003), but internal to the cluster (Porter, 1990, 2003; Molina-Morales and Martínez-Fernández, 2004; Dei Ottati, 2006). Agglomeration economies (Marshall, 1920; Jacobs, 1969; Lucas, 1988) can be specified in the efficient use of resources, especially labor (through access to a pool of skilled workers; which would facilitate an educated, specialized and flexible labor market) and intermediate inputs (such as proximity to specialized suppliers). Clusters allow the achievement of external economies of scale and facilitate products, services, and systems development that improve production and distribution (Enright, 1998, Porter, 1990, 2000, Porter and Ketels, 2003).

New economic geography has also deeply investigated the reasons for agglomeration, confirming the advantages found by classic economics, though insisting on the existence of a number of forces (centrifugal and centripetal) that would move companies to belong or not to belong to a cluster (Krugman, 1991, Fujita and Krugman, 2004). In this sense, the different motivations for belonging to a cluster would result in the adoption of different forms of cluster. The main reason for clustering would reside on the achievement of increasing returns to scale, which would be faced by companies to the increase in transaction costs derived from spatial distance (Gordon and McCann, 2000) resulting in different forms of cluster (Krugman, 1995; Fujita and Krugman, 1995; Fujita and Mori, 1997).

Secondly, another motivation to cluster resides in the achievement of competitive advantages and subsequent enhanced competitiveness. The generation of competitive advantage to companies clustered over those other that are not, may come from the external economies cited previously (Henderson, 1999). In this case, the competitive advantage is known as district effect or cluster effect (Sölvell et al. 2006).

We would expect smaller companies to show a higher clustering activity based on a motivation to enhance competitiveness. The larger the company, the easier it is to show a higher competitiveness *per se*, without requiring the incorporation to a cluster.

Moreover, another source of competitive advantage lies in the sharing of resources. Firms may cluster in order to share resources with other firms within the cluster (Molina-Morales and Martínez-Fernández, 2004). Such resource sharing would also permit meeting those requirements to gain competitive advantage set forth by the Resource Based View (RBV) (Barney, 1986, 1991)¹. Shared resources within the cluster would fulfill the VRIO analysis (Maskell and Malmberg, 1999), and consequently generate a competitive advantage.

¹ The main assumption of the RBV is that resources and capabilities may be heterogeneously distributed across firms and that these differences may be long lasting (Barney, 2001). Barney (1991) argues that sustained competitive advantage derives from the resources and capabilities a firm controls that meet the requirements of the VRIO analysis; that is, these resources and capabilities are Valuable, Rare, imperfectly Imitable, and not substitutable (Original).

Another incentive to cluster lies in the search for knowledge and innovation. Cluster economies would improve productivity and innovation (generated from knowledge spillovers, and from the grouping of heterogeneous characters). Within the clusters, a distribution, generation and accumulation of knowledge that facilitates economic growth can be expected –Fujita and Krugman, 2004, Becattini and Musotti, 2003; Rauch, 1993; Scott, 1992. Our proposal would be that larger companies have a higher incentive to cluster based on the improvement of knowledge and innovation than smaller ones.

Additionally, and as a consequence of these economies, clusters also show greater international competitiveness than other productive areas (Becattini and Musotti, 2003). Porter (1990) hypothesized that firms that operate internationally and pertain to an industrial cluster in their home countries would be highly competitive in the global marketplace. This international competitiveness would facilitate internationalization, and would generate a higher export propensity inside the cluster.

We propose that the larger the company, the higher the motivation to internationalize its activities. Micro companies are concentrated in many other strategic issues apart from the internationalization; as they grow in size, the motivation to internationalize becomes an important driver of firm strategy, and consequently, an incentive to cluster.

Another motivation to achieve market power lies, not only in obtaining cost advantages and factor inputs, but also in the strategic positioning of companies. This positioning means choosing activities that are different from and superior to those of rivals (Porter, 1998).

We would expect smaller companies to show a higher motivation to cluster in order to joint strategic planning than larger ones.

Finally, and besides the benefits of cost reduction and access to better resources (Pouder and St. John, 1996), firms also have an incentive to join the cluster to improve their legitimacy, and to avoid the problems derived from the novelty (Aldrich and Fiol, 1994; Singh, Tucker, and House, 1986), resulting in a sort of political or institutional motivation to cluster.

We would expect larger companies to show a greater trend towards clustering based on improving institutional relationships than smaller ones.

4. CLUSTERS IN THE ARAGON REGION

Aragon lies in the north-east quadrant of Spain, strategically located midway the leading cities of Barcelona, on Spain's Mediterranean coast, Bilbao, on the Atlantic seaboard, and the national capital of Madrid. Aragon has a dynamic and open economy with an industrial tradition that dates back to the beginning of the last century.

If we used the Productive Specialization Index (IEP)² (Echebarria y Larrañaga, 2001) (an index usually employed in studies on territorial productive structures) to

² The IEP is the result of comparing the proportion that a specific activity *i* represents in the production of a territory, in relation with the proportion that same activity holds in the territory of superior dimension where the former territory is integrated.

compare data for Aragonese economy with those of the Spanish economy as a whole, we could state that Aragon is relatively more specialized in industrial production than the average of Spanish regions.

Industrial activity in Aragon is highly specialized in transport equipment, particularly in the motor-vehicle sector and auxiliary sub-industries. Other common industrial activities are machine, mechanical equipment, and metallic products manufacturing. Consequently, and as we will show later, practically half of Aragonese clusters are linked to these traditional industrial behaviors.

As we have already mentioned, it is difficult to differentiate what it is, or what it is not a cluster, as there is not a generally accepted definition (Martin and Sunley, 2003, Markusen, 2003; Moulaert and Sekia, 2003; Schmitz, 1995). As a consequence, in order to determine which are the clusters present in Aragon, object of this paper, we will refer to a publication of Ebrópolis³ (2009) on the “Innovation System in Aragon”.

According to such document clusters in Aragon are:

- a. AECAE. Association of lift component manufacturers.
- b. AERA. Aragonian Aerospace Cluster.
- c. ANMOPYC. Manufacturers Association of Construction and Mining Equipment.
- d. CAAR. Automotive Cluster of Aragon.
- e. CLAC. Footwear Aragonese Cluster.
- f. TECNARA. Aragon Association of Information Technology, Electronics, and Telecommunications Companies.
- g. IDIA. Investigation, Development, and Innovation in Aragon.
- h. BIOARATEC. Biotechnological Companies of Aragon Cluster.

These eight clusters are based in Aragon, and are characterized by including a total of 298 firms; which over a total number of 37.577 firms in the region represent less than a one percent.

Table 1 shows descriptive information on the size of each of the identified clusters in terms of the number of clustered firms. Only five of our companies are present in two clusters, whereas the rest belong to only one cluster.

Biggest clusters in terms of number of companies are ANMOPYC (the construction and mining equipment cluster), and TECNARA (the ICT cluster). The smallest –and youngest, is that of companies related with the biotechnology industry.

³ Ebrópolis is a public interest declared NGO, created on May 1994, with the purpose to elaborate and promote the Strategic Development of Saragossa, the capital city of the Aragon region.

TABLE 1. Number of companies included in each cluster

Cluster	Number of Companies	%
AECAE	25	10.50
AERA	14	5.88
ANMOPYC	67	28.15
CAAR	16	6.72
CLAC	24	10.08
TECNARA	66	27.73
IDIA	27	11.34
BIOARATEC	4	1.68

We have classified the firm size of those companies in our sample according to The European Commission Recommendation of May 6, 2003 (see Table 2). The classification of Micro, Small, Medium or Large company is based on having a certain number of employees plus a determined minimum amount in one of two additional measurements: the annual turnover and total assets value.

TABLE 2. European Union firm size determination

Category	Employee Count	Annual Turnover	or	Total Assets
Medium	< 250	≤ € 50 million	or	≤ € 43 million
Small	< 50	≤ € 10 million	or	≤ € 10 million
Micro	< 10	≤ € 2 million	or	≤ € 2 million

If we use this method of size determination to classify firms in our sample, the number of companies in our clusters in terms of size is (Table 3):

TABLE 3 Number and size of firms per cluster

	Large	Medium	Small	Micro	Total
AECAE	1	6	13	5	25
AERA	1	3	9	1	14
ANMOPYC	6	20	24	17	67
CAAR	5	4	6	1	16
CLAC	0	0	20	4	24
TECNARA	2	6	21	37	66
IDIA	20	6	1	0	27
BIOARATEC	0	0	4	0	4
Total	35	45	98	65	

We additionally investigated those motivations firms in these clusters have, by carefully analyzing the advantages clusters claim to offer to their members. Information on motivations was obtained from these eight clusters' mission, vision and values. As a conclusion, we found several motivations common to more than one cluster. Firms cluster in order to improve their competitiveness, to conduct an international expansion, to facilitate institutional relations, to share knowledge, to innovate, and to jointly plan their strategies. Descriptive results are shown on Table 4. Internationalization is present in 57,14% of the cases, resulting in the most frequent motivation for firms to cluster in Aragon.

TABLE 4. Motivations to cluster in Aragon

Motivation	Number of cases	%
Competitiveness	69	28.99
Internationalization	136	57.14
Institutional Relations	96	40.34
Knowledge Sharing	70	29.41
Innovation	85	35.71
Strategic Planning	58	24.37

5. DATA ANALYSIS AND GENERATION OF THE MODELS

To determine if firms behave differently in terms of their size, and in terms of their motivations to cluster, we have generated a database that collects, on the one hand, performance variables of firms incorporated in the cluster, and on the other, companies' incentives to cluster. The original database contained information about the 298 companies that belong to these clusters, and included data for 23 variables. Data were obtained from the SABI⁴ database, which contains more than one and a half million business listings in Spain and Portugal. This initial database was updated in the light of the lack of adequate information, to reduce the total number of companies to 238.

From the original information obtained, basically Balance Sheet and Profit and Loss Statements data, we have calculated some different ratios to achieve our objectives. Performance measures used are ROA (Return on Assets –calculated as the Earnings before interest and taxes divided by Total Assets), ROE (Return on Equity –as profit divided by Equity), company's liquidity ratio (LIQ –calculated as the quotient between current assets and current liabilities), the leverage ratio (LEV –or the proportion of total liabilities over total assets), sales per employee (SALE –measured as sales over number of employees), and profit per employee (PROF –as net profit over total employee count)

⁴ SABI "Sistema de Análisis de Balances Ibéricos" is a database that contains financial company information and business intelligence for more than 1,500,000 companies in Spain and Portugal. It is published by Bureau van Dijk.

(see Table 5 for variables definition).

TABLE 5: Variable definitions

Variable	Definition
Return on Assets (ROA)	Calculated as Earnings Before Interest and Taxes divided by Total Assets. Data for 2009, '08, '07
Return on Equity (ROE)	Calculated as Net Profit over Shareholders' Equity. Data for 2009, '08, '07
Liquidity Ratio (LIQ)	Total cash divided by short-term borrowings. Data for 2009, '08, '07
Leverage Ratio (LEVE)	Calculated as Debt divided by Equity. Data for 2009, '08, '07
Sales per employee (SALE)	As Turnover divided by number of Employees. Data for 2009, '08, '07
Profitability (PROF)	Calculated as Net Profit over number of employees. Data for 2009, '08, '07
FACTROA	Factor that reduces the three observations for ROA 2009, '08, '07 into one variable
FACTROE	Factor that reduces the three observations for ROE 2009, '08, '07 into one variable
FACTLIQ	Factor that reduces the three observations for LIQ 2009, '08, '07 into one variable
FACTLEVE	Factor that reduces the three observations for LEVE 2009, '08, '07 into one variable
FACTSALE	Factor that reduces the three observations for SALE 2009, '08, '07 into one variable
FACTPROF	Factor that reduces the three observations for PROF 2009, '08, '07 into one variable
SIZE	Variable that classifies firms as Micro, Small, Medium or Large
COMP	Dummy set to 1 if the firm had the enhancement of competitiveness as a motivation to cluster
INTAL	Dummy set to 1 if the firm had internationalization as a motivation to cluster
INSTREL	Dummy set to 1 if the firm had the improvement of institutional relations as a motivation to cluster
KNOWL	Dummy set to 1 if the firm had knowledge sharing as a motivation to cluster
INNOV	Dummy set to 1 if the firm had innovation as a motivation to cluster
STRAT	Dummy set to 1 if the firm had strategic planning as a motivation to cluster

Some of these variables requested additional preparation in order to reduce the number of observations and the noise that appeared in the analysis of the sample. Consequently, we conducted a Principal Components Analysis, factoring variables by grouping the observations for 2006, 2007, and 2008 for the ratio they were measuring. We grouped ROA under FACTROA, ROE under FACTROE, LIQ into FACTLIQ, LEV under FACTLEV, and SALE and PROF into FACTSALE and FACTPROF respectively.

In addition, we included the variable that captures differences in firm size (SIZE) as suggested by the European Union (EU, 2003). The existence of four different categories for size implies six different relationships among these categories.

Furthermore, we have incorporated to our database those motivations companies in our sample have to cluster: competitiveness enhancement (COMP), international expansion (INTAL), institutional relations (INSTREL), knowledge sharing (KNOWL), innovation (INNOV), and common strategic planning (STRAT). These variables were considered as dummy (0, 1). A 1 value was given to the variable if the firm observed

was included in a cluster that had this motivation, and a 0 value in the contrary.

Our initial investigation consists on a descriptive analysis of the motivations firms have to cluster. We analyze firms motivations to cluster based on firm size by observing the percentage of large, medium, small or micro firms that had every specific motivation to cluster.

Subsequently, we generate a model, MODEL 1, which considers firm size as the dependent variable. As explained, determination of firm size (SIZE) is based on the European Union classification of firms as Micro, Small, Medium or Large enterprises (EU, 2003). Our independent variables are the generated factors for the ratios of business performance, previously defined: FACTROA, FACTROE, FACTLIQ, FACTLEV, FACTSALE and FACTPROF.

In a third step, a new model, namely MODEL 2, will complete MODEL 1 with those motivations companies in our sample have to belong to the cluster: competitiveness enhancement (COMP), international expansion (INTAL), institutional relations (INSTREL), knowledge sharing (KNOWL), innovation (INNOV), and common strategic planning (STRAT).

6. THE MULTINOMIAL LOGISTIC REGRESSION (MLR)

The Binary Logistic Regression is used to find the relationship between a binary dependent variable and a set of k predictor variables $\{x_1, x_2, \dots, x_k\}$, which are either categorical (factors) or numerical (covariates). This dependent variable can be always interpreted as the occurrence or not of an event E . The logistic regression model is an expression of the form

$$\log\left(\frac{\text{prob}(E)}{1 - \text{prob}(E)}\right) = b_0 + \sum_{i=1}^k b_i x_i$$

where the b_i 's denote the unknown logistic regression coefficients (b_0 is the intercept) while $\text{prob}(E)$ denotes the probability that event E will occur. The quantity on the left side of equation is called a logit. So, the simple LR model can be used for predicting the probability of an event occurrence.

The model can be generalized in the case where the dependent variable can have more than two categories. In such a case, if we assume that the possible categories are q , we need to model $q - 1$ logits,

$$\log\left(\frac{\text{prob}(\text{category}_j)}{\text{prob}(\text{category}_q)}\right) = b_0^{(j)} + \sum_{i=1}^k b_i^{(j)} x_i, \quad j = 1, \dots, q - 1$$

One of the categories is used as reference and is called the *reference category* (Sentas and Angelis, 2006). Our study wants to investigate the relation between the different sizes of firms within the clusters; in consequence, we will compare the possible outcomes of the SIZE variable (micro, small, medium and large) with one of

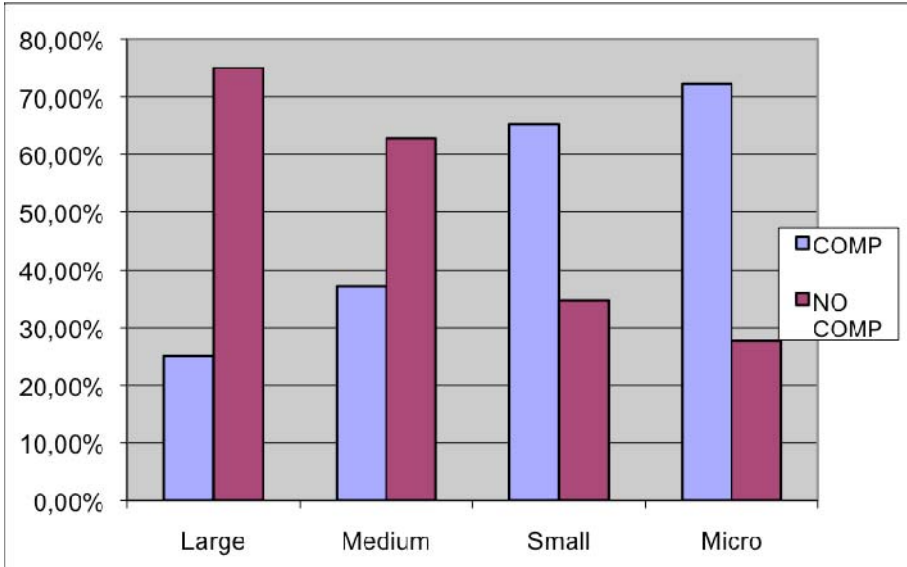
these same categories considered as the reference category.

7. RESULTS

7.1. Descriptive analysis of sizes and motivations.

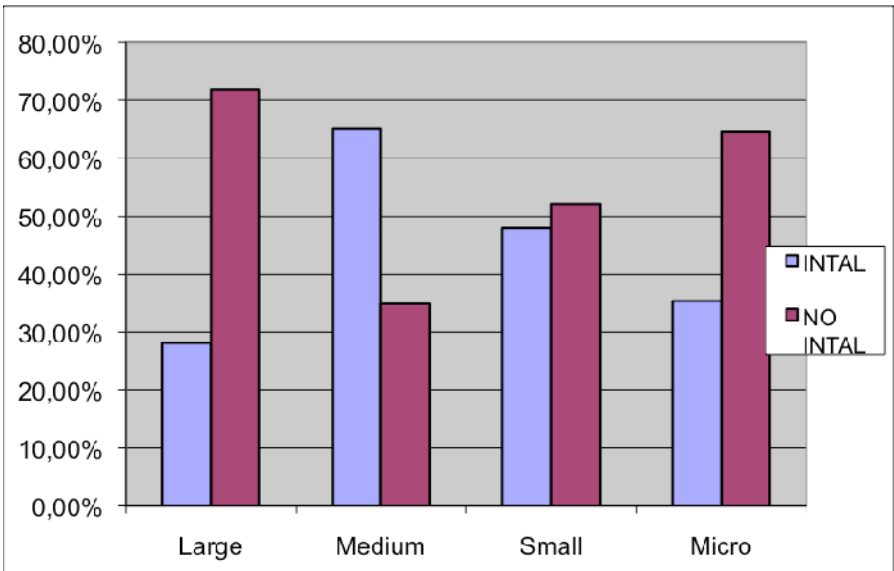
The comparison of sizes and motivations are shown in Charts 1 to 6.

CHART 1. Percentage of firms per size that cluster to enhance their competitiveness



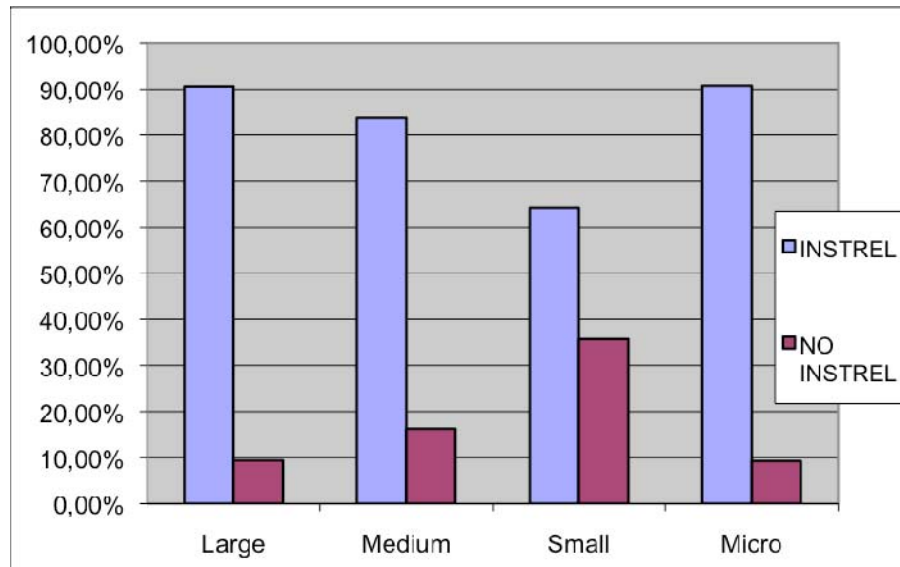
The smaller the company, the higher it is the interest to cluster to improve its competitiveness, and vice-versa.

CHART 2. Percentage of firms per size that cluster to internationalize



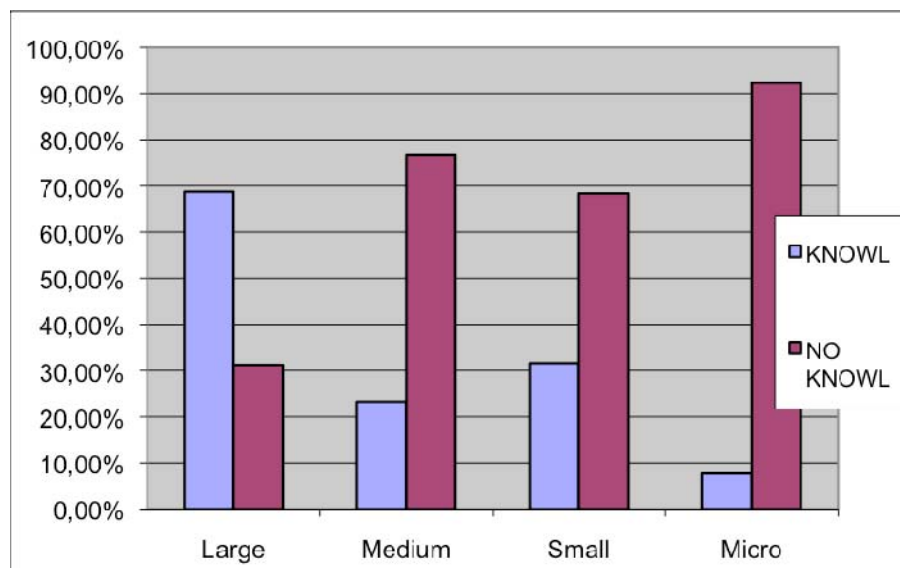
The larger the size of the company, the higher the incentive to cluster to internationalize operations, except for large companies, which are already internationalized and, consequently, have lost this motivation.

CHART 3. Percentage of firms per size that cluster to improve institutional relationships



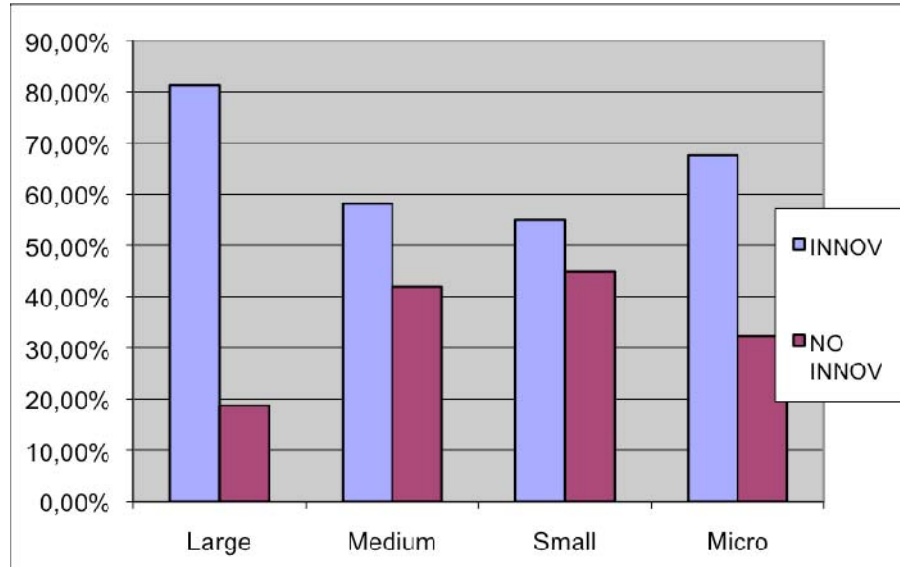
Except for Micro companies, the larger the size the larger the motivation to cluster to improve institutional relationships in the firms in our clusters.

CHART 4. Percentage of firms per size that cluster to improve knowledge



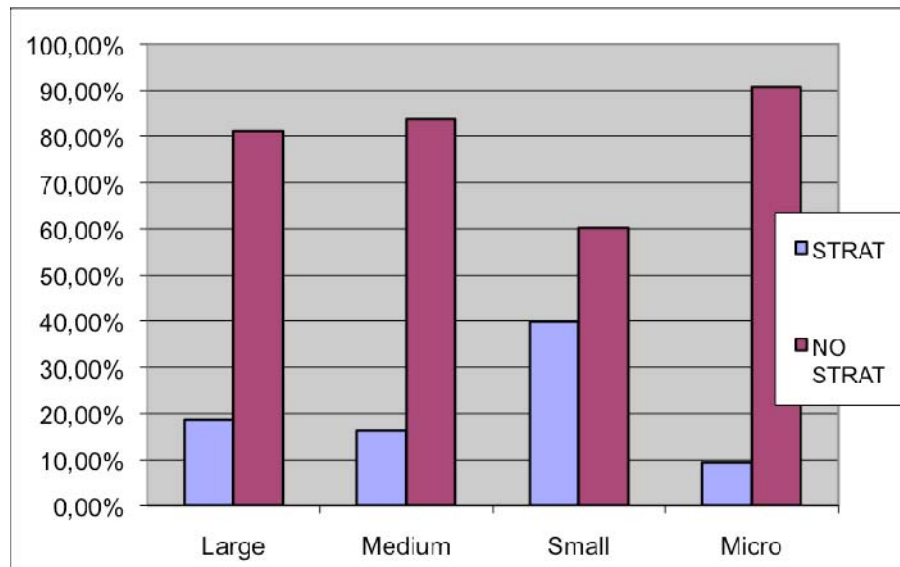
Apart from medium companies, the larger the size of the firm, the higher the percentage of companies that cluster in order to improve knowledge.

CHART 5. Percentage of firms per size that cluster to innovate



A higher percentage of large firms choose innovation as a motivation to cluster. There is not a clear trend in the rest of firms. However, we can claim that for all firm sizes, there are more firms where innovation represents an incentive to cluster than where it does not.

CHART 6. Percentage of firms per size that cluster to jointly plan strategies



There is not a clear tendency in the previous chart in terms of size. We can say that joint strategic planning is not chosen by many firms, representing an incentive to cluster

to just a few number of companies despite of their size.

7.2. Results for the Multinomial Logistic Regression.

Results for MODEL1, the one that does not include motivation, are shown in Table 6. In this case, we achieve a statistically significant relationship in 20 of our cases, especially when we compare the attitude of micro companies with those large and medium firms. According to this MLR, variables predicted show a behavior closer to that of small firms in many of these observations.

Results for MODEL2, are presented in Table 7. In this case, the model permits us to compare the attitude of firm size not only on performance measures, but also on those motivations for clustering. We have found statistically significant results in 24 of our outcomes. When including motivation, the larger amount of significant results is found when comparing the results between large and small firms. As before, predictions show that a large amount of firms behave as if they were small.

8. DISCUSSION AND CONCLUSIONS

Results obtained allow us to claim that Aragon clusters serve well those motivations that arise as firms grow. We could assimilate firm growth to a product life cycle. According to this assimilation, firms would be born as micro, and then grow up to larger sizes. Needs of these companies would grow together with firm size. As a consequence, it seems pretty reasonable for smaller firms to search, much more than larger companies, their inclusion in a cluster to improve their competitiveness.

However, and excluding the performance of those smaller firms, which show different features, it is observed that as size grows firms look for other objectives when it is the time to cluster, such as internationalization, improve institutional relationships, knowledge and innovation. In these cases, a direct relationship can be observed between motivations and firm size.

Encompassing firm growth to market demands presents, to individual firms, the difficulty to face, by themselves, riskier and more expensive activities; such as innovation, knowledge acquisition, or internationalization of their operations. The willingness to share risks and expenses is, normally, higher as larger is firm size. Nonetheless, there are exceptions to this comment: larger companies, which are already present in international markets, do not usually have these motivations when it is time to cluster; in the same vein, medium size firms present knowledge as a motivation to cluster in a smaller proportion than smaller firms (the main explanation to this issue may come from the fact that small firms and large firms in our database pertain to clusters that have a sound technological base and, therefore, a stronger motivation to increase knowledge or innovation).

Implications for those motivations related to improving institutional relationships or conducting a joint strategic planning are not so easy to determine. In the case of institutional relationships, the proportion of firms having this motivation grows with firm size; exception made of micro size firms that want to improve their institutional relationships and as the major number of these firms are in service, and pretty mature, industries. Joint strategic planning is predicted to be higher in small firms, as medium or large companies are presumed to already have a strategic plan when they decide to

cluster. Micro size companies do not consider this motivation initially when there are other important issues (such as competitiveness) to solve first.

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TABLE 6. Results obtained in the MLR. MODEL 1.

Reference Category	Micro			Small		Medium
	Large	Medium	Small	Large	Medium	Large
Intercept	-1.43783213 ***	-0.33245633	0.52432003 ***	-1.96215215 ***	-0.85677635 ***	-1.10537580 ***
FACTROA	-3.85529422 ***	-1.30715508 **	-0.80815582 **	-3.04713840 ***	-0.49899926	-2.54813914 ***
FACTROE	0.62412911 **	0.18881558	-0.14251669	0.76664580 ***	0.33133227	0.43531353 *
FACTLIQ	-1.19151065 *	-0.75704292 **	-0.30332672	-0.88818394	-0.45371620	-0.43446774
FACTLEV	0.51542373 *	0.13350769	0.12259076	0.39283297	0.01091693	0.38191604
FACTSALE	-2.55569601 ***	-0.63664416 *	-0.15964085	-2.39605516 ***	-0.47700331	-1.91905185 ***
FACPROF	0.23383828	0.53572227	0.40070775	-0.16686947	0.13501452	-0.30188399

Coefficient significance is * p<0.10; ** p<0.05; *** p<0.01

TABLE 7. Results obtained in the MLR. MODEL 2.

Reference Category	Micro			Small		Medium
	Large	Medium	Small	Large	Medium	Large
Intercept	16.56757126	0.59960349	17.30777146	-0.74020020	-16.70816801 ***	15.96796776
FACTROA	-0.83387625	-0.48811171	-0.16443828	-0.66943797	-0.32367343	-0.34576455
FACTROE	0.44471904	0.22634405	0.19570410	0.24901494	0.03063995	0.21837499
FACTLIQ	-2.38880746 ***	-0.64729548	-0.17406419	-2.21474327 ***	-0.47323129	-1.74151198 ***
FACTLEV	-3.03673721 ***	-0.95244614 *	-0.76793735 *	-2.26879986 ***	-0.18450879	-2.08429107 **
FACTSALE	0.35626567	-0.06869035	-0.26883699	0.62510266 *	0.20014663	0.42495603
FACTPROF	0.23540372	0.50785224	0.49157720	-0.25617348	0.01627504	-0.27244852
COMP	-3.19837627 ***	-2.70369827 ***	-0.13425643	-3.06411984 ***	3.19837627 ***	-0.49467800
INTAL	0.84959633	1.89008128 ***	0.90616607	-0.05656974	-0.84959633 *	-1.04048494
INSTREL	15.61481407	-1.85644660	13.99092785	1.62388622	-15.61481407 ***	17.47126067
KNOWL	3.40199583 **	2.27135602	0.59062178	2.81137405 **	-3.40199583 *	1.13063981
INNOV	2.77734122 **	2.94523580 ***	0.51088359	2.26645763 **	-2.77734122 ***	-0.16789458
STRAT	15.47865790	-1.84736333	16.10049450	-0.62183660	-15.47865790	17.32602122

Coefficient significance is * p<0.10; ** p<0.05; *** p<0.01

