



## **PAPER**

**Title: Analysis of chemical industry management in Valencia region**

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**Subject area: Location of economic activity, cluster and value change**

### **Abstract:**

The analysis of chemical industry on region Valencia by applying the accounting methodology of radar charts takes as hypothesis that regional location of companies is a cultural factor, which acts on their economic and financial transactions. Measuring the activity of companies by representation average periods of maturation on axes of radar charts and applying the sine and cosine theorems on them positive, objective and independence indicators of actions researches are generated. Radar charts are kinds of management that economic activity units adopted in a region as answers to changes of markets. Decisions adopted on an area have multidirectional effects on others, and these effects are different because each region can have a different economic culture. The qualitative and quantitative analysis applied justifies government decisions do not have same effects on a same economic sector.

**Keywords:** *Methodology, Management, Economic culture.*

**JEL codes:** A12. B41. M10.

## 1. Introduction

According to Nourse (1969) the study of geographical location of scarce resources is the aim of regional economy science. The government actions on a region as well as the arrangement of the factors of production by the activity of unit of economic activity change economic and financial environments where companies are located. The macroeconomic variables are the result of human economic action including decision-making process of companies located on a region. The theories of geographical economy (Xu, J at all 2003. Fujita and Krugman, 2004. Franco Prado, AJ, 2009. Arango Martin, 2015. Soifer, H. D. 2015) and cost of transaction (Fritsch and Wyrwich, 2016. Schneider, G. & Nega, B., 2016. Meador, JM, Skerratt, S. 2017. Bosma, N et al. 2018) consider that there are cultural factors of human action affecting to performance of companies. So, the rational action of managers supposes the assuming cultures of environments where companies are located, and these adjustments are barriers or synergies on their answers to changes of markets because companies belonging to the same sectors do not have why to take same answers to changes of markets.

Considering the above hypothesis, this manuscript presents the analysis of chemical industry in Valencia region (Community of Valencia) applying the accounting methodology of radar chart (Perez, 2013. Perez et al, 2017a, 2017b). Average periods of maturation are the dynamic variables to measure answers companies to changes of markets, and their representation on a radar charts generates geometrical figures. The application of cosine and sine theorems allows to assess these geometrical figures as kind of management (KM).

This manuscript develops the application of accounting methodology of radar chart (AMRCh) on chemist industry in Community of Valencia and this first section is the introduction to the aims of this manuscript. The second section explains the AMRCh to obtain perimeter distances (PD) as measure of tensions on each area of a radar chart and it is the main variable for analysing the activity of companies. The third section explains sectorial behaviour of chemist industry analysing the evolution of macroeconomic regional variables, the fourth section represents the location of KM building maps of management on Valencia region, and fifth section assessment the answer of companies to perturbations of markets by types of management (TM), they are sum of tensions (PD) on each KM. The sixth section analyses structure of costs goods sold on each province and the last section are conclusions, considering that economic agents built economic variables as answer to changes of market and they do not have why

to present a same behaviour on a region. So that, the unidirectional politic decisions on an industrial sector are not enough to improve their economic situations because KMs can be different on geographical area where they are located.

## 2. Methodology

This manuscript assesses the activity of companies applying AMRCh. This methodology allows to develop qualitative and quantitative analysis on activity of companies. The qualitative analysis considers kinds of management as answers of companies to changes of market, and so there is relation between them and macroeconomic variables. Considering this effect, Chi2 p-values are obtained by annual contingency tables, which relates the location companies with their KMs. The quantitative analysis justifies when companies achieves optimal of management and get good a performance. According to aims of this manuscript, the qualitative analysis is developed building maps of management and costs of companies associated to their respective kind of management, avoiding the quantitative analysis.

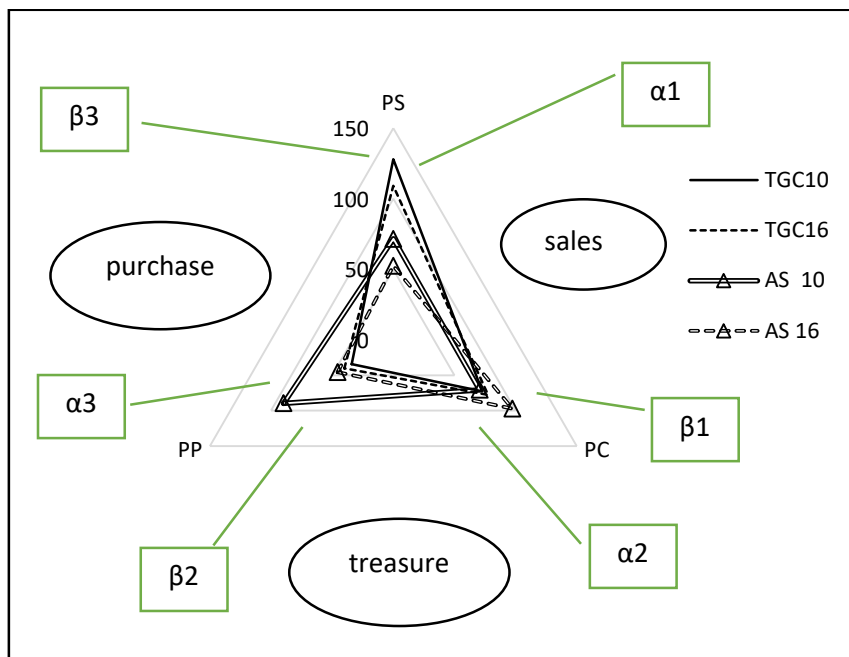


Figure 1. Radar charts or Kinds of management.

The radar charts of figure 1 represent kinds of management (KM) adopted by two companies belonging to sample of analyse. The effects of their decisions are measured by average periods of maturation, and they are axes of radar charts representing period of payment (pp), sales (ps) and collect (pc). The distance between them are perimeter distance (PDK) which measures the tension of economic and financial transactions made

by companies and measuring their orientation allows to obtain the necessary conditions to define Kinds of management (KM). So that, AMRCh is the assessment of the making decisions by principles of plane geometric.

Following the last considerations of above paragraph there are tow companies represented on figure 1, and both companies have a more dynamic activity on 2016 than 2010 because radar chart belong 2016 are more concentrated than second ones. Moreover, the company TGC maintains its KM (radar charts) on 2010 and 2016, but company AS changes its KMs. The dynamic behavior and geometrical figure of KM have effects on performance of companies applying the cosine and sine theorems, because the changing of their axes has relation with financial structure as well as the economic activity of companies.

The expression 1 is the application of cosine theorem to obtain the tension (PDk) between two vectors referred to canonic base on center of Cartesian axes.

$$PD_k^2 = p_i^2 + p_j^2 - 2 \cos 120 * p_i * p_j \quad \text{expression 1}$$

K = 1, 2, 3. 1 (sales area), 2 (treasury area), 3 (purchases area)  
*i* ≠ *j*; *i* = *j*: *i* = p (payment), s(sales), c(collect)

The second step to measure de activity of companies is the knowing the value of internal angles of each area represented on a radar chart.

$$\frac{PDk}{\sin 120} = \frac{p_i}{\sin \alpha_k} = \frac{p_j}{\sin \beta_k} \quad \text{expression 2}$$

K = 1, 2, 3. 1 (sales area), 2 (treasury area), 3 (purchases area)  
*i* ≠ *j*; *i* = *j*: *i* = p (payment), s(sales), c(collect)  
 $\alpha_k, \beta_k$ , are internal angles of areas of management

The permutations without repetition of PDk are KMs that companies can adopt according their answers to changes on markets. Nevertheless, relations of internal angles of each management areas allows to establish different KM. So, internal relation of angles ( $\beta_k/\alpha_k$ ) for each management area are necessary conditions to define kinds of management. The table 1 presents several KMs that companies can to adopt on their activity and defines necessary conditions measured by respective Perimeter Ratio (PRk) of each management area. The Perimeter ratio is the expression 3, and the sum of its angles is 180 grades.

$$PR_k = \beta_k / \alpha_k$$

expression 3

$K = 1, 2, 3$ . 1 (sales area), 2 (treasury area), 3 (purchases area)

$$\beta_k + \alpha_k + 360/K = 180$$

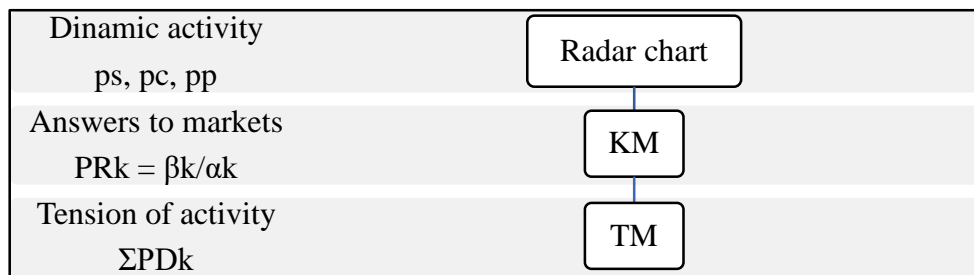
condition

*Table 1. Kinds of management (KM) and necessary conditions (PRk)*

General KMs	KM	Permutations PDk	Sales	Treasure	Purchase
Positive KM	A	$PD_2 \geq PD_3 \geq PD_1$	$PR_1 < 1$	$PR_2 < 1$	$PR_3 > 1$
	B	$PD_3 \geq PD_2 \geq PD_1$	$PR_1 \geq 1$	$PR_2 < 1$	$PR_3 > 1$
	C	$PD_3 \geq PD_1 \geq PD_2$	$PR_1 > 1$	$PR_2 < 1$	$PR_3 \leq 1$
Negative KM	D	$PD_1 \geq PD_3 \geq PD_2$	$PR_1 > 1$	$PR_2 > 1$	$PR_3 \leq 1$
	E	$PD_1 \geq PD_2 \geq PD_3$	$PR_1 \geq 1$	$PR_2 > 1$	$PR_3 < 1$
	F	$PD_2 \geq PD_1 \geq PD_3$	$PR_1 < 1$	$PR_2 > 1$	$PR_3 > 1$

The angles of management areas on figure 1 are internal angles of each area, and a first classification the KM can be positive and negatives according to value of PRk on treasure area (table 1). When PR2 is higher than 1 ( $PR_2 > 1$ ) the kM is negative and the KM is positive when PR2 is lower than 1 ( $PR_2 < 1$ ). The KM is negative when company gives credit to market for clients or debtors because tension on sales area is lower than purchases area, and the KM is positive when company obtain credit from creditors more than debtors on trade operations because tension on purchases area is lower on sales area.

Resume, several variables raised on this AMRCh are on figure 2, showing that knowing the behavior of companies supposes several levels to explain more and more their decision-making processes.



The dynamic activity of companies measured by average periods of maturation allows to build radar charts. These dynamic variables do not need any transformation for been consider as axes of a radar charts. Three periods are considered in this research, and Kinds of management (KMs) generated are 6 according to permutes of perimeter distances (PDk) without repetition. So, the sum of PDk ( $\Sigma PD_k$ ) are general tension that companies support on their making decisions, and this sum allows obtained de type of management (TN) for each kM.

### 3. Qualitative analysis

The qualitative analysis of AMRCh is applied on a sample companies obtained from database Orbis over license of Universitat of València. The criterion to selection the sample of companies considers their location in Valencia region as well as they belong to chemical industrial sector in the classification of NACE 20 Manufacture of chemicals and chemical products. The sample was 834 companies and their adjustments are presented on table1 for each year and province because average periods of maturation are not always can be obtained. The chemical sector increases its level of company according results of table 1.

*Table 1. Companies in Valencia region*

YEARS	30*	T%	46*	T%	12*	T%	TOTAL
2016	77	10,72%	209	9,12%	56	10,07%	342
2015	85	11,84%	245	10,69%	61	10,97%	391
2014	84	11,70%	251	10,96%	60	10,79%	395
2013	79	11,00%	242	10,56%	56	10,07%	377
2012	75	10,45%	235	10,26%	60	10,79%	370
2011	70	9,75%	234	10,21%	60	10,79%	364
2010	68	9,47%	221	9,65%	58	10,43%	347
2009	62	8,64%	228	9,95%	57	10,25%	347
2008	59	8,22%	217	9,47%	54	9,71%	330
2007	59	8,22%	209	9,12%	34	6,12%	302
	718	100,00%	2291	100,00%	556	100,00%	

*Postal codes: 30\* Alicante, 12\* Castellón, 46\* Valencia.*

The aggrupation of companies by kind of management (KM) is on Table 2 and by province where they are located since 2007 up to 2016. This aggregation of table 2 has several results and a more explanation is on Annex A. So, companies located in Alicante province adopt same level on A (23,12%) and D (21,17%) Kinds of management, but level of negatives (54,74%) are higher than positive (45,26%). Companies located in Valencia province adopt high percentage of D kind of management (24,57%) as well as level of negative percentage of KM is higher than positive ones. Kinds of management in Castellon province adopt the highest level of negative KM respect to level got on other two provinces, and among them D Kind of management get the best level of percentage (35,79%). Moreover, level of employment has same relative value respect to percentage (t%) of KMs adopted by companies in respective provinces, but Castellon province has the best level of employment on F Kind of management. So, the effect of synergy can to have relation on location companies and their concentration, but their answers to changes of market does not have why to be the same.

*Table 2. Kinds of managements and contracted workers*

03	A	B	C	D	E	F	SUMA
KMA	166	76	83	152	114	127	718
	23,12%	10,58%	11,56%	21,17%	15,88%	17,69%	100,00%
LA	1997	1066	1418	3634	1761	1979	11.855
	16,8%	8,9%	11,9%	30,6%	14,8%	16,7%	100,00%
46	A	B	C	D	E	F	SUMA
KMV	305	198	379	563	427	419	2291
	13,31%	8,64%	16,54%	24,57%	18,64%	18,29%	100,00%
LV	10102	3779	8500	17808	10917	14222	65.328
	15,46%	5,78%	13,01%	27,26%	16,71%	21,77%	100,00%
12	A	B	C	D	E	F	SUMA
KMC	63	41	66	199	83	104	556
	11,33%	7,37%	11,87%	35,79%	14,93%	18,71%	100,00%
LC	1488	136	424	887	417	3632	6.984
	21,21%	1,86%	6,11%	12,50%	5,94%	52,37%	100,00%

*Variables: KMx, number of KM adopted by companies on Alicante (KMA), Castellon (KMC) and Valencia (KMV); Lx number of workforce on province of Valencia region for Alicante (LA), Valencia (LV) and Castellon (LC).*

Considering companies built macroeconomic variables, table 3 presents annual Chi2 p-value (p-value PP) and annual percentage variation of Gross Domestic Product (VGDP) by provinces. The Chi2 p-value are obtained from contingency tables according to relation between KM and criteria of location companies on their province district.

*Table 3. Chi2 p-value of KM and Variation of province GDP*

Year	P-Value Al	P-Vakue Vl	P-Value Cs	VGDPAL	VGDPVL	VGDPVS	VGDPVCS
2016	0,9990	0,3447	0,6871	NP	NP	NP	NP
2015	0,9676	0,4505	0,6849	0,0333	0,0317	0,0580	0,0356
2014	0,8220	0,3203	0,6588	0,0314	0,0193	0,0068	0,0217
2013	0,8100	0,9273	0,7625	-0,0082	-0,0145	-0,0131	-0,0122
2012	(*)0,0231	0,6486	0,3597	-0,0376	-0,0403	-0,0603	-0,0421
2011	0,1675	0,8519	0,8012	-0,0310	-0,0134	0,0095	-0,0163
2010	0,2922	(*)0,0538	0,6403	-0,0114	-0,0014	0,0014	-0,0044
2009	(*)0,0869	0,8109	0,8048	-0,0554	-0,0531	-0,0444	-0,0528
2008	0,4343	0,5324	0,9269	0,0277	0,0385	0,0126	0,0315
2007	(*)0,0335	(*)0,0000	0,9315	0,0565	0,0877	0,0297	0,0692

*(\*) Chi2 p-value takes value of null hypothesis. Variables: P-value PP are Ch2 p-values or Al (Alicante), Vl (Valencia) and Cs (Castellon); VGDP PP: variation of GDP of AL (Alicante), VL (Valencia), CS (Castellon).*

The behavior of companies measured by province Chi2 p-value allows to know what answers they make respect change of markets. Considering the independency criterion of Chi2 p-value when it takes values of null hypothesis, companies have difficult

on their activity and they do not have freedom for building their own strategies. So, companies have difficult on their management when annual value of Chi2 p-value of table 3 has the symbol (\*). This situation does not occur in Castellon province where level of negative Kind of management is the highest of them according to results of table 2. Nevertheless, it is not possible get a conclusion about this last issue because Chi2 p-values of Alicante adopt a higher value than other provinces on last years, and to understand these several behaviors, the figure 2 represents evolutions of variation of GDP and Chi2 p-value for each province as well as the variation of GDP of Community of Valencia.

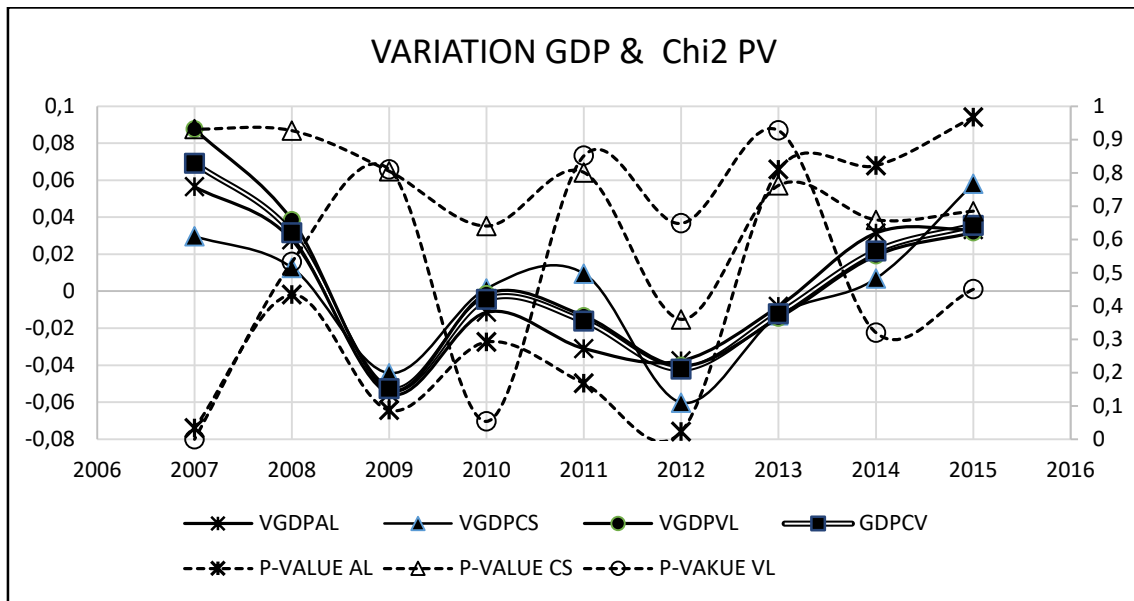


Figure 2. Evolution of variation of GDP provinces and Chi2 p-value provinces.

The evolution of indicators of table 3 are on figure 2 and have two references. Graphics of Chi2 p-values have their references on secondary y-axes and they are represented by dashed lines. So, continued lines represent evolution of variations of GDPs and they have their references on primary y-axes. Analyzing the evolution of indicators, there are two periods taking reference on year 2011, but excluding variables P-value AL and VGDPAL of table 3, because both indicators have same evolution along period of analysis. The evolution of P-value indicators referred to Valencia and Castellon provinces are not adjusted to respective VGDPs before 2011. Nevertheless, the graphics of respective indicators have same evolution after 2011, and Alicante indicators archive the highest level among them. So, according results obtained, Alicante province is the reference to adopt decisions about this industrial sector and next section analyzes the location of companies considering both period before and after 2011.



#### 4. Maps of management of chemical sector

The map of management is the location of companies on Community of Valencia region represented in figure 3, and it represents what kind of management companies have adopted along of period of research. So, when a company adopts more positive than negative KMs its location is representing by a cross (+) and a point symbol (o) represents that a company adopts more the negative KMs than positive. The concentration of companies as well as their lineal sequences on maps of figure 3 are criteria of synergies effects according to Krugman's theory. The industrial parcs are the first effect of concentration by application of politic decisions and the second criteria of location have relation with own strategies of companies, their locations are next to terrestrial media of communication.

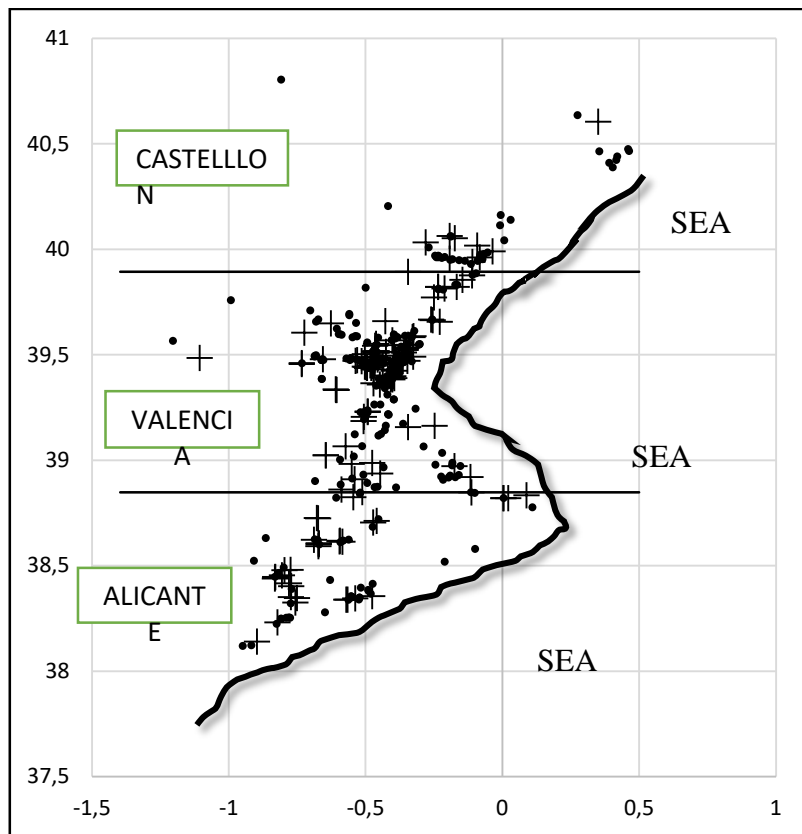


Figure 3. Map of management

The positions of companies on figure 3 are the longitude and latitude of relative position companies on Valencia region. Applying Google Maps tool, the longitude (x-axis) and latitude (y-axis) are geographical positions of companies and not their administrative location. According to results obtained on figure 3, the presentation of maps of management has considered the differences among positive and negative kinds

of management. When companies preferably adopt a kind of management there is an economic culture on environment where they are located, and this is the hypothesis followed to explain geographical locations of companies. Companies located on figure 3 are far of politic centres of region, province or district and they prefer to take negative KMs as well as when they go northward of Valencia region. This economic culture is consolidated on Valencia region after 2011 according to results on figure 4.

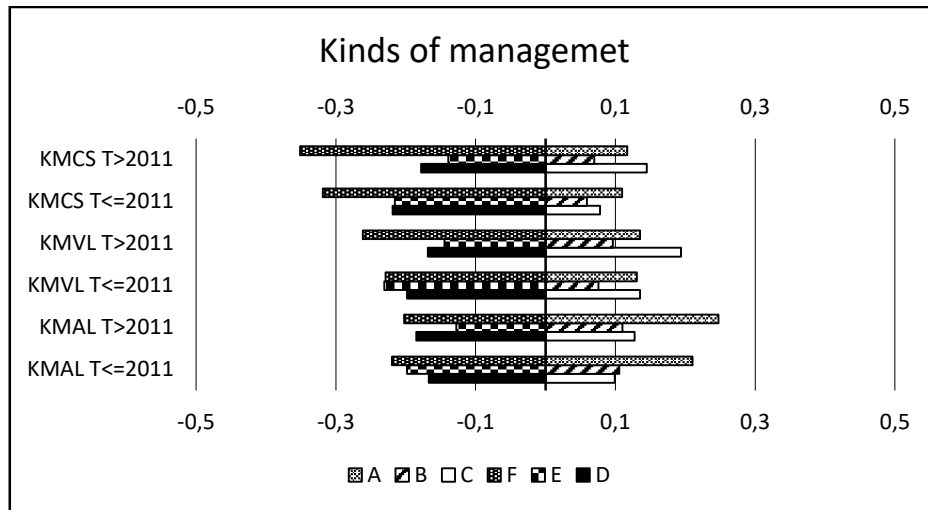


Figure 4. Kind of management.

The representation of kinds of management on figure 4 has its reference by relative level of them measure by percentage (t%), which value are on respective annex of manuscript for each province. The negative kind of management have represented their positions on x-axis on figure 4 as negative value and their positive numbers are represented on right of 0%. The assessment of Kinds of management has two periods differentiated, before and after 2011, and for each province are contrasted KMs according to position of PD2 on permutes which define a KM. So, the contrast by par of KMs on each province are F respect A, E respect B and D respect C.

Contrasting periods before and after 2011, Alicante KM have different behaviour respect to other provinces. This province maintains their proportions of KMs but increases A KM when E KM decreases. On the contrary, this reduction of last KMs represents the increasing negative F KM and D KM. According previous results, companies adopt high level of negative KM when they are located towards North of Valencia region and on South companies adopt positive KM. These changes of KMs are answer companies to change of markets and the next section analyses what effects have them on the dynamic activity of companies.

## 5. Types of management

Type of management is level of general tension of a KM on a year, and its value is sum of its Perimeter Distances ( $\Sigma PD_k$ ). Considering the contrast of KMs on figure 4, the average of  $\Sigma PD_k$  for respective KM are represented on figure 5 for two periods before and after 2011. Types of management before 2011 are represented on y-axis as variable  $TM_{xxT \leq 2011}$  and variable  $TM_{xxT > 2011}$  is for TM in period after 2011, on figure 5. To assessment the activity on Valencia region the high level of sum PDs supposes low dynamic level of activity, and so there will be high distance from zero value on x-axis of figure 5 up to level of respective  $\Sigma PD_k$  for each kind of management. The negative (positive) value of  $\Sigma PD_k$  has reference with negative (positive) KMs, respectively for each one of them.

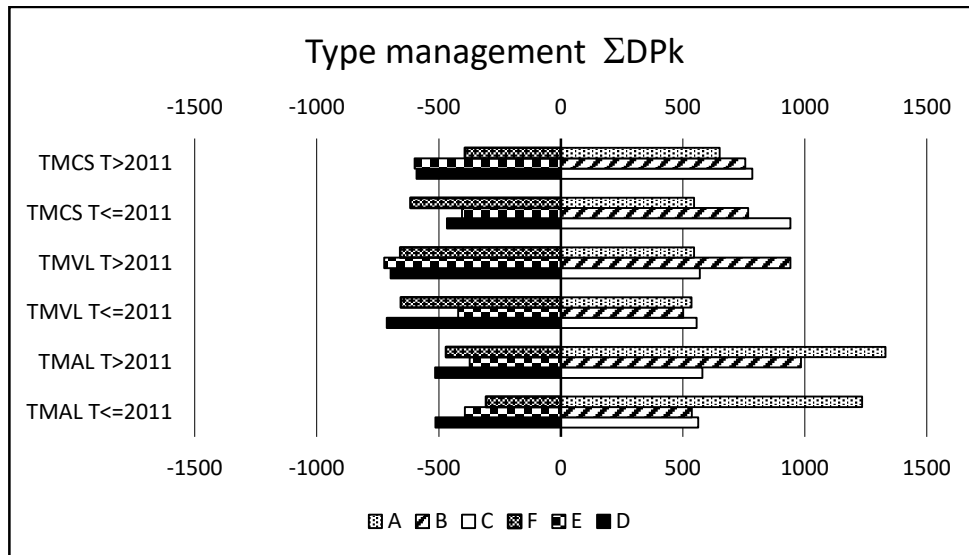


Figure 5. Types of management

The representation of TM on figure 5 follows same criteria to associate KM in figure 4, and the dynamic activity is different among provinces of Valencia region. According to position of PD2 on each KM are contrasted TMA whit TMF, TMB with TME and TMC with TME on figure 5. Considering common characteristics before and after 2011, Alicante province has higher tension (level of activity) on negative KM than positive ones, Valencia province maintain the dynamic activity on negative F and D Kinds of management as well as their corresponding positive KM, and Castellon province presents hard difference among KMs because when negative KMs have high level of dynamic activity the positive KM have low level of it. Differences on behaviour of

companies after 2011 are changes of B and E kind of management with relation to their behaviour before 2011 as follows

1. Alicante province presents low level of activity on B kind of management and maintains the level of activity on E KM, contrasting their activity before 2011.
2. Valencia province presents lower level of activity on B and E KM after 2011 than before 2011.
3. Castellon province maintain level on B KM and decreases on E KM after 2011. These answers suppose changes of compensation on other KMs.

Contrasting tension level of management (figure 5) with respective numbers of KMs adopted on provinces (figure 4), there are different behaviour on both variables. The table 6 contrast variation of KM and their respective TM after 2011, considering positions archives by companies on named figures.

*Table 6. Contrast KM with TM*

KMs	Alicante		Valencia		Castellon	
	KMAL	TMAL	KMV	TMVL	KMCS	TMCS
A	$\Delta$	$\partial$	Cte	Cte.	Cte.	$\Delta$
B	Cte	$\partial$	Cte	$\partial$	Cte.	Cte.
C	$\Delta$	Cte	$\Delta$	Cte.	$\Delta$	$\Delta$
D	Cte	Cte	$\partial$	Cte.	$\partial$	$\partial$
E	$\partial$	Cte	$\partial$	$\partial$	$\partial$	$\partial$
F	$\partial$	$\partial$	$\Delta$	Cte.	$\Delta$	$\Delta$

*Variables: KM kind of management; TM Type of management. Symbols: Cte Maintain constant value.  $\Delta$ . Increasing variable after 2011.  $\partial$  decreasing variables after 2011*

Transversal analysis shows Valencia and Castellon adopt same variation on KMs, and Alicante takes same variation on B, C and E kinds of management respect those provinces. Analysing tensions of management (TMs), Alicante and Valencia take same variations of TM on B, C and D kinds of management, but Castellon adjust their variations of TM respect to KM excluding variation of A KM. So, same variations of KML and KMCS can justify the adjustment of their GDP respect to Chi2 p-value after 2011 in section 3 on figure 2 for Valencia and Castellon provinces. Nevertheless, Castellon province presents better adjustment than Valencia because their tensions have same variation of their KMs.

Longitudinal analysis on results of table 6 shows that companies have same variations their KM and TM of B and C kinds of management on Alicante and Valencia provinces, and companies located on Valencia and Castellon take E kind of management

for a same variation on both variables. So, there is not a same answer for companies located on a same administrative region on change of market, the geographical approaching allows to adopt same behaviours of unites of economic activity.

These results show that strategies of companies take several alternatives which are not associated either a same sectorial behaviour neither a same administrative politics from regional governments. The geographical location of companies has its effect on management them and the next section analyses the changes on costs of goods sold and level of employment according to changes about answers of company (Kinds of management) to changes of market.

## **6. Analysis of structure of cost of goods sold.**

The cost of goods sold is sum of cost of depreciation, cost of material raw and cost of workforce. The cost of goods sold is the variable applied for obtaining average periods of maturation, and the analysis of variation of its components allows to explain effects of changes of KMs and their respective TMs before and after 2011.

The analysis of cost on years before and after 2011 is represented on three-plot graphics on next figures in this section. The triangles of three-plot diagrams have represented components of cost of goods sold on each one of sides by respective percentages, which are their aggregate sum divided by aggregate sum of costs of goods sold before 2011 and after 2011. Tree-plot diagrams have on the bottom of triangles the cost of material raw, the cost of depreciation is on right side of triangle and the cost of employment is on its left side. An observation on three-plot graphics sum 100% because it has reference on three components of cos of goods sold, and same observation on a side of triangle represent percentages of two related variables on it,  $t\%$  for one and  $100\%-t\%$  for other.

The three-plot graphic of structure of costs of goods sold on provinces of Valencia region considers KM adopted before and after 2011. Their numerical sequences on respective figures have a number for identify the province and a word for identify the respective periods before and after 2011. Their respective diagonals are the sum of cost of employment and material raw, which always sum 100%. Moreover, the line slope with origin on null depreciation in three-plot diagram are the relation on two variables, and it is constant along of it. So, they are relations on cost of depreciation and cost of employment when this line cuts the side of cost of employment.

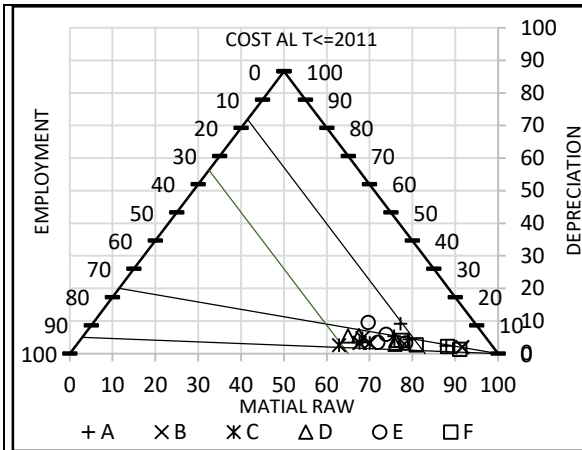


Figure 6a. Three-plot Alicante before 2011

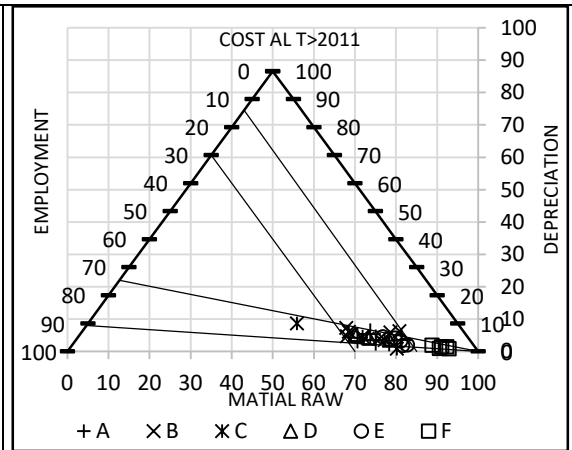


Figure 6b. Three-plot Alicante after 2011

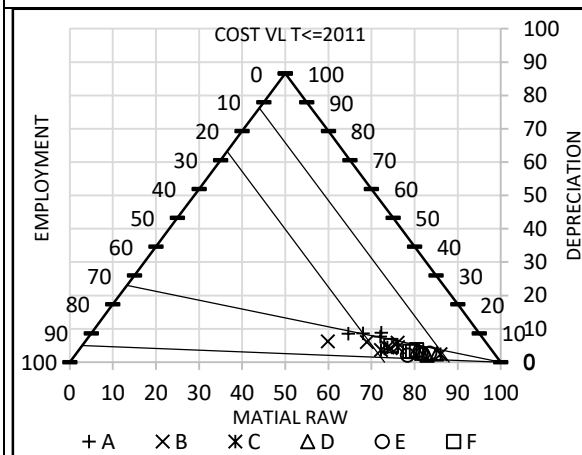


Figure 7a. Three-plot Valencia before 2011

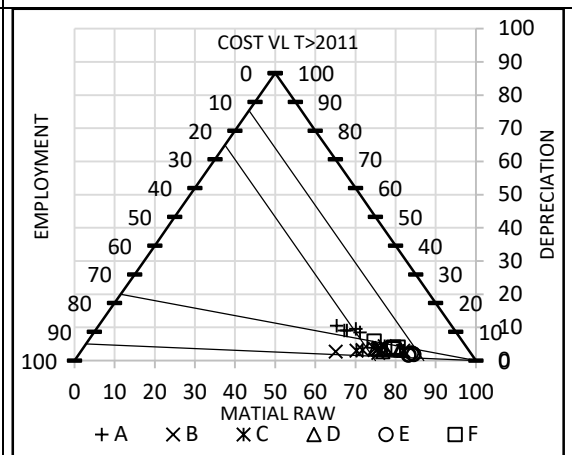


Figure 7b. Three-plot Valencia after 2011

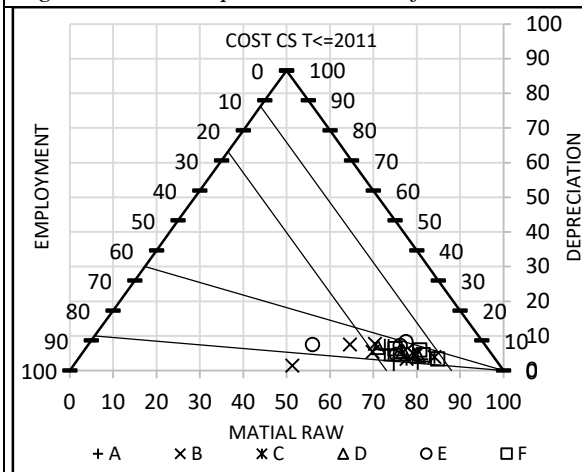


Figure 8a. Three-plot Castellon after 2011

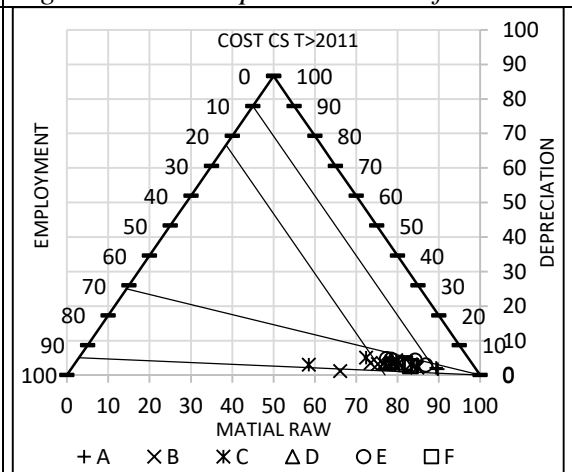


Figure 8b. Three-plot Castellon after 2011

The result of table 4 are values of diagonals on costs of employment and material raw, and the lines slopes measure level of costs of depreciation respect to costs of employment (100 - material raw). The cost of employment is lower on Alicante province than other provinces before and after 2011, and this cost decreases on three provinces after 2011. The analysis by diagonal lines supposes compensation between related costs, and so costs of material raw represent higher costs than costs of employment and depreciation before and after 2011. Nevertheless, cost of depreciation increases on Alicante province after 2011 but not on other provinces.

*Table 4. Relative relation among cost of goods sold*

Before 2011	Alicante	Valencia	Castellon
Employment	17% to 35%	27% to 38%	27% to 38%
Material raw	83% to 65%	73% to 62%	73% to 62%
Amortization÷ (100-Mat. raw)	0,2261 to 0,0515 20/88,45 to 5/97,11	0,2652 to 0,0515 23/86,72 to 5/97,11	0,3628 to 0,1061 30/82,68 to 10/94.22
After 2011	Alicante	Valencia	Castellon
Employment	14% to 30%	25% to 35%	23% to 38%
Material raw	86% to 70%	75% to 65%	77% to 62%
Amortization÷ (100-Mat. raw)	0,25201 to 0,08387 22/87,3 to 8/95,38	0,22611 to 0,05149 20/88,45 to 5/97,114	0,29217 to 0.05149 25/85,566 to 5/97,114

The general strategy on costs is the reducing cost of employment after 2011 without considering KMs and their respective TMs. So, level of contracts is the nominal variable to assessment behaviour of employment, which is represented on maps of management considering differences of KM before and after 2011 and along of period of research.

The maps of management on figure 9, 10 and 11 have applied same criteria to locate KMs that figure 3 in section 4 of this manuscript. When differences among KM of a company are more positives than negative the location of a KM adopts a cross (+), and a circle (○) when they are more negative than positive. The positive (negative) KMs located on maps of management are associate according to position of PD2 on permutes of perimeter distances, which define KM of Table 1. So, the A and F kinds of management on figure 9 have their PD2 higher than PD1 and PD3. The figure 10 has located B and E Kinds of management because their PD2 is on the middle of PD1 and PD3. The figure 11 has located C and D kinds of management because their PD2 is lower than PD1 and PD3.

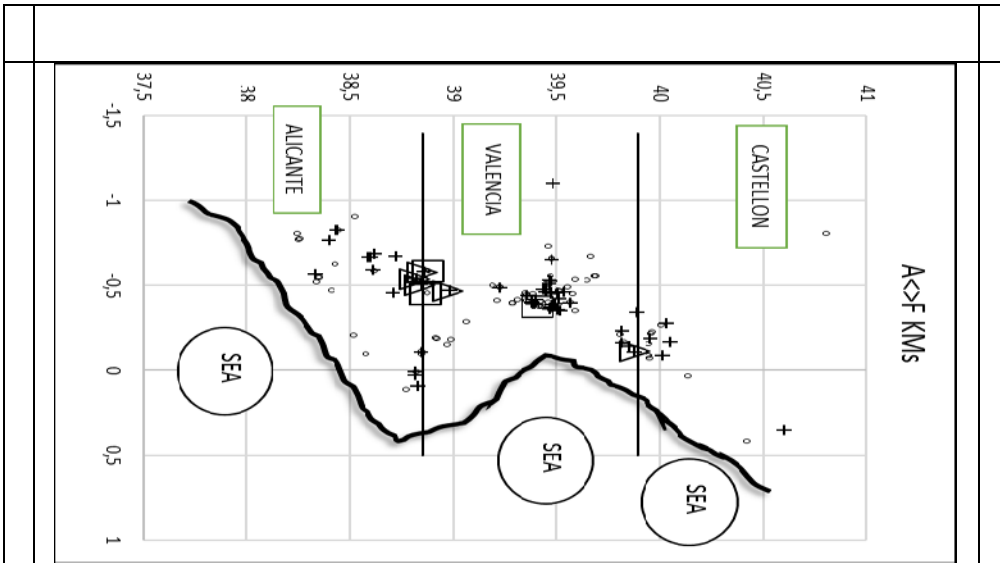


Figure 9. Maps management A and F

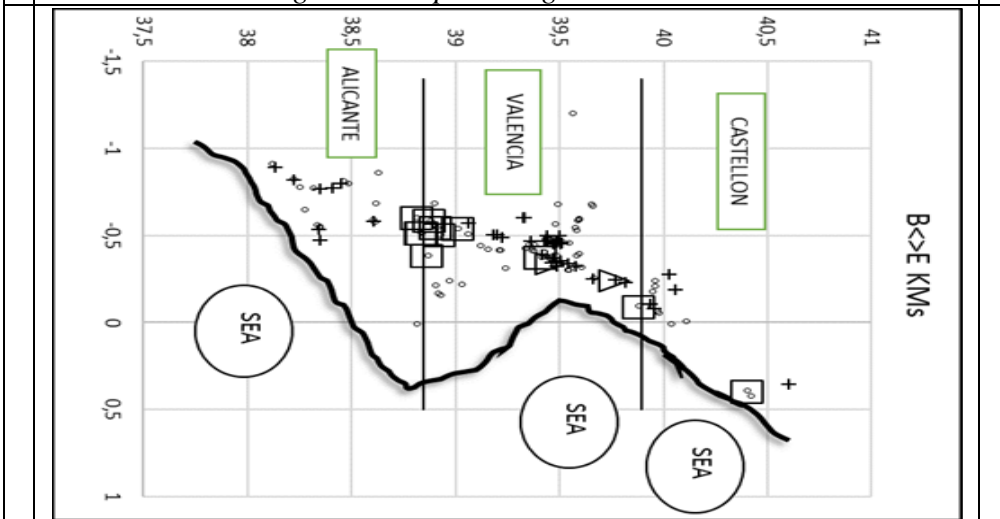


Figure 10. Maps management B and E

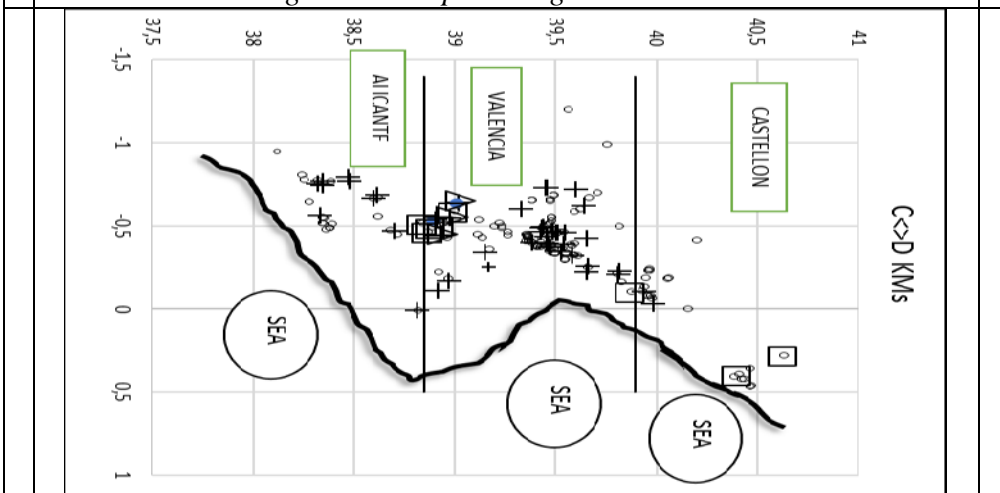


Figure 11. Maps managements C and D



The results of assessment of employment on Valencia region are represented by triangle ( $\Delta$ ) and square ( $\square$ ) on maps of management of figure 9, 10 and 11. The triangle figure is positive KM and the square is for representing negative KM, and the criteria applied for representing them are on table 5, following the contrast on behaviour of workforce before and after 2011.

*Table 5. Statistics of employment*

CODE POST	Pearson t $\leq$ 2011	WTo	Pearson t $>$ 2011	WTi	Pto $\langle$ >Pti	WTi $\langle$ >Wto	p $<$ 0 & w $<$ 0
468*	0,549	1014	0,743	963	-0,194	-51	<b>468*</b>
1259*	1,119	420	1,122	284	-0,004	-136	<b>1259*</b>
1253*	0,462	103	0,553	80	-0,091	-23	<b>1253*</b>

*Sources: dates from companies of samples. Variables: WTo workers' companies before 2011. WTi workers' companies after 2011. Pto and Pti Pearson coefficients of variation before and after 2011.*

The statistics obtained on table 5 take on account sum of level of workers before and after 2011 for each kind of management. The maps of management represent bad behaviour of companies considering the decreasing level of Pearson coefficient (Pt) and negative variation of workforce (W) after 2011. So, when the comparing Pearson coefficients and sum of workers are negative at same time, answers of companies do not improve the level of employment and activity on a region. These bad results have postal codes on table 5 and their geographical location are on maps of management where triangles (positive KM) and squares (negative KM) are located on latitude 38,7 and longitude -0,5. The concentration of losses and the instability of employment on a zone of maps of management allows consider that there is a same behaviour to overcome the economic or financial crisis on a same geographical area, and so an economic culture of management.

The concentration of losses and instability of employment on Valencia province must be explained according result on section 4 and 5. The section 4 shows that positive KM maintain their number and negative KM increase theirs (figure 4). Theses answers have effect on dynamic level of acidity (TM), which is analysed in section 5 where numbers of E and B kinds of management decrease but they are maintained on the other KMs. This behaviour has effect on cost of goods sold on Valencia province (Figure 7b) where there is a reduction of cost of employment on negative KMs because A (symbol +) and B (symbol x) kinds of management increase theirs. This is the assessment of strategies of companies in Valencia province, when companies adopt negative KM after 2011 has effect on the losing and instability of level of employment.

## **7. Conclusion.**

The Accounting Methodology or Radar Chart (AMRCh) assessment answers of companies to changes of markets, considering that their geographical location has effect on their decision-making processes. So, answers of units of economic activity built macroeconomic variables according to economic environment where they are located, and this effect explains the economic and financial culture of transactions on a geographical area.

The different answers of companies are perimeter distances of radar charts and considering their orientations kinds of management arise. The distribution of kinds of management is different on Valencia region. Alicante province has more positive kind of management than negative after 2011, and this distribution changes toward north of Valencia region because those located in Castellon take more negative kind of management than positive. This is the effect of economic culture on Valencia region and it has effect on tension of transaction (perimeter distances) as well as structures of cost of goods sold.

The manuscript emphasizes about the existence of economic and financial cultures in the location of companies according to above paragraph. The change of behavior of companies after 2011 shows same difficulties for the adapting companies to changes of markets reducing costs of employment. Moreover, the administrative regulation of sectorial activity does not avoid the coexistence of several kind of management on industrial parcs and the location companies next to mean of communications.

This manuscript considers that kinds of management must be components of research on theory of location companies because explain how companies adjust their behavior to implicit agreements on economic and financial transaction made on a geographical area. This culture can be acting as barriers or advantages on economic and monetary policies which must be take in account to improve answers of companies for changes in markets.

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Annex A  
ALICANTE

KINDS MANAGMENTE ALICANTE

03*	A	B	C	D	E	F	SUMA	
2016	22	7	11	16	10	11	77	10,72%
2015	22	9	12	15	12	15	85	11,84%
2014	21	12	7	19	10	15	84	11,70%
2013	19	7	11	18	9	15	79	11,00%
2012	15	9	10	13	10	18	75	10,45%
2011	17	11	6	11	9	16	70	9,75%
2010	21	7	9	10	7	14	68	9,47%
2009	18	10	8	11	5	10	62	8,64%
2008	8	4	8	13	17	9	59	8,22%
2007	3	0	1	26	25	4	59	8,22%
	166	76	83	152	114	127	718	100,00%
	23,12%	10,58%	11,56%	21,17%	15,88%	17,69%	100,00%	

WORKERS ALICANTE

03*	A	B	C	D	E	F	SUMA	MWA	SDWA	PWA
038*	306	180	501	1243	29	12	2271	378,50	461,19	1,218
037*	278	44	11	51	190	352	926	154,33	140,74	0,912
036*	309	146	420	888	309	316	2388	398,00	255,60	0,642
035*	18	0	0	0	26	31	75	12,50	14,31	1,145
034*	632	283	249	112	607	277	2160	360,00	210,54	0,585
033*	280	96	66	643	222	290	1597	266,17	206,75	0,777
032*	0	0	0	63	60	0	123	20,50	31,77	1,550
031*	17	15	64	125	5	7	233	38,83	47,46	1,222
030*	157	302	107	509	313	694	2082	347,00	220,70	0,636
	1997	1066	1418	3634	1761	1979	11855			
	16,8%	8,9%	11,9%	30,6%	14,8%	16,7%	100,00%			

Table TPAL. Three-plot Alicante

KM AL ALICANTE	Before 2011			After 2011		
	COST MAT	COST W	AMORT.	COST MAT	COST W	AMORT.
A	79,14%	14,64%	6,21%	75,15%	20,53%	4,32%
B	84,60%	11,91%	3,49%	71,16%	22,85%	5,99%
C	65,21%	30,83%	3,96%	64,49%	28,81%	6,71%
D	69,84%	25,23%	4,93%	70,09%	24,70%	5,20%
E	73,03%	22,14%	4,83%	78,88%	17,54%	3,58%
F	86,63%	10,97%	2,41%	90,89%	7,69%	1,42%

## CASTELLON

### KINDS OF MANAGEMENT CASTELLON

12*	A	B	C	D	E	F	SUMA	
2016	8	3	7	22	8	8	56	10,07%
2015	5	5	9	22	10	10	61	10,97%
2014	8	3	9	22	9	9	60	10,79%
2013	6	6	10	18	4	12	56	10,07%
2012	9	6	8	20	3	14	60	10,79%
2011	9	6	6	20	6	13	60	10,79%
2010	7	7	7	20	3	14	58	10,43%
2009	5	4	6	22	7	13	57	10,25%
2008	3	0	4	20	20	7	54	9,71%
2007	3	1	0	13	13	4	34	6,12%
	63	41	66	199	83	104	556	
	11,33%	7,37%	11,87%	35,79%	14,93%	18,71%	100,00%	

### WORKERS CASTELLON

12*	A	B	C	D	E	F	SUMA	MWC	SDWC	PWC
1260*	24	17	129	3	56	135	364	60,67	57,95	0,96
1259*	77	57	11	201	195	163	704	117,33	79,61	0,68
1258*	3	0	74	263	49	5	394	65,67	101,20	1,54
1255*	5	3	137	186	5	173	509	84,83	89,64	1,06
1254*	736	22	29	105	66	2549	3507	584,50	1000,60	1,71
1253*	23	23	44	64	12	12	178	29,67	20,48	0,69
1252*	603	7	0	45	29	595	1279	213,17	299,30	1,40
1251*	17	7	0	0	0	0	24	4,00	6,96	1,74
1250*	0	0	0	20	5	0	25	4,17	8,01	1,92
	1488	136	424	887	417	3632	6984			
	21,21%	1,86%	6,11%	12,50%	5,94%	52,37%	100%			

*Table TPAL. Three-plot Castellon*

KM CS	BEFORE 2011			AFTER 2011			
	CASTELLON	COST MAT	COST W	AMORT.	COST MAT	COST W	AMORT.
A		72,35%	20,61%	7,05%	81,60%	15,02%	3,39%
B		65,47%	26,01%	8,52%	74,16%	22,06%	3,78%
C		78,50%	16,69%	4,81%	78,41%	17,59%	4,00%
D		73,59%	20,38%	6,03%	75,86%	19,97%	4,17%
E		74,54%	19,10%	6,36%	80,62%	15,14%	4,24%
F		78,90%	15,78%	5,32%	81,05%	15,64%	3,31%

VALENCIA  
KINDS OF MANAGEMENTE

46*	A	B	C	D	E	F	SUMA	
2016	35	16	40	55	28	35	209	9,12%
2015	33	24	51	67	30	40	245	10,69%
2014	35	20	55	70	34	37	251	10,96%
2013	28	26	44	60	39	45	242	10,56%
2012	29	28	39	57	40	42	235	10,26%
2011	38	20	45	45	37	49	234	10,21%
2010	33	21	36	41	33	57	221	9,65%
2009	34	30	35	41	42	46	228	9,95%
2008	32	11	27	51	56	40	217	9,47%
2007	8	2	7	76	88	28	209	9,12%
	305	198	379	563	427	419	2291	100,00%
	13,31%	8,64%	16,54%	24,57%	18,64%	18,29%	100,00%	

WORKERS VALENCIA

	A	B	C	D	E	F	SUMA	MWV	SDWV	PWV
469*	723	603	1162	5362	3774	2167	13791	2298,500	1909,344	0,831
468*	258	112	500	436	430	237	1973	328,833	149,322	0,454
467*	77	101	262	125	583	1701	2849	474,833	629,427	1,326
466*	28	9	215	201	378	92	923	153,833	139,177	0,905
465*	3185	139	212	281	216	389	4422	737,000	1202,199	1,631
464*	1669	445	947	1312	697	809	5879	979,833	443,078	0,452
463*	2526	97	555	1360	1006	3386	8930	1488,333	1243,698	0,836
462*	609	592	522	1345	734	1172	4974	829,000	344,020	0,415
461*	882	1614	3887	5937	2046	3472	17838	2973,000	1841,097	0,619
460*	145	67	238	1449	1053	797	3749	624,833	562,721	0,901
	10102	3779	8500	17808	10917	14222	65328			
	15,46%	5,78%	13,01%	27,26%	16,71%	21,77%	100,00%			

Table TPAL. Three-plot Valencia

VALENCIA	BEFORE 2011			AFTER 2011			
	KM VL	COST MAT	COST W	AMORT.	COST MAT	COST W	AMORT.
A		66,42%	24,24%	9,34%	63,61%	25,75%	10,64%
B		67,85%	23,05%	9,10%	71,92%	24,20%	3,88%
C		75,36%	20,14%	4,50%	75,42%	20,76%	3,82%
D		79,12%	17,37%	3,51%	76,69%	19,47%	3,84%
E		79,00%	17,88%	3,12%	83,18%	14,59%	2,23%
F		75,62%	19,46%	4,93%	76,65%	18,62%	4,73%

Annex B

**Table AL. Alicante statistics**

CODE			Pearson		Pearson					
POST	DesTip	Mean	t<=2011	WTo	t>2011	WTi	Pto<>Pti	WTi<>Wto		p<0 & w<0
030*	24,186	18,980	1,274	949	1,187	1139	0,0874	190		NP
031*	4,821	6,737	0,716	128	0,707	105	0,0084	-23		NP
032*	1,549	12,000	0,129	60	0,239	63	-0,1095	3		NP
033*	16,841	14,265	1,181	699	1,026	899	0,1543	200		NP
034*	11,747	12,879	0,912	747	1,714	1420	-0,8015	673		NP
035*	2,853	7,167	0,398	43	0,234	32	0,1642	-11		NP
036*	9,898	11,126	0,890	1057	1,054	1333	-0,1643	276		NP
037*	10,347	9,868	1,049	375	1,339	551	-0,2910	176		NP
038*	50,369	41,833	1,204	753	1,033	1518	0,1712	765		NP

**Table CS. Castellon statistics.**

CODE			Pearson		Pearson					
POST	DesTip	Mean	t<=2011	WTo	t>2011	WTi	Pto<>Pti	WTi<>Wto		p<0 & w<0
469*	42,206	24,139	1,748	7121	1,730	6670	0,019	-451		NP
468*	5,857	10,674	0,549	1014	0,743	963	-0,194	-51		468*
467*	29,129	19,935	1,461	1535	1,442	1341	0,020	-194		NP
466*	8,099	8,391	0,965	386	1,079	537	-0,114	151		NP
465*	119,880	65,273	1,837	2154	2,151	2292	-0,315	138		NP
464*	57,941	18,382	3,152	2794	2,757	3103	0,395	309		NP
463*	88,923	45,988	1,934	3725	1,584	5207	0,349	1482		NP
462*	17,839	16,689	1,069	2687	1,032	2302	0,037	-385		NP
461*	66,312	31,336	2,116	8680	2,075	9221	0,041	541		NP
460*	40,627	23,954	1,696	3665	1,459	3790	0,237	125		NP

**Table VL. Valencia statistics**

CODE			Pearson		Pearson					
POST	DesTip	Mean	t<=2011	WTo	t>2011	WTi	Pto<>Pti	WTi<>Wto		p<0 & w<0
1260*	5,038	7,294	0,691	124	1,237	287	-0,546	163		NP
1259*	31,320	28,000	1,119	420	1,122	284	-0,004	-136		1259*
1258*	6,994	8,542	0,819	205	0,735	181	0,084	-24		NP
1255*	14,964	16,417	0,911	197	1,145	312	-0,233	115		NP
1254*	139,854	74,769	1,870	1944	1,574	1563	0,297	-381		NP
1253*	2,266	4,905	0,462	103	0,553	80	-0,091	-23		1253*
1252*	35,340	35,050	1,008	701	0,854	578	0,154	-123		NP
1251*	#iDIV/0!	#iDIV/0!	#iDIV/0!	0	0,792	25	#iDIV/0!	25		#iDIV/0!
1250*	2,463	4,545	0,542	50	0,435	31	0,107	-19		NP
1240*	0,894	7,000	0,128	35	0,059	34	0,069	-1		NP
1221*	31,140	294,250	0,106	1177	#iDIV/0!	0	#iDIV/0!	-1177		#iDIV/0!
1220*	65,191	54,508	1,196	3216	1,083	2879	0,113	-337		NP
1219*	102,422	135,286	0,757	1894	0,924	2711	-0,167	817		NP
1218*	2,427	3,667	0,662	22	0,471	38	0,191	16		NP
1212*	1,166	10,200	0,114	51	0,051	48	0,063	-3		NP
1211*	485,602	340,200	1,427	6804	1,524	9307	-0,097	2503		NP
1210*	166,760	152,778	1,092	1375	0,415	2402	0,676	1027		NP
1210*	166,760	152,778	1,092	1375	0,415	2402	0,676	1027		NP
1200*	42,876	32,700	1,311	654	1,290	583	0,021	-71		NP