
Support for Farmers' Cooperatives

Clustering European Cooperatives: Towards A Useful Typology Of Cooperative Profiles

Giel Ton



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Preface and Acknowledgements

In order to foster the competitiveness of the food supply chain, the European Commission is committed to promote and facilitate the restructuring and consolidation of the agricultural sector by encouraging the creation of voluntary agricultural producer organisations. To support the policy making process DG Agriculture and Rural Development has launched a large study, "Support for Farmers' Cooperatives (SFC)", that will provide insights on successful cooperatives and producer organisations as well as on effective support measures for these organisations. These insights can be used by farmers themselves, in setting up and strengthening their collective organisation, and by the European Commission in its effort to encourage the creation of agricultural producer organisations in the EU.

Within the framework of the SFC project, this report on clustering European agricultural cooperatives has been written.

In addition to this report, the SFC project has delivered 34 case study reports, 27 country reports, 8 sector reports, 6 EU synthesis and comparative analysis reports, a report on cluster analysis, a report on the development of agricultural cooperatives in other OECD countries, and a final report.

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1. Introduction

This report presents the first results of the cluster analysis of the data on the more than 500 agricultural cooperatives in the EU on which we collected data. The elaboration of clusters is Theme 6 of the project 'Support for Farmers' Cooperatives'. This clustering is needed as input for decisions on the case studies that will be investigated in the second part of the project (Themes 7 and 8).

Clustering is an interesting process as it requires both quantitative analysis of the data and qualitative iterations of reasoning about meaningful clusters that can be used for further research. At the same time it is a challenging process, where the researchers have to make many decisions on which variables to include and which to exclude. Based on the results of the EU Syntheses Reports and Sector Reports (Theme 4 and 5), as well as on our building blocks, choices have been made on regions, categories of cooperatives and particular organisational and strategy characteristics of the cooperatives in including/excluding variables in the cluster analysis.

This report is structured as follows. In section 2 we briefly discuss our methodology and the steps that have been taken to generate the clusters. In section 3 the eight resulting clusters are presented. In section 4 we present some additional explorations into clustering the cooperatives in our database.

2. Clustering methodology

The cluster analyses presented in this report are based on data on more than 500 farmers' cooperatives in the EU. This data has been collected in the first half of 2011 by the National Experts, using an extensive questionnaire with questions performance, position in the food chain, international governance, and other organisational characteristics. The cooperatives in our sample were strategically chosen as we wanted to cover the majority of the farmers in a sector. Thus, the largest cooperatives in each of the eight sectors in our project were surveyed.

The clustering process followed is inspired by the principles of case-base analysis (Byrne and Ragin, 2009), i.e., respecting the integral complexities of each observation while looking for transcending patterns. We applied a combination of statistical clustering and identification of contrasting cases. We see the present analysis as a first and motivating step for more in-depth analysis of differences between (groups of) farmers' cooperatives in the EU.

The data-base on the cooperatives allowed the use of hierarchical cluster analysis as a means to explore sets of differences between groups as well as communalities within groups. The procedure is an iterative process that is heavily influenced by the variables used to compute clusters.

As a first step to facilitate clustering, we recoded several continuous variables to ordinal/categorical values and explored the thresholds used to define the categories in each of these variables. Size of the membership was recoded to the categories 'tiny', 'small', 'medium' and 'big', with respective thresholds of 20, 100 and 1000. Economic service provision was estimated by the variable "turnover per member", and recoded to the categories 'extremely low' (<1,000 euro), 'low' (<50,000), 'medium' (<500,000) and 'high'(>500,000). Several other variables have also been recoded to categorical variables, such as the age of the cooperative and the level of specialization.

A second step was the selection of the variables that would be used to compute clusters. We looked for variables where information is relatively complete, with few missing data. We did several iterations with the clustering algorithm in SPSS, and finally selected the following:

- Heterogeneity: specialization (2 categories: high or low)
- service_intens_cat: turnover per member (4 categories: see above)
- membership_cat: size of membership (4 categories; see above)
- @3.2.2: prime position in the food chain: collective bargaining (2 categories: yes/no)
- @3.2.4: prime position in the food chain: primary processing (2 categories: yes/no)
- @3.2.7: prime position in the food chain: branded goods (2 categories: yes/no)
- @2.7: operational management: board or professional managers (3 categories: only BoD, only professionals, both)
- @2.15: obligation of members to deliver all their products (2 categories: yes/no)

We used hierarchical cluster analysis with the method of 'between group linkage'. This gives clusters with different sizes that differ most on the selected variables. The clustering exercise resulted in a dendrogram (Appendix 1).

A third step was the selection of the number of clusters. With the dendrogram we analysed a range of possible clusters, and decided on the preferred number of clusters. This decision was based on the analysis of the differences between the clusters on both the variables used to cluster, and other variables from the survey. This exploration resulted in the decision to stop excessive 'fragmentation' and to use a fixed cut-off point of 10 clusters. Two of these ten had only a very limited number of observations and are further ignored in the analysis. This left eight clusters in the analysis. These clusters are, as could be expected, significantly different from each other on most of these variables (see ANOVA results in Appendix 2). The validity of the clustering exercise lies especially in the capacity to 'capture' differences among meaningful characteristics defined by the other variables in the survey that are not used as the basis for computing the clusters.

In the fourth step we have described each of these clusters on their distinctive characteristics. Based on a detailed analysis of the crosstabs, we identified distinctive characteristics of each cluster that provided the terms for the profile. This resulted in the characterization as presented in Table 3.

In the fifth step, we analysed the profiles of each cluster and put a distinctive 'label' to each cluster. These names, plus the profiles, must be considered as abstractions of the cooperatives in each cluster but also as useful labels to frame the diversity that exist among European cooperatives. Based on a discussion on these labels, cooperatives that correspond most closely to the description can be selected for further case-studies.

3. Results

The eight clusters (A to H) have been computed without a reference to the regions in which the cooperatives are based, nor to the sector in which the cooperatives are operating. This is done purposively to capture an overarching typology based primarily on key organisation and strategy characteristics. These clusters can be used in addition to and in combination with those other two ways of grouping them.

However, the analysis of the illustrative variables on their differences between the clusters (selecting meaningful contrasting cases in the crosstabs) shows that geographic regions are indeed important: some clusters consist of a higher proportion of cooperatives from a particular region. We used the following regional classification: North Sea, Baltic, Central and Mediterranean (see Appendix 3 for the countries in each region). Table 1 presents the geographical gravity of the eight clusters over the four regions.

Table 1: Geographic gravity of the clusters

			Clusters of cooperatives in survey sample								Total
			Cluster A	Cluster B	Cluster C	Cluster D	Cluster E	Cluster F	Cluster G	Cluster H	
European region	Baltic	Count	15	11	11	13	12	4	5	3	74
		%	27.3%	23.9%	13.9%	37.1%	14.3%	26.7%	38.5%	25.0%	21.8%
	Central	Count	12	11	44	5	10	0	8	0	90
		%	21.8%	23.9%	55.7%	14.3%	11.9%	.0%	61.5%	.0%	26.5%
	Mediterranean	Count	21	9	6	7	20	6	0	3	72
		%	38.2%	19.6%	7.6%	20.0%	23.8%	40.0%	.0%	25.0%	21.2%
	North Sea	Count	7	15	18	10	42	5	0	6	103
		%	12.7%	32.6%	22.8%	28.6%	50.0%	33.3%	.0%	50.0%	30.4%
Total		Count	55	46	79	35	84	15	13	12	339
		%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Likewise, we can analyse how the clusters are distributed over the eight different sectors that we use in our project (cereals, dairy, F&V, olives and olive oil, pig meat, sheep meat, sugar, and wine). Table 2 shows the gravity of the different clusters towards the different sectors.

Table 2: Sectoral gravity point of each cluster

			Clusters of cooperatives in survey sample								Total
			Cluster A	Cluster B	Cluster C	Cluster D	Cluster E	Cluster F	Cluster G	Cluster H	
Sector Cereals	Count		9	17	13	3	17	4	3	0	66
	%		15.8%	37.0%	16.5%	8.6%	20.0%	22.2%	23.1%	.0%	19.1%
Dairy	Count		15	8	16	12	32	7	1	4	95
	%		26.3%	17.4%	20.3%	34.3%	37.6%	38.9%	7.7%	33.3%	27.5%
Fruit and vegetables	Count		15	9	16	16	12	4	5	2	79
	%		26.3%	19.6%	20.3%	45.7%	14.1%	22.2%	38.5%	16.7%	22.9%
Olives and olive oil	Count		2	0	2	0	6	0	0	0	10
	%		3.5%	.0%	2.5%	.0%	7.1%	.0%	.0%	.0%	2.9%
Pig meat	Count		7	2	13	2	3	2	1	1	31
	%		12.3%	4.3%	16.5%	5.7%	3.5%	11.1%	7.7%	8.3%	9.0%
Sheep meat	Count		2	3	8	1	1	0	3	0	18
	%		3.5%	6.5%	10.1%	2.9%	1.2%	.0%	23.1%	.0%	5.2%
Sugar	Count		2	2	2	0	5	0	0	0	11
	%		3.5%	4.3%	2.5%	.0%	5.9%	.0%	.0%	.0%	3.2%
Wine	Count		5	5	9	1	9	1	0	5	35
	%		8.8%	10.9%	11.4%	2.9%	10.6%	5.6%	.0%	41.7%	10.1%
Total	Count		57	46	79	35	85	18	13	12	345
	%		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

We can analyse all other variables in the data-set on contrasting cases and tendencies. In Table 3, we have characterized the clusters with some key words that help to see the difference between them. As these characteristics (profiles) are based on averages and a combination of variables, each individual cooperative in each cluster might not correspond completely to these profiles.

Table 3: Profiles of the eight clusters of cooperatives

Cluster	Name	Profile (key distinctive characteristics)
A	Second-tier Cooperatives	<ul style="list-style-type: none"> • high turn-over per member • tiny - small membership • homogeneous • mostly outside North Sea area • board managed • trading with non-members
B	Supply Cooperatives	<ul style="list-style-type: none"> • stagnant growth • spread over Europe • no processing • no branded products • one-member-one-vote

C	Bargaining Cooperatives	<ul style="list-style-type: none"> • stagnant • especially Central European • bargaining • no branded products • partial liability • non-differentiating
D	Specialized (Processing) Cooperatives	<ul style="list-style-type: none"> • steady growing • high turnover-member • relatively homogeneous • no bargaining • producing final consumer goods • branded products • professionally managed
E	Large Agribusiness Cooperatives	<ul style="list-style-type: none"> • large turnover • relatively heterogeneous • especially in North Sea area • primary processing • producing final consumer goods • bulk and private labels • branded products • transnational membership • relatively many holdings • differentiation
F	Niche Market Cooperatives	<ul style="list-style-type: none"> • medium sized • board managed • differentiated costs policy • marketing on differentiation • focussed
G	Emerging Cooperatives	<ul style="list-style-type: none"> • high growth rate • tiny membership • especially Central European • very new • bargaining • non-processing • low capital contribution • board managed • member-centred • no volume based premium • no differential costs
H	Regional Specialties Cooperatives	<ul style="list-style-type: none"> • low turnover per member • especially North Sea area • especially in wine and dairy • bargaining • no wholesale • high liability • high specialized farmers • differentiated costs • no cost leadership • differentiation

4. Further Exploration of the regional clusters

We further explored the differences between the cooperatives from different regions. As dependent variable we used the turnover per member (which can be considered as a kind of performance measure). We selected only cooperatives with more than 20 members. Table 4 presents the descriptive statistics for the relationship among turnover-per-member, sector and geographic region.

We see that for each commodity there are contrasting cases that illustrate the characteristics of the cooperatives in each region:

- The cereal cooperatives in the North Sea area are much bigger than their Mediterranean counterparts.
- In the dairy sector, the average cooperative in the sample in Mediterranean region is bigger than their North Sea counterparts. However, the relatively high standard deviation in North Sea area indicates that there are some cooperatives in the sample with very high turnovers and some others that have much lower turnover-per-member.
- The fruit and vegetable cooperatives in the Mediterranean are also relatively large in their turnover per member.
- Much more prominent is the difference between the Mediterranean pig cooperatives relative to the cooperatives in the rest of Europe. The turnover-per-member is far higher, indicating an (average) membership of relatively large farms.

Table 4. Descriptive statistics for turnover-per-member in sectors and regions

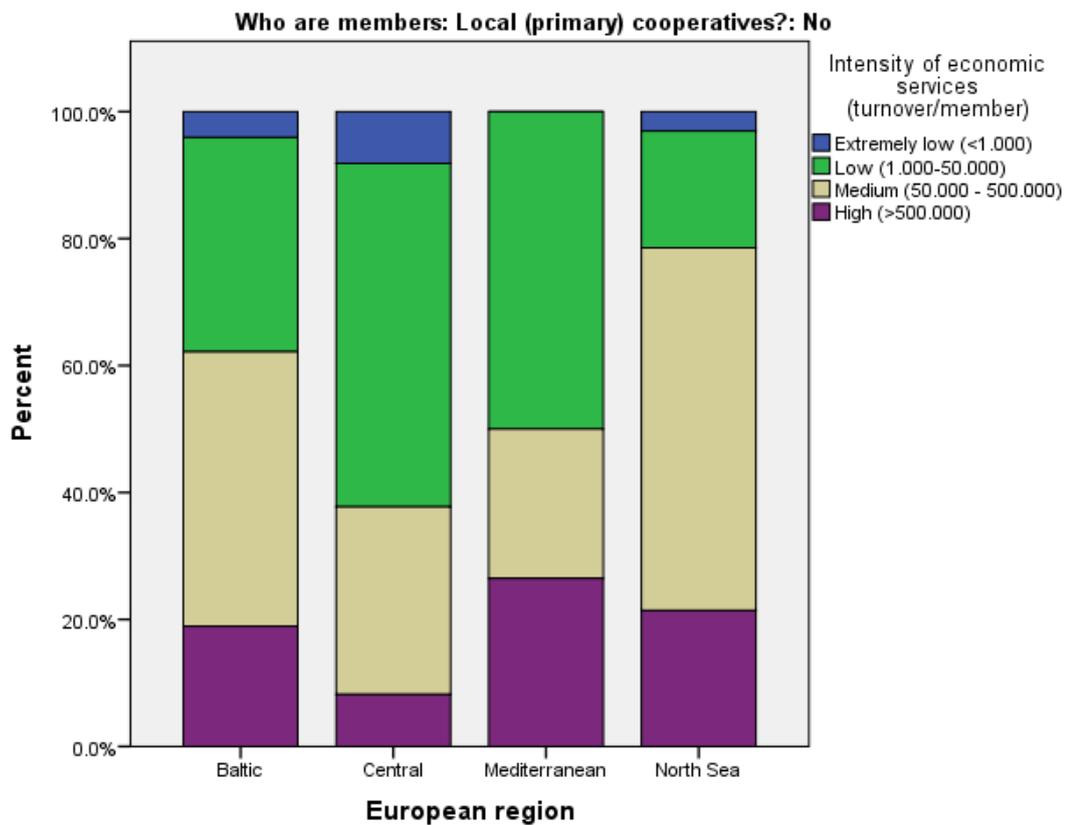
Sector	European region		N	Mean	Std. Deviation
Cereals	Baltic	turnover_member	13	68995.5759	46184.10694
		Valid N (listwise)	13		
	Central	turnover_member	24	51297.3386	122087.88324
		Valid N (listwise)	24		
	Mediterranean	turnover_member	13	351126.9587	695830.58858
		Valid N (listwise)	13		
	North Sea	turnover_member	20	3035005.2977	12895938.13891
		Valid N (listwise)	20		
Dairy	Baltic	turnover_member	26	232125.8595	295326.74101
		Valid N (listwise)	26		
	Central	turnover_member	20	177745.5328	300418.17891
		Valid N (listwise)	20		
	Mediterranean	turnover_member	14	1219957.8186	1697219.94009
		Valid N (listwise)	14		
	North Sea	turnover_member	42	477291.1493	2002333.93249
		Valid N (listwise)	42		

Fruit and vegetables	Baltic	turnover_member	15	399348.7980	535276.64195
		Valid N (listwise)	15		
	Central	turnover_member	16	111974.7227	202934.08719
		Valid N (listwise)	16		
	Mediterranean	turnover_member	21	1822704.9406	4474730.38446
Valid N (listwise)		21			
North Sea	turnover_member	28	1093659.2381	1894778.31941	
	Valid N (listwise)	28			
Olives and olive oil	Central	turnover_member	2	31488.4924	43958.20457
		Valid N (listwise)	2		
	Mediterranean	turnover_member	12	394031.2256	1077086.06583
		Valid N (listwise)	12		
Pig meat	Baltic	turnover_member	7	307975.7932	545801.09966
		Valid N (listwise)	7		
	Central	turnover_member	6	220191.5372	228319.73967
		Valid N (listwise)	6		
	Mediterranean	turnover_member	7	1099321.5543	946337.56442
		Valid N (listwise)	7		
	North Sea	turnover_member	13	436134.5206	551282.54243
		Valid N (listwise)	13		
Sheep meat	Baltic	turnover_member	1	81.8182	.
		Valid N (listwise)	1		
	Central	turnover_member	9	33139.5855	24554.11076
		Valid N (listwise)	9		
	Mediterranean	turnover_member	1	43753.2291	.
		Valid N (listwise)	1		
	North Sea	turnover_member	4	89288.8509	81626.89639
		Valid N (listwise)	4		
Sugar	Baltic	turnover_member	1	152.3603	.
		Valid N (listwise)	1		
	Central	turnover_member	3	141229.6789	108169.85269
		Valid N (listwise)	3		
	Mediterranean	turnover_member	2	32355.4214	19941.79516
		Valid N (listwise)	2		
	North Sea	turnover_member	4	182922.4651	110742.88366
		Valid N (listwise)	4		
Wine	Central	turnover_member	13	14810.5720	13867.63508
		Valid N (listwise)	13		
	Mediterranean	turnover_member	16	440754.0687	1564923.88013
		Valid N (listwise)	16		

North Sea	turnover_member	11	244828.3595	425669.76122
	Valid N (listwise)	11		

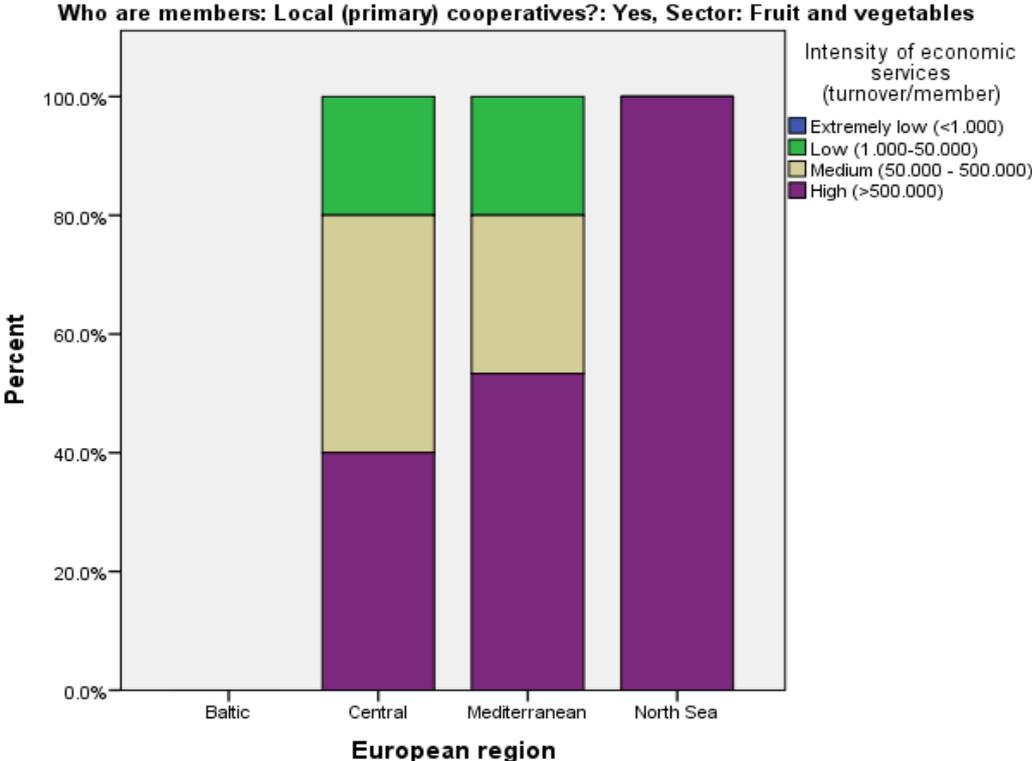
Central Europe has many cooperatives in the sample that have a low turnover per member. The North Sea cooperatives in the sample have a relative high turnover per member. This is influenced by the way that members are defined. In the following graph we present only those cooperatives that reported direct affiliation of farmers (thus excluding second-tier cooperatives).

Figure 1. Distribution of cooperatives over turnover-per-member classes, in four regions (primary cooperatives)



For second-tier cooperatives there is no significant differences between the different regions. Of course, there will be difference when we look at specific sectors. Interesting contrasting cases are in the fruit and vegetable sector where second-tier cooperatives in the North Sea area all have high turnover per member, while in Central Europe and the Mediterranean region there are also cooperatives in the sample that have more modest turnover per member. However, these figures should be interpreted with care as the number of second-tier cooperatives is rather limited.

Figure 2. Distribution of cooperatives over turnover-per-member classes, in four regions (second-tier cooperatives)



Another interesting issue is the way the cooperatives are managed. Generally, one can make a distinction between cooperatives that are managed by the Board of Directors (BoD), often with the chairman of the board functioning as the CEO, and cooperatives that have a professional manager as CEO. In the latter cooperatives the BoD remains responsible for the strategic decisions, but the operational management is left to the professional.

Figure 3 shows that while in three regions the distribution is more or less equal, with half of the cooperatives being run by a professional manager and half of them by the BoD, in the North Sea region a clear majority of the cooperatives leaves operational management to a professional manager (this is also statistically significant).

As to the marketing strategy (and thus the position in the food chain), an important indication is the importance of branded products in the sales of the cooperative. Figure 4 shows that there is a significantly lower incidence of branding as a marketing strategy in the cooperatives of the Central region compared to the other regions.

If we ask the question about the extent of branding in the different sectors of our study, we find the following results (Figure 5). Not surprisingly, cooperatives in the wine sector use significantly more brands as part of their marketing strategy. Then next sector where branding is important is the dairy sector. Also in F&V and olives/olive oil, as substantial number of cooperative sell under a brand name. Surprising are the findings for sheep meat, which also seem to be sold under a brand by quite a number of cooperatives.

Figure 3. Operational management in the hands of BoD or of professional manager

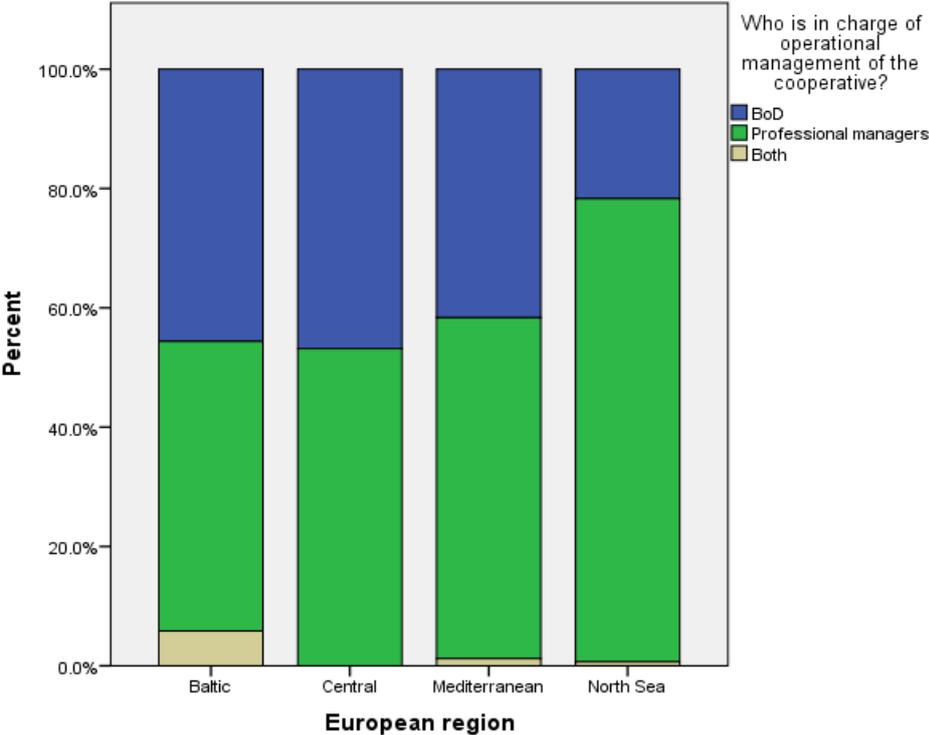


Figure 4. The importance of branding in the marketing strategy of the cooperative, per region of the EU.

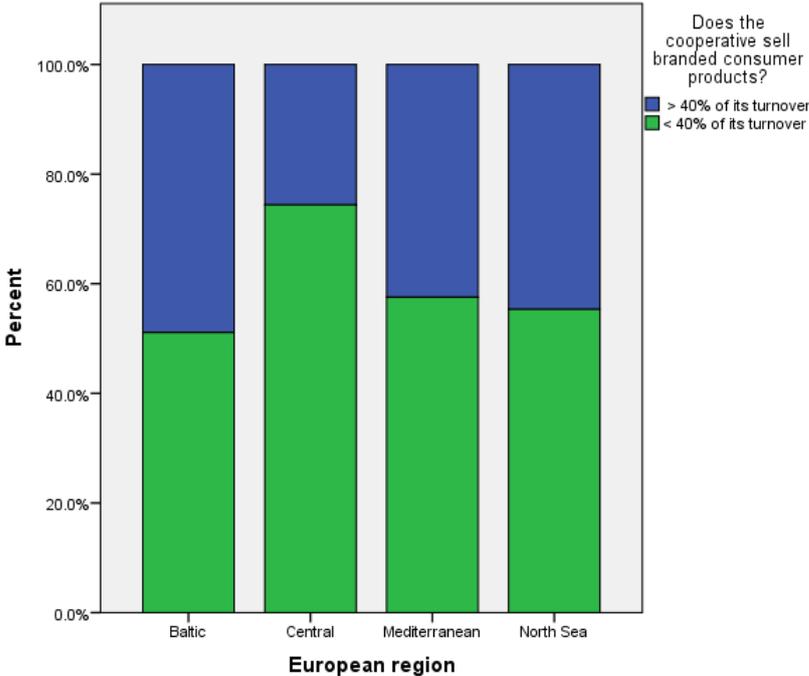
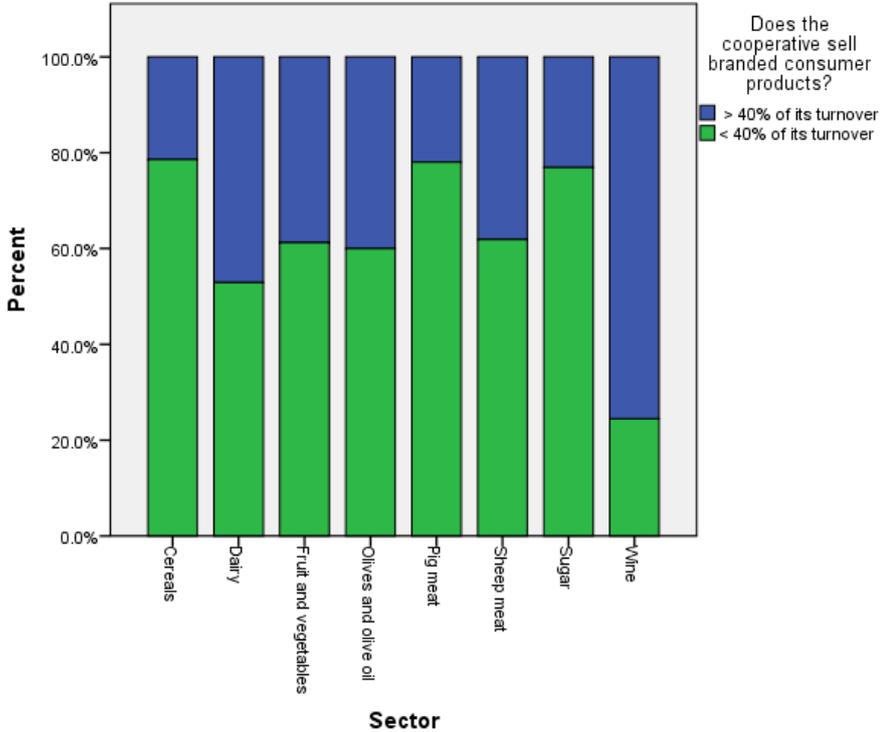


Figure 5. The importance of branding in the marketing strategy of the cooperative, per sector.

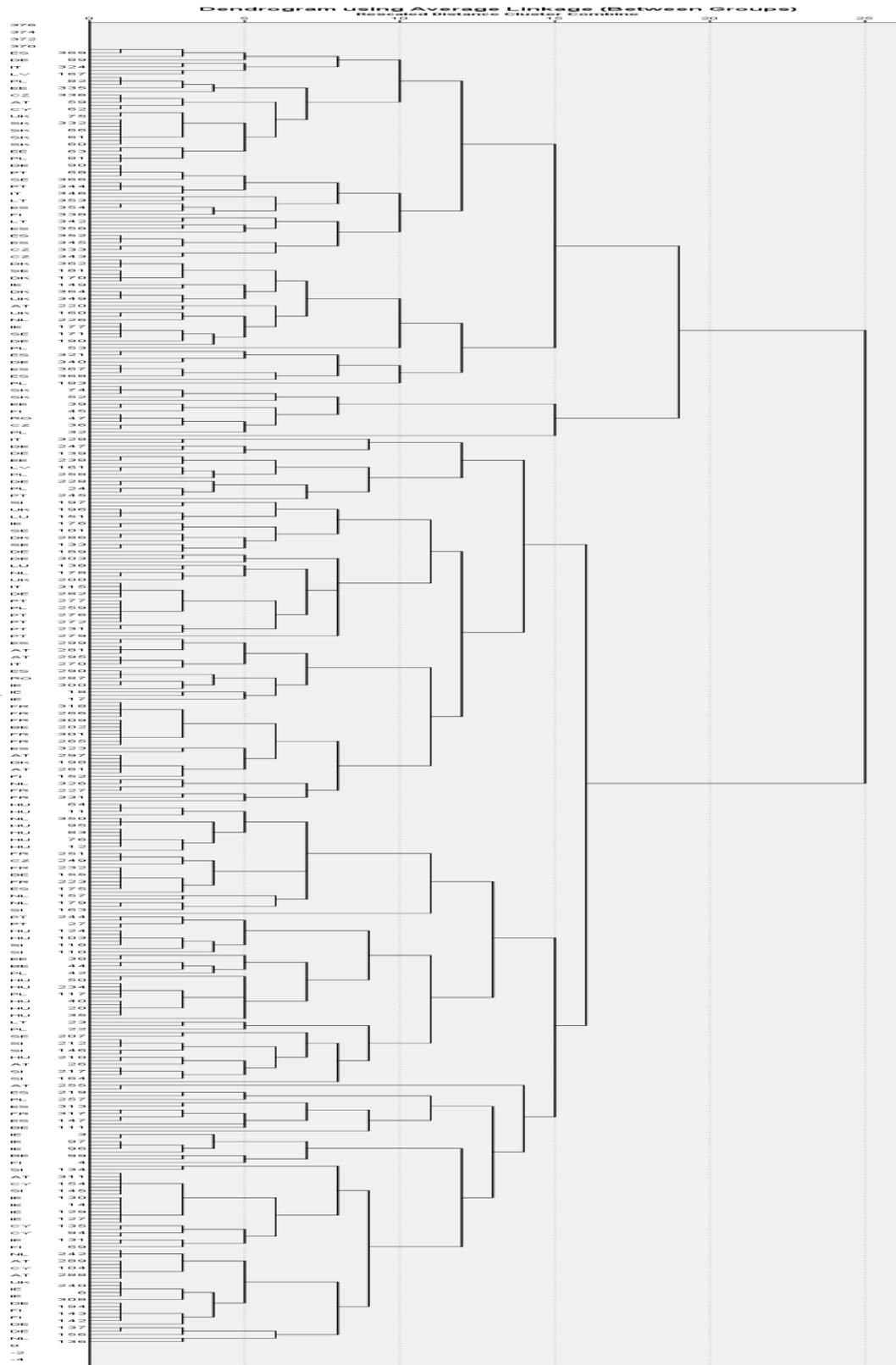


5. Conclusions

For this brief report on clustering agricultural cooperatives in the EU, we applied hierarchical clustering and found eight meaningful clusters, ranging from small emerging cooperatives, which can be found particularly in the Eastern Member States, to large, international agribusiness cooperatives, which can be found in several regions of the EU, but dominate in the North Sea region.

In addition to developing the clusters, we also explored a number of differences among cooperatives from the four different regions of the EU. Cooperatives in the Central region are clearly smaller, and make fewer use of a branded product marketing strategy. The cooperatives in the North Sea area are larger than cooperatives in other regions, particularly in dairy and sugar. Potentially linked to the size of the cooperative is the issue of professional management or not; cooperatives in the North Sea area significantly have more professional managers taking care of operational management, compared to Board of Directors being in charge of operational management.

Appendix 1: Dendrogram derived from the Hierarchical Cluster Analysis



Appendix 2. ANOVA results of comparing clusters

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Specialisation	Between Groups	2.018	7	.288	4.664	.000
	Within Groups	22.135	358	.062		
	Total	24.153	365			
Intensity of economic services (turnover/member)	Between Groups	126.129	7	18.018	53.769	.000
	Within Groups	119.969	358	.335		
	Total	246.098	365			
Size of the membership	Between Groups	329.796	7	47.114	199.267	.000
	Within Groups	84.644	358	.236		
	Total	414.440	365			
What was the position of the coop in the food chain in 2010? In collective bargaining (e.g. bargaining association)	Between Groups	14.322	7	2.046	9.762	.000
	Within Groups	75.036	358	.210		
	Total	89.358	365			
What was the position of the coop in the food chain in 2010? In primary processing (producing intermediary products for the food industry)	Between Groups	31.020	7	4.431	26.578	.000
	Within Groups	59.690	358	.167		
	Total	90.710	365			
What was the position of the coop in the food chain in 2010? In marketing branded products	Between Groups	37.369	7	5.338	35.322	.000
	Within Groups	54.107	358	.151		
	Total	91.475	365			
Who is in charge of operational management of the cooperative?	Between Groups	31.827	7	4.547	25.243	.000
	Within Groups	64.482	358	.180		
	Total	96.309	365			
Do members have the legal obligation to deliver all their products to the cooperative?	Between Groups	24.915	7	3.559	19.137	.000
	Within Groups	66.585	358	.186		
	Total	91.500	365			

Appendix 3. Regional classification of the 27 EU Member States

Baltic Region (7 MS):	Denmark (DK), Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Finland (FI) and Sweden (SE)
Central Region (7):	Bulgaria (BG), Czech Republic (CZ), Hungaria (HU), Austria (AT), Romania (RO), Slovenia (SI), and Slovakia (SK)
Mediterranean Region (6):	Cyprus (CY), Greece (GR), Spain (ES), Italy (IT), Malta (MT) and Portugal (PT)
North Sea Region (7):	Belgium (BE), Germany (BE), Ireland (IE), France (FR), Luxemburg (LU), The Netherlands (NL) and United Kingdom (UK)