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The Relevance of the Policies of Development in the Agri-Food Sector of Emilia-Romagna Region

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THE RELEVANCE OF THE POLICIES OF DEVELOPMENT IN THE AGRI-FOOD SECTOR OF EMILIA-ROMAGNA REGION

Cristina Brasili and Mirko Bonetti¹

Abstract

The aim of this paper is to analysis the impact of the policies of development and investments in the food industry at geographical and enterprises levels. We will analysis how the different geographical areas inside the Italian region Emilia-Romagna are sensitive to the development policies. A Principal Component Analysis and a Cluster Analysis will be applied to determine the most homogeneous geographical areas with respect to the considered variables. Then for evaluating the sensibility of these areas with respect to changes in investments and policies for food industry enterprise will be applied a Multicriterial Analysis and a Sensitivity Analysis.

Keywords

Agri-food sector, Development Policies, Food industry, Multicriterial Analysis, Region Emilia-Romagna, Sensitivity Analysis.

1. The food industry in Emilia-Romagna

In the last ten years, many important structural changes have taken place in the Italian agri-food industry. There has been development in both big industrial enterprises, based on foreign investments, and of several middle and small enterprises which characterise specific “agri-food districts”. In this situation, the Emilia-Romagna region has played a crucial role, because the position of its food industry is a consequence of great structural changes in Italy. Since 1945 many big enterprises who play a crucial role in the Italian food industry have developed in Emilia-Romagna (Barilla, Cremomini, Amadori, Granarolo, Unibon, Conserve Italia, Apofruit and Orogel). Agri-food districts within Emilia-Romagna also play an important role; in fact, some of them, for example Parmigiano Reggiano, Prosciutto di Parma and the district of Forlì, characterise and influence the regional food industry. These districts are characterised by the presence of deep specialisation processes together with old product traditions.

2. The financial support to investments of food enterprises in Emilia-Romagna

A positive contribution to the changes of the food industry in the 1990s has been given by the regional and EU financial support for the development of this sector. This support for developing and improving the agri-food system has been notable at regional and EU level.

The regional law n.39/1999 “Supports for the development of agri-food system”, points to sustain and qualify the system of the regional agri-food enterprises. More than 20.6 millions of euro for 2003 and 10.3 millions of euro for 2004 has been made available; these supports will be used for investments for development and structural actions and will be regarded as regional agri-food enterprises. The regional enterprises presented 276 demands and of these, 205 have been financed.

The regulation EEC n.886/90 and regulation EEC n.951/97, both regarding the objective 5.a of the structural policies and the measure 1.g regarding the actual “Support for rural development” (2000-2006), plan actions and assist the improvement of conditions of transformation and commercialisation of agricultural products. The support to measures regarding reg. EEC n.866/90 and EC n.951/97, have been realised by Operational Programmes, presented to the countries in reference to the Community Support Framework.

In Emilia-Romagna, during the period 1994-1999, there have been two Operational Programmes: the first for the period 1994-96 and the second for the period 1997-99. The participation to both programs has been high: totally around 500 enterprises have presented demands with investment amounts over 1.500 billion lire. The demands increased from 192 for the first period to 305 for the second period, but it has only been possible to support the 23.4% of these. The aid, given to the enterprises, has been more than 104 billion lire.

A third of this aid has been given to the fruit and vegetable sector and a fifth to the sectors of dairy, meat and wine. The distribution of this aid at a provincial level shows that the provinces of Modena and Forlì received 20% of each, then Bologna (15%) and Piacenza and Parma (between 11-12%).

Analysing the data about the measure 1.g, we notice that the precedent list of provinces has changed. In this period 119.6 million euro (231.58 billion lire) improved the conditions of transformation and commercialisation of agricultural products. There have been 77 approved projects: of these, 53 regard the areas of Objective 2. A fourth of this aid has been given to the province of Parma (around 25.5%), then Modena (16%), Ravenna (14%) and Piacenza (14%). Rimini has been the only province that has not presented request for support: confirming it as a lower projective tendency in the agri-food system.

3. The homogenous areas of the agri-food sector in Emilia-Romagna

Our analysis will allow us, starting from the individual regional agri-food areas, to evaluate their sensibility with regard to changes in investments and policies for food industry

enterprises. We considered 80 variables at municipal level² such as the sectors belonging to the regional food industry, the dynamic of the LU³, workers, size and the supports and investments.

We have applied the Principal Component Analysis (PCA) to all these 80 variables. We have defined 19 new variables (principal component), as a linear combination of the 80 variables that we have considered. This new group of variables explains 84% of the total variance⁴.

Then we applied the Cluster Analysis (CA) to these 19 new variables, for identifying the clusters with the most homogenous characteristics with respect to the structure, specialisation and the more relevant investments in the regional food industry. We have identified 10 clusters of municipalities, but their numerical composition is very different. Each cluster's size and typology is reported in table 1 and presented in figure 1.

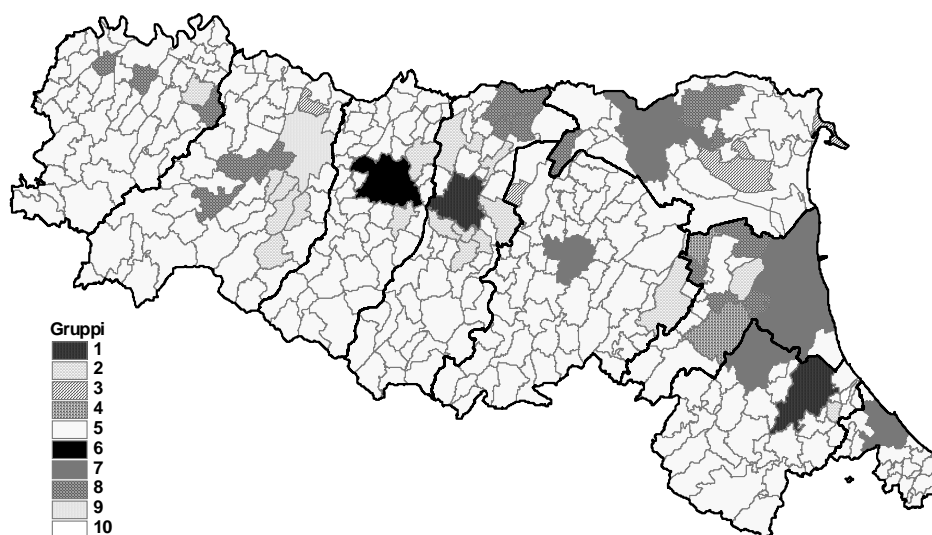
The results of the CA evidence a very fragmented regional reality, with different situations strongly characterised by the presence of the food industry, and a large area with a small agri food sector. Each of the clusters is defined below.

Table 1 – The agri-food areas in Emilia-Romagna

<i>Cluster</i>	<i>Typology</i>	<i>Municipalities</i>
1	Modena and Cesena	2
2	Transformation of the pork meat	18
3	Municipalities without food enterprises	6
4	Faenza and Conselice	2
5	Small dimension municipalities	289
6	Reggio-Emilia	1
7	Bologna and cities of Romagna	5
8	Middle dimension dairy sector	16
9	Parma	1
10	Gatteo	1

Source: An elaboration from ISTAT and Emilia-Romagna's agriculture councillorship data

Figure 1 – The agri-food areas in Emilia-Romagna



Source: Our elaboration from ISTAT and Emilia-Romagna's agriculture councillorship data

Cluster 1 – Modena and Cesena. These two municipalities are located in different socio-economic contexts, but they have in common a high degree of specialisation in the meat sector (pork and beef in Modena, poultry in Cesena), with medium to large establishments; the size of the establishments has grown from 69 workers per LU in 1991 to around 104

workers per LU in 1996. Both municipalities specialise in the fruit and vegetable sector, but the average size of the establishments has decreased from 46 workers per LU in 1991 to around 32 per LU in 1996; this decrease has been caused by the crisis and the restructure of the sector during the second part of 1990s. The project and investment capacity respects the regulations regarding the improvement of the conditions of transformation and the commercialisation of agricultural products. Considering the average supports in the two considered periods, these two municipalities have the highest average expenditure: around 5.4 billion lire in 1994-96 and about 7.8 billion lire in 1997-99.

Cluster 2 – Transformation of the pork meat. This cluster includes 18 municipalities, principally situated in the area between Parma and Modena, with a traditional meat sector and an important feed production sector. This is the most relevant cluster regarding the feed sector, with over 770 workers in 1991 and over 700 in 1996; The average size of establishments is 36 workers per LU (only Reggio Emilia with 39 workers per LU is greater). This cluster is also relevant in reference to supports and investments: the average support is 1.1 billion lire in 1994-96 (third place), 1.7 billions lire in 1997-199 (fifth place) and the total support for the whole period 2000-2004 has been around 2.2 million euro.

Cluster 3 - Municipalities without food enterprises. This cluster included 6 municipalities, which have no specialisation in the food industry sector; there are very few LU (principally in the fish sector) and very little investment in the food-industry. These municipalities, located in different areas of the region, are Torrile (PR), Sant'Agata Bolognese (BO), Ostellato, Goro, Migliaro (FE) and Cattolica (RN).

Cluster 4 - Faenza and Conselice. Both these municipalities belong to the province of Ravenna. In the fruit and vegetable sector, they had over 139 workers per LU in 1991, with a larger than average establishment size inside the clusters, but in 1996 this average size decreased to around 36 workers per LU. The workers reduced from 1 394 to 180 and the LU decreased around 50%. This cluster is also characterised by the oil and fats sector (vegetable and animal fats), that confirmed the same LU (3), whereas workers have declined from 368 to 412, during 1991 and 1996, reaching an average establishment size of 137 workers per LU. These two municipalities have requested 9 projects, receiving 6.7 billion lire in the period 1994-96, 4.5 billion lire in the period 1997-99 and around 5 million euro in the period 2000-02, of which it has not yet been spent. Of these 9 projects, 8 related to the technological aspect, the structure and the modernisation of fruit and vegetable establishments. These data show that the enterprises in this cluster are pushing to modernise regardless of any potential crisis situation.

Cluster 5 - Small dimension municipalities. This is the largest cluster with 289 municipalities, covering the whole regional area. In these municipalities there are mainly small sized food enterprises across all food sectors: in fact the share of workers in LU with more than 100 workers was the lowest in the 10 clusters. In 1991 the LU was 20% and in 1996 it declined to 13.5%. The average value of the investments has been the lowest in all considered periods.

Cluster 6 – Reggio-Emilia. This cluster includes only the municipality of Reggio-Emilia. There are three relevant sectors: meat, feed and dairy. The dynamics, between 1991 and 1996, of the enterprises involved in these sectors has been the same: a substantial reduction of the average establishment size. The capacity to obtained high support has reduced drastically in the following periods (1.1 billion lire in the period 1994-96).

Cluster 7 - Bologna and cities of Romagna. In this cluster there are five big municipalities of Emilia-Romagna: Bologna, Ferrara, Ravenna, Forlì and Rimini. The prevalent sector is food transformation (processing) and they have the highest average of LU per municipality 174 in 1991, which increased to 193 in 1996. The average size of establishments in the sector is not large, even if there are some big LU producers of pasta (the enterprise “Corticella” in Bologna), of stove products, packed in Ravenna and Rimini (“Piadina” and other typical products) and of sugar (Forlì). Another important sector, in 1991, was the fruit and vegetable sector with 1 242 workers across all the five municipalities, by 1996 this value had decreased to 365 workers, whereas the LU has fallen from 26 to 21. The

project and investment capacity has been very high for the period 1997-99 with an average value of around 4.8 billion lire.

Cluster 8 – Middle dimension dairy sector. This cluster includes 16 municipalities of the provinces of Piacenza, Parma, Modena, Ferrara and Ravenna. The principal sectors are the dairy, fruit and vegetable, and other food transformation. The size of the enterprises involved in these sector are over the regional average. In fact the share of workers in enterprises with more than 100 workers was, more than 66% in 1991 and in 1996 was around 64%. The average size of the enterprises of the dairy sector were higher than the other clusters (44 workers per LU in 1991 and around 28 workers per LU in 1996). In the fruit and vegetable sector, the workers have reduced to 4 314 in 1991 to 2 981 in 1996, but this reduction is not as drastic as that in cluster 7. The project and investment capacity has been increased in recent years with support of over 1.3 million euro per municipalities.

Cluster 9 – Parma. The most relevant sector is other food transformation: in fact in this area there is some very large enterprises, one of these is “Barilla”. In 1991, the LU was 128 and there were 3 079 workers; in 1996 the LU remained the same, but the number of workers increased to 4 449. The average size of establishments in this sector are significantly larger than in the other clusters. The financial support has only been consistent in the period 1997-99 with a value of 1.3 billion lire.

Cluster 10 – Gatteo. In this municipality in the province of Forlí there was only 1 LU in the meat sector with 258 workers in 1991 and 2 LU with 61 workers in 1996. In the period 1997-99 the financial support was 4 billion lire for the sector of meat, and for this reason Gatteo has been included in a single cluster.

Our analysis allow us to show a distribution of the food industry around the “via Emilia”. The location of the regional food industry follows the areas of specialised production in regional agriculture, particularly the areas with higher productivity. The evolution of the location and specialisation of the food industry has been greatly influenced by the recent increase of trade (import – export exchange), which has become more important over the last years.

4. The suitability of policy to the homogenous areas

For evaluating the suitability of the investments and policies for the food industry enterprises to the previously identified regional areas, we have applied a Multicriterial Analysis (MCA) and a Sensitivity Analysis (SA). In order to determine the characteristics, that could influence the suitability of the clusters in the food industry, we suppose that the evolution of the food sector in Emilia-Romagna depends to two aspects which define two different scenarios.

In the first scenario (Scenario 1: structure and specialization of the food industry in Emilia-Romagna), we consider the specific variables, from the 80 available variables, regarding this structure and specialisation; in the second scenario (Scenario 2: development and innovation of the food industry in Emilia-Romagna), we consider, again from the available variables, the variables about support and investments. We have chosen 22 variables for Scenario 1 and 17 variables for Scenario 2: in Scenario 1 the value of each variable in each cluster has been calculated by arithmetic mean (see Appendix A) and in Scenario 2 some values have been calculated by arithmetic mean and others by weighted average, where as weight we have considered the total LU of the food system in 1996 (see Appendix B).

In the MCA each cluster represents an alternative and each variable an attribute. For each scenario we have obtained a matrix where each element represents the value of the attribute in the generic alternative. As it was not possible to determine an ordering of the alternatives, we have utilised the Multi Attribute Analysis⁵; that has allowed us to obtain an ordering of the alternatives inside the two scenarios (table 2).

Table 2 - Ordering of the alternatives inside the two scenarios

Scenario 1: structure and specialization		Scenario 2: Development and innovation	
<i>Weight</i>	<i>Cluster</i>	<i>Weight</i>	<i>Cluster</i>
0,25	9	0,27	1
0,14	4	0,15	4
0,14	6	0,14	6
0,13	10	0,11	9
0,12	1	0,08	5
0,08	3	0,07	7
0,06	8	0,06	2
0,05	7	0,06	10
0,02	2	0,04	8
0,01	5	0,01	3

The range of the weights is the same in both scenarios, showing a similar relevance of the two considered aspects: specialisation and investment. The ordering of the alternatives is however, different inside each scenario, and this means that the clusters have not the same “sensitivity” with respect to the changes of specialisation and investment.

Scenario 1 - structure and specialization of the food industry in Emilia-Romagna

Initially there is cluster 9, which includes Parma, that plays an important role in the regional agri-food system. Secondly, far removed from the first cluster, there are clusters 4 and 6, confirming the important role of the territorial specialisation and concentration. Finally, clusters 1 and 10, that also underline the relevance of specialisation inside the regional food industry.

Scenario 2 - Development and innovation of the food industry in Emilia-Romagna

Cluster 1 (Modena and Cesena), as we have seen, is more active in support and investments. Clusters 4 and 6 are once again they remain in fourth place, probably because the investment has always been high and less influenced by common regulations.

Finally through the SA, we have evaluated as to whether the ordering in these two scenarios could change if the weights of the variables are varied.

This analysis has been conducted firstly with respect to variations in the specialization and structural processes and then to the changes of development and investments in the agri-food system.

The results from scenario 1 show that an increase of the weight of the average size of the establishments in the fruit and vegetable sector, could be an advantage for cluster 8 (the 16 municipalities of the provinces of Piacenza, Parma, Modena, Ferrara and Ravenna). It may be necessary to restructure another process in these municipalities. A variation of workers in the meat sector could strongly influence cluster 1 (Modena and Cesena); these municipalities could be advantaged by an increase in concentration of their production. Finally, only cluster 1 would be sensitive in respect to a change of the average size of establishments, because it is able to take advantage of scale economies (see Appendix C).

In scenario 2, we notice that the change of supports for the period 2000-2002 could be important for the clusters 6 and 2, which are specialised in the pork sector, while the approved support in the same period could be advantageous to cluster 4 (see Appendix D).

Conclusions

The analysis of the different “sensitivities” of the clusters, that we have identified as homogenous in the agri-food system of Emilia-Romagna, put in evidence the importance of the specialisation process developed in previous years both inside the agricultural and the food industries. The good reaction of some agri food sectors to the opportunities given by the EU about the innovation and investment in this crucial economic sector of the region Emilia-Romagna deserves to be emphasised.

Appendix A

Scenario 1: values of the considered variables

<i>Variables</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
Workers Wheat - 1996	44,50	9,61	3,33	9,00	2,50	39,00	35,60	11,19	75,00	372,00
Workers/LU Wheat - 1996	9,33	3,42	2,42	2,60	1,59	6,50	5,90	5,90	10,71	372,00
Workers Fish - 1996	0,00	0,00	33,33	0,00	0,24	0,00	8,40	0,06	17,00	0,00
Workers/LU Fish - 1996	0,00	0,00	33,33	0,00	0,18	0,00	5,90	0,06	17,00	0,00
Workers Fruit - 1996	269,00	7,22	0,00	90,00	5,20	0,00	73,00	186,31	686,00	0,00
Workers/LU Fruit - 1996	27,76	5,92	0,00	30,92	3,37	0,00	17,75	85,16	49,00	0,00
Workers Oil - 1996	0,00	0,72	0,17	206,00	0,79	0,00	45,20	0,00	41,00	0,00
Workers/LU Oil - 1996	0,00	0,64	0,17	158,75	0,67	0,00	16,80	0,00	20,50	0,00
Workers Feed - 1996	45,50	39,11	12,17	7,50	2,22	296,00	22,80	1,88	154,00	0,00
Workers/LU Feed - 1996	8,42	18,58	10,42	1,88	1,54	26,91	5,13	1,88	51,33	0,00
Workers Beverages - 1996	174,50	15,89	2,33	132,00	5,35	283,00	110,40	14,88	59,00	0,00
Workers/LU Beverages - 1996	23,83	4,52	2,33	28,00	3,49	18,87	15,24	4,79	8,43	0,00
Workers Meat - 1996	1.140,00	335,11	12,67	74,00	15,96	833,00	111,20	47,88	201,00	61,00
Workers/LU Meat - 1996	139,27	19,15	3,75	22,57	5,07	34,71	13,50	9,91	9,14	30,50
Workers other Products - 1996	676,50	67,28	60,17	178,50	37,26	56,00	991,40	98,69	4.449,00	43,00
Workers/LU other Products - 1996	5,11	3,81	6,57	5,99	4,45	4,00	4,98	15,91	34,76	3,31
Workers Milk - 1996	144,00	33,89	12,33	15,00	14,21	667,00	51,80	88,31	374,00	7,00
Workers/LU Milk - 1996	5,10	3,64	2,17	2,92	2,95	8,78	3,00	15,34	4,40	2,33
Total LU 1996	194,00	55,11	17,50	54,50	14,65	146,00	242,40	23,13	269,00	19,00
Total Workers 1996	2.494,00	508,83	136,50	712,00	83,73	2.174,00	1.449,80	449,19	6.056,00	483,00
LU 1996/1991	26,00	2,72	0,00	5,00	1,57	-104,00	35,20	0,63	38,00	5,00
% Workers 1996/1991	9,05	-4,50	-13,33	-46,95	9,26	-33,31	-7,46	-21,59	26,77	58,88

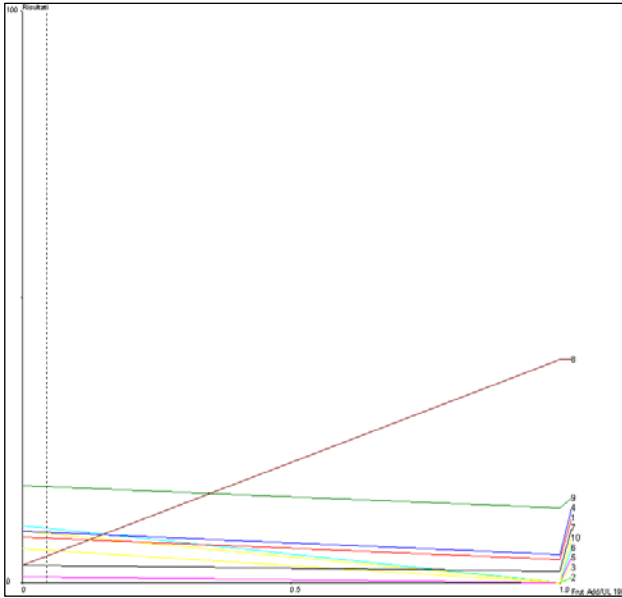
Appendix B

Scenario 2: values of the considered variables

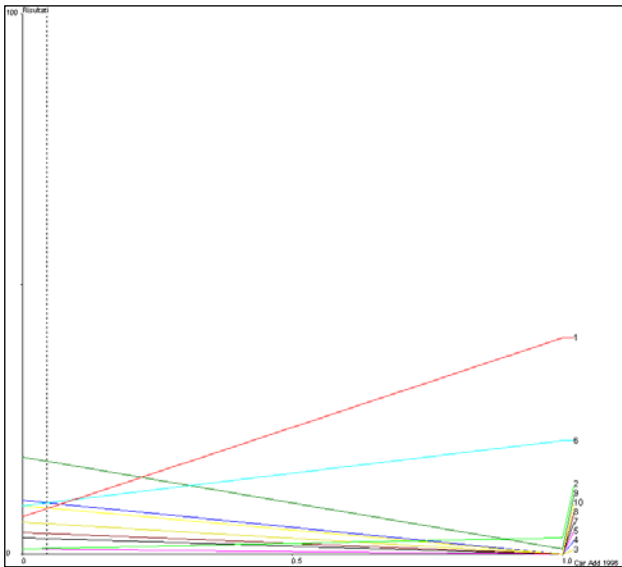
<i>Variables</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>
Supports 951/97 - 1994/1996 *	2,50	0,61	0,00	1,00	0,15	1,00	0,53	0,14	0,00	0,00
Supports 951/97 - 1997/1999*	3,50	0,91	0,00	3,25	0,18	1,00	2,04	0,35	1,00	1,00
Supports 1257/99 – 2000/2004*	1,50	1,62	0,00	1,50	0,20	2,00	0,24	0,70	1,00	0,00
Support area 951/97*	0,00	0,00	0,00	0,00	0,01	0,00	0,00	0,00	0,00	0,00
Support area 1257/99*	0,00	0,04	0,00	0,75	0,03	2,00	0,24	0,04	0,00	0,00
Costs 951/97 - 1994/1996 (billion £)*	5,402	1,374	0,00	3,425	0,240	1,100	0,884	0,413	0,00	0,00
Costs 951/97 - 1997/1999 (billion £)*	8,618	1,702	0,00	6,599	0,333	0,368	4,774	0,577	1,300	4,0
Costs 1257/99 – 2000/2002 (€)	2.592.023,74	2.150.537,08	0,00	3.740.344,52	245.817,70	958.500,00	208.692,07	1.318.189,49	1.185.400,00	0,00
Expenditure 951/97 - 1994/1996 (billion £)*	5,402	1,140	0,00	3,419	0,238	1,100	0,883	0,411	0,00	0,00
Expenditure 951/97 - 1997/1999 (billion di £)*	7,782	1,702	0,00	6,574	0,323	0,368	4,665	0,575	1,300	4,0
Expenditure 1257/99 – 2000/2002 (€)*	503.403,37	208.340,41	0,00	0,00	13.920,38	214.750,00	0,00	0,00	0,00	0,00
Total LU 1996**	194,00	55,11	17,50	54,50	14,65	146,00	242,40	23,13	269,00	19,00
Total Workers 1996**	2.494,00	508,83	136,50	712,00	83,73	2.174,00	1.449,80	449,19	6.056,00	483,00
LU 1996/1991**	26,00	2,72	0,00	5,00	1,57	-104,00	35,20	0,63	38,00	5,00
% Workers. 1996/1991**	9,05	-4,50	-	-46,95	9,26	-33,31	-7,46	-21,59	26,77	58,88
Average Workers 1991**	14,89	11,30	13,35	30,91	6,26	13,04	8,06	29,59	20,68	21,71
Average Workers 1996**	13,81	9,76	8,74	15,32	5,41	14,89	5,98	23,08	22,51	25,42

Appendix C

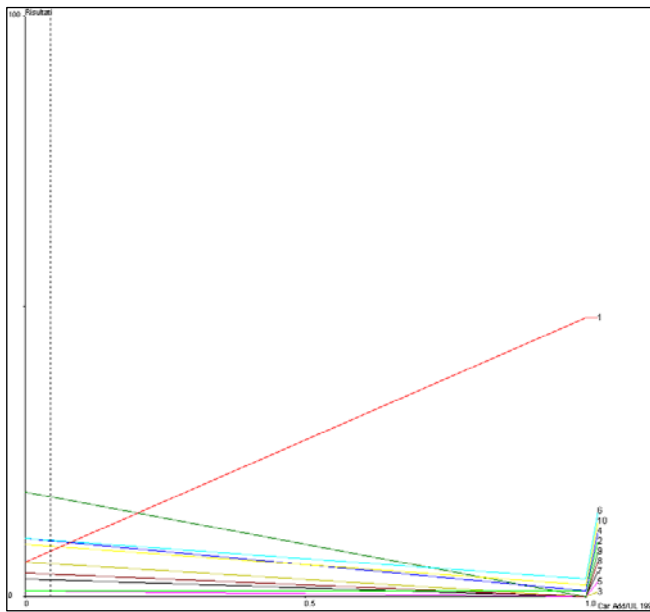
Scenario 1: structure and specialization of the food industry in Emilia-Romagna
Change of the average establishment size of LU in the fruit and vegetable sector



Change of the number of workers in the meat sector



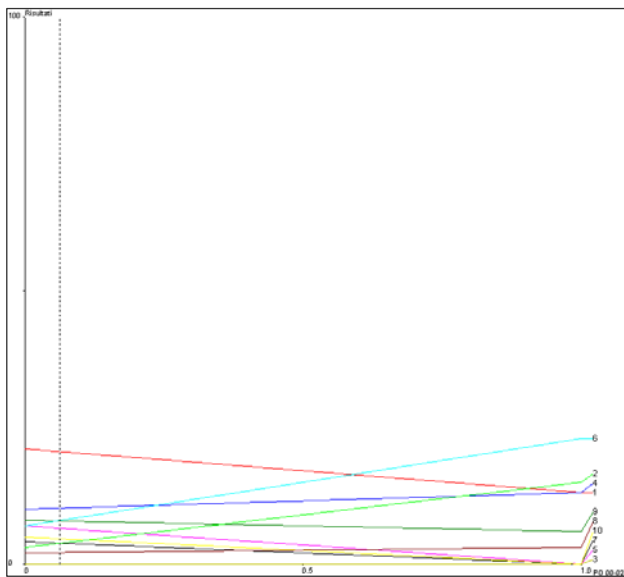
Change of the average establishment size of LU in the meat sector



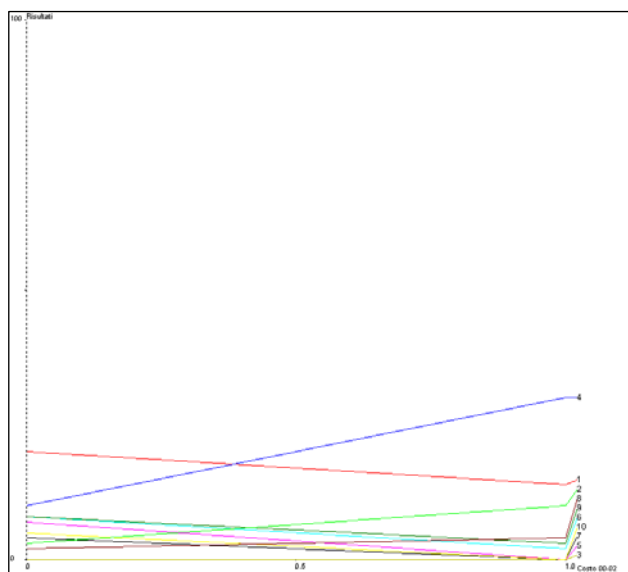
Appendix D

Scenario 2 - Development and innovation of the food industry in Emilia-Romagna

Change of the previewed supports for the period 2000-2002



Change of the approved supports for the period 2000-2002



Notes

¹ Cristina Brasili is Associate Professor, Department of Statistics, University of Bologna (Italy). Mirko Bonetti is PhD student, Department of Statistics, University of Bologna (Italy). Paper presented at the EAAE Seminar on Institutional Units in Agriculture, held in Wye, UK, April 9-10, 2005.

² We have utilized the data of the Industrial and Service Census (1991 and 1996).

³ Local Units.

⁴ For more details on the analysis for identifying regional agri-food areas, see Cannata (1989), Cannata, Forleo (1998), Boccafogli, Brasili C. (1998), Anania, Tarsitano (1995) and Fanfani, Mazzocchi (1999).

⁵ This analysis requires a limited number of alternatives and the independence of the attributes. We have estimated the utility function of each attribute (lowest value to the alternative that we considered the worst and higher value to the alternative that we considered the best) and then their composition through appropriated weights. The next step was to estimate the linear utility functions. The values that we obtained, allowed us to calculate the weights of each alternative inside the respective scenario.

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