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# 14 Quality Labels: economic results for the producer<sup>1</sup>

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## 14.1 Introduction

The agricultural production is not homogeneous, it exists a large variety of product types for the same production. The extent of this diversity depends on the productive model dominating at a given time. Thus, the installation of an 'intensive model' during the Sixties aimed to reduce the production costs by imposing 'good practices' defined on the basis of scientific knowledge and technical know-how. This model led to a reduction in the diversity of the products compared to the former 'peasant production.'

Then, starting from the middle of the eighties, a new type of model emerged with a differentiation of the agricultural produce carried out on the basis of official quality labels. Then, the nineties were remembered by a new type of differentiation which is based on the 'management system quality': technical paths, risk management, guaranties concerning some characteristics, traceability of the agricultural product, associated performances of service, logistics, direct sales, etc. The concept of quality extends to cover various forms with differentiation from the agricultural produce.

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<sup>1</sup> The original French version of this study has been previously published in *DEMETER 2008 - Economie et Stratégie agricole*, entitled: '*Signes de qualité : quels résultats économiques pour le producteur?*', pp. 69-119.

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With the 2003 Common Agricultural Policy (CAP) reform, the role of the market is accentuated in the regulation of the agricultural production; the commercial choices take an increasing importance. The agricultural producer is less and less a deliveryman, only worried by the technical optimization of his farm holding, to become a business leader which must make strategic choices, even if these choices are constrained by his agronomic environment and the possibilities of transformation taking into account the industries present near the farm holding. Among the possible options, the choices as regards quality policy take a new importance.

In the agricultural sector, the word 'quality' refers to various realities. They are initially the official quality labels (PDO, Red Label, Organic Farming), but also professional labels testifying to professional approaches (reasoned agriculture, codes of good practices, compliance certificates), or an absence of distinctive labels (it is the case for products 'without label' whose production can be optimized under other constraints). The productions 'without label' of quality are the productions for which the definition of quality is only elaborated in the relationship between an agricultural supplier and his customer, taking into account the requirements of the downstream industry. In this last case, there is no third-party organization that intervenes in the definition of quality. The absence of a third party does not mean that the quality of the delivered products is lower. It only means that food industry or the mass marketing controls quality on the basis of «customer» condition schedule. The presence of a third introduces rules which transcend the basic commercial relationship: the tradition, the territory, international agreements on good practices related to the control of the risks or as regards environmental protection, etc.

The 'official quality labels' already were the subject of many analyses on behalf of economists, sociologists, anthropologists, geographers, historians, and finally of multidisciplinary studies. In this paper, the financial approach is favored: what is the financial interest for a farmer to commit in a strategy of differentiation with an official quality label?

Beyond the estimates of profitability, this study seeks to clarify the concepts of 'quality' and 'service': a production can be marketed with an official quality label, but if it does not render services, it is not developed, and it cannot be profitable. For example, sold 'Red Label' table fowls are products of higher quality, which do not render services to the outside home catering because it uses the products of the poultry cutting (chicken legs, chicken breasts, etc.) that cannot be labeled under the current rules. A quality, which does not correspond to the particular, needs for a customer does not render him service.

This question is crucial in a context of liberalization of the agricultural markets where choices of strategies will be binding to the farmers more and more.

To compare strategies of differentiation and strategies based on the costs is possible solely because the agricultural production belongs to different competing universes. This context of competing universes is not specific to agriculture but common to many economic sectors. Also, we initially present the concept of 'competing universes' while seeking to position agricultural productions in these universes. These competing universes are characterized by the rules of the competing game between producers. This general framing will show how the agricultural strategies can evolve in time.

In a second part, we present cartography of the quality labels in France, in order to clarify the relations between the quality labels and the various productions. Then, taking into account the territorial dimension for the PDO as well as the regional traditions for other labels, we analyze the links between local areas and quality labels. Lastly, it is necessary to present the relation between the labels and the economic size of farm holding. These three factors (products, regions, economic size) have a great importance in addressing the topic of financial interest for some products under quality labels.

Lastly, we analyze the economic result in some strategies developed by the farm holdings for some livestock productions: cow milk, pigs and poultries. We carry out a statistical analysis of dispersion to compare the economic results of the farm holdings which have a strategy of differentiation by an official quality label, compared with those of a 'pilot population' of farm holdings which produce 'without official quality label', this last kind of farm holding being the most numerous in France. Our approach takes into account the bias that could introduce factors such as the regional area or the farm holding size. The two sources used are the French Farm Accounting Data Network (FADN-RICA) and the French Agricultural Census (FAC).

**Box 1****RICA, the French FADN***The FADN-RICA*

The French Farm Accounting Data Network ('*RICA - Réseau d'information comptable agricole*') collects the accounting data of the professional farm holdings in order to provide an empirical base to microeconomic analyses on the agricultural production. This sample survey is carried out according to the quotas method, targeting the population of the 'professional farms', concept implying that their agricultural products have to be marketed. One of the main objectives of microeconomic studies is to evaluate the economic results obtained by the professional farmers, on the basis of the accounting and financial data to finally analyze individual dispersion of the various technical and economic indicators.

*Professional farm holding*

The professional farm, in addition to the generic criteria used to define the farm at the time of the French Agricultural Census ('*Recensement de l'Agriculture*'), must reach an economic size of at least 8 European Size Units (ESU), equivalent to 8 dairy cows or 12 hectares of soft wheat, and to use the equivalent work of a person occupied with the three quarters of its annualized time, that is to say 0,75 Annual Work Unit (AWU). With the last French Agricultural Census carried out in 2000 (FAC 2000), reference for the methodology of the present study, the universe of the professional farm holdings comprised 393,000 professional holdings on all 664,000 farms, accounting for approximately 60% in number but especially more than 95% of the released gross margin.

*Universe of the French producers*

In 2000, the RICA sample comprised approximately 7,700 farm holdings representing the 393,000 French professional farms while the 2004 sample comprised approximately 7,300 farm holdings.

*Cohort 2002-2004*

In order to study the influence of the quality labels on the economic results of the producers, we merge two statistical complementary sources, on the one hand, the Census of agriculture for information on the quality labels and, on the other hand, the RICA for the economic results.

*Prices at production stage estimated from the RICA*

The estimate of the price at production stage provided by the RICA is computed as the ratio of the annual sum of the sales to the annual sum of the sold quantities for homogeneous products. Thus, these are average costs paid to the producer; they integrate the elements of remuneration (rebates) on the quality of the product paid during the financial year.

## 14.2 The positioning of agricultural productions in the 'competing universes'

We are based on the traditional concept of 'competing universes' that the Boston Consulting Group defines to analyze the strategy of companies. These competing universes make it possible to characterize the rules of the competing game for a branch of industry. Although the agricultural producer has less room for maneuver in his choices of strategies compared to other economic sectors, the successive reforms of the CAP and the liberalization of the agricultural production will reinforce the strategic and commercial dimensions of the farm holding management. These types of competition thus require an adaptation in the agricultural context taking into account the specific regulation modes of the agricultural activities, and the regional context. In fact, a production considered at the national level can concern several competing universes according to the regional contexts. This typology can thus be used in analyzing the changes for some regional productions which switch from a competing universe to another one over time: either because the advantages in terms of cost reduction are reduced, or because the possibilities of differentiations appear or disappear.

The typology of the competing universes is generally presented in the shape of a matrix that makes it possible to specify the dominant characteristics of competition on an activity on the basis of two assessment criteria. The first criterion relates to the possibility of being different. In some cases, there exists very few possibilities of being different; in other cases, there is a lot of it. The second criterion does not relate on the possibility of a differentiation, but on the benefit which one can gain from a differentiation. The two criteria are thus:

- the number of existing sources of competing differentiation. These sources of differentiation can be numerous or relatively few taking into account the sensitivity of the customers to differentiation;
- importance of the competitive advantage that it is possible to build in the sector. It is not enough that there are possibilities of being different so that a differentiation generates a competitive advantage with respect to the other producers.

The matrix thus makes it possible to define four universes called: 'Fragmentation', 'Specialization', 'Dead end', and 'Volume/Cost'. These four terms indicate rules of competition, which are essential on the companies present in a given sector. One can thus define four types of competing universes.

Graph 1		Typology of the competing universes	
		Competitive advantage	
		Weak	Strong
Possibilities of competing differentiations	Numerous possibilities	Fragmentation	Specialization
	Few possibilities	Dead end	Volume/Cost

*Boston Consulting Group, (1985), 'L'évolution des systèmes concurrentiels,' Perspectives et stratégie.*

On the basis of the definition of these competing universes, we will initially analyze their relevance to characterize agricultural productions either at the national level, or at the regional level. Lastly, these competing universes make it possible to characterize the great historical changes, which we present as illustrations.

- 'Fragmentation'

This universe is made of competing systems in which there exist a lot of companies in competition, each company having its own elements of differentiation. However, these sources of differentiation are compensated and neutralized. There is no possibility of building a competitive advantage on the basis of a specific source of differentiation. The size of the company does not have either a positive effect in terms of costs; it can even generate a loss of competitiveness. It is, indeed, the fast adaptation to the market that is the independent factor of success here. The margins are various and unstable. An often-quoted example is the small retail business or automobile repair.

In the agricultural sector, this competing context exists in productions where the size of the farm holdings corresponds to a technical optimum and where the agricultural produce is a raw material with little differentiation. The production of consumption potatoes was in this competing universe during a very long time. In some regions, at the time where the intervention price was high, the production of soft wheat was also in a fragmented universe. In the same way, there can be fragmentation in very regulated sectors. For example, it is the case of the

protected-designation-of-origin (PDO) productions, where differentiation between producers is very limited, and where the farm holding sizes do not generate significant variations of costs.

- 'Specialization'

This universe is made of competing systems in which there exist many sources of differentiation that are significant for the customer and thus that may undergo beneficiation. The company position on small segments of production, and competitiveness is based on the specific costs. Several companies are very profitable.

Many farms are committed in productions requiring a particular know-how or their localization allows them a strong differentiation. Since the beginning of the eighties, the production of consumption potatoes is in a universe of specialization where the possibilities of differentiations are many and which may undergo beneficiation at the product level. In the same way, the production of soft wheat evolves to specialized universes, in some regional areas.

- 'Volume/Costs'

They are competing universes in which volume brings an important advantage in terms of cost, and thus of price. It concerns activities for which there exist a few possibilities of product differentiation. The main part of the efforts relates to the management of the shared costs. It is necessary to grow more quickly than the competitors to improve its position in terms of cost. Irons and steel industry were an example of volume industry. In the agricultural sector, they are especially based on strategies of cost reduction with or without enlarging of the farm holding.

Again, the production of common wheat was subjected to this type of competing environments in the great cereal regions. It was the same for the production of pigs or milk in Brittany at one time.

- 'Dead end'

They are competing universes in which the sources of differentiation are few, and cannot get a decisive competitive advantage. In the same way, volume does not bring any advantage in terms of costs. If nobody reduces his production, everyone loses money. The more modern companies are involved in debt, and the most obsolete ones are financially the most solid ones.

One finds situations of dead end for the agricultural productions of some regional areas, which began in strategies of reduction of the costs without



obtaining possibility of differentiating their production. The concentration of the farm holdings lead to comparable performance levels which do not give any more advantages in terms of costs, whereas there are no possibilities of being different.

We analyze now how productions passed from a universe to another because introducing new methods of production or marketing (such as the opening of rays self-service in the distribution for the fresh produce), some changes in the regulation, a new policy for some joint-trade consortium, or due to the evolution of the international context.

Graph 2		Changes of competing universes in the sector of poultry production	
		Competitive advantage	
		Weak	Strong
Possibilities of competing differentiations	Many possibilities	Fragmentation (1) 'The Fifties' Poultry	Specialization (3) « 85 - 00 » Poultry
	Few possibilities	(4) « 2000 - » Poultry Dead end	(2) « 60 - 85 » Poultry Volume/Cost

The production of table fowls makes it possible to illustrate this matrix (cf. graph 2). This production of poultry knew changes of very interesting strategic universes during the last fifty years. Indeed, one passed from a fragmented universe (1), where each producer can be different from the other producers by many possibilities without building a competitive advantage, to a volume/cost universe of (2) with integration. This type of relation between the upstream and the downstream allowed a very fast fall of the production costs. Competition relates primarily to the prices for standardized products. Then, during the Eighties, differentiation appears possible with the Red Label and the competing

universe becomes a universe of specialization (3). Lastly, since the end of the Nineties, the multiplication of the labels, standardization of the products, and the opening of the European borders lead the production of poultry to the 'dead end' (4).

The analysis of the competing universes makes it possible to represent each family of production and to determine in which competing universe it is. Is differentiation by the quality labels possible? Is differentiation by official quality labels profitable?

The answer to these questions initially supposes to perform an analysis of the relationship between the quality labels and the various productions, because some productions having different economic and institutional possibilities to create of a quality label. Then, it is necessary to take into account territorial dimensions: some regions have specific possibilities of differentiation that other regions cannot mobilize, in particular with the PDO. Lastly, it is necessary to analyze the size of the farm holdings, which is likely to have an important effect on the profitability of the differentiation policies based on quality labels. One can indeed make the assumption that the small-scale farm holdings can compensate for structural disadvantages of competitiveness by the costs, thanks to policies of differentiation.

Thus, we will initially analyze the relations between the quality labels and the groups of products. Then, in a second step, we will study how the various regions position with regards to the quality labels. Finally, the influence of the farm holding size is compared with that one of the quality labels. We thus constitute a kind of cartography of the quality labels in France.

### **14.3 The cartography of quality labels in France**

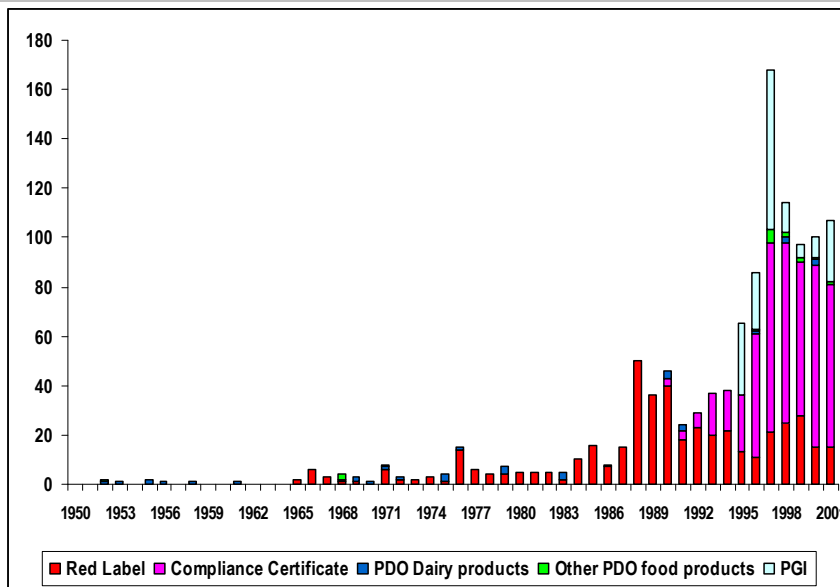
The differentiation of the food products on the basis of differentiation of the raw material is a specificity of the food industry: in general, in the sector of consumer goods, differentiation is the result of industrial innovation. In the food sector, the innovation rests initially on industry, as in the other economic sectors, but a specific source of innovation comes from the differentiation of the agricultural raw material. All the public measures concerning official quality labels aim to make recognize this source of differentiation for the processed products. In this field, the action of the public authorities is old: the existence of quality labels defined by third parties initially appeared in the vine growing sector at the beginning of the XX<sup>th</sup> century with the Protected Designation of Origin (PDO) in 1935. Then, are successively introduced the Agricultural 'Red'

Label (1960), the Organic Farming (1980), the Compliance Certificate of food products (1988) and eventually the Protected Geographical Indication (PGI). During the nineties, other certifications appeared, they relate to environmental protection, good practices, even ethics and, finally, sustainable development.

If the public measures concerning official quality labels are old, the economic weight of these differentiation forms of food products based on differentiated agricultural raw material, dates only from the middle of the eighties.

**Graph 3**

**Annual number of new notifications for official labels of food products quality (except wines and alcohols)**



Source: According to data from INAO, the French Institute for Quality and Origin.

The presence of labels certified by third parties does not relate to all agricultural productions on the same basis. In the same way, these strategies of differentiations are rather developed by farm holdings of intermediate or small sizes. Finally, some of the regions are not committed in this logic of differentiation with the same intensity than the other ones.

### 14.3.1 Labels and productions

To have a comprehensive view of the presence of the quality labels in the various productions, we retain five French labels that the agricultural census treated in 2000. They are the Protected Designations of Origin (PDO), the Agricultural Labels (AL), the Organic Farming (AB), the Compliance Certificates (CC), and the Codes of Good Practices or other quality labels with schedules of conditions (CGP).

#### **Box 2**      **Chi-Square test**

The independence test based on Chi-Square tests the assumption of independence in probability: two factors are independent in probability if the probability of the joint event is the product of the elementary event probabilities. Under this assumption, the  $D^2$  statistic follows a Chi-Square distribution of probability, function of the independent variation source number (i.e. the degrees of freedom for the cross-table with  $p$  lines and  $q$  columns, that are equal to  $[p-1] * [q-1]$ ). If, taking into account the number of lines and columns of the table, the value of  $D^2$  is considered to be too important for probably belonging to the values of a distribution of a Chi-Square distribution with the same degrees of freedom, then assumption of independence is rejected. The risk of error (p-value) associated with this decision of rejecting the assumption of independence is then quantifiable.

To evaluate the statistical significance of the relationship between labels and productions, we use the Chi-Square test. This test leads to reject the assumption of independence between the two criteria, 'quality labels' and 'groups of products.' Thus, there is a statistically significant relationship between the quality labels and the types of production.

**Box 3****Correspondence Analysis**

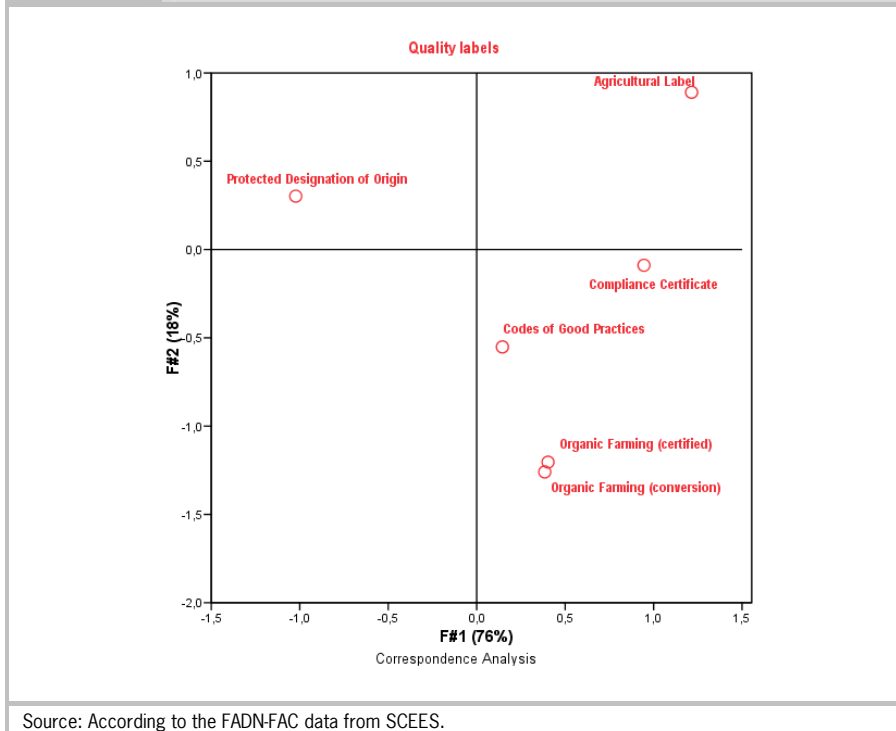
The correspondence analysis (CA) reveals the links (correspondences) between the categories of two qualitative criteria. This exploratory factorial technique makes it possible to graphically represent these interrelationships projecting on a scatter-diagram the categories of the two criteria analyzed. This projection is carried out on the basis of their departure from a theoretical situation of independence between these two qualitative criteria represented by the origin of the scatter-diagram. The location of the points representing the categories is computed according to the absolute frequency (i.e. the 'contingency table') resulting from the crossing of these two criteria. The factors of the correspondence analysis are interpreted in terms of independent dimensions making it possible to describe the analyzed relationship.

For each relationship considered to be statistically significant according to a Chi-Square test between the quality label criterion and one of the structure criteria analyzed (productions, regions, and economic size of the farm holdings), the CA of the contingency table (counting the various quality labels announced by the farmers listed according to each studied criterion) makes it possible to analyze the distribution profiles of the quality labels characterizing this relationship for the population of French farm holdings.

To analyze the statistically significant relations between labels and productions, we carried out a correspondence analysis, which makes it possible to visualize the structure of the interrelationships between labels and productions. Visualization is carried out on the basis of the factorial two-dimension plots, which gather the greatest part of information available. The first factorial plot accounts for 96% of total variability: thus, it is enough to represent the interrelationships existing between labels and products. Indeed, the first factor explains 76% of inertia (the weighted-case measure of variability for CA) and the second one, 18%.

The geometrical projections of quality label categories along those two factorial axes (graph 4) and the analysis of their contributions to the axis variability show that the first axis opposes the PDO to the Agricultural Labels and Compliance Certificates and more largely to the whole set of the non territorialized quality labels. The second axis opposes PDO and Agricultural Labels to the other quality labels, in particular Charters of Good Practices and Organic Farming where the CGP certified production presents a profile similar to that one of Organic Farming Conversion.

**Graph 4** CA of quality labels by products, factorial plot of quality labels

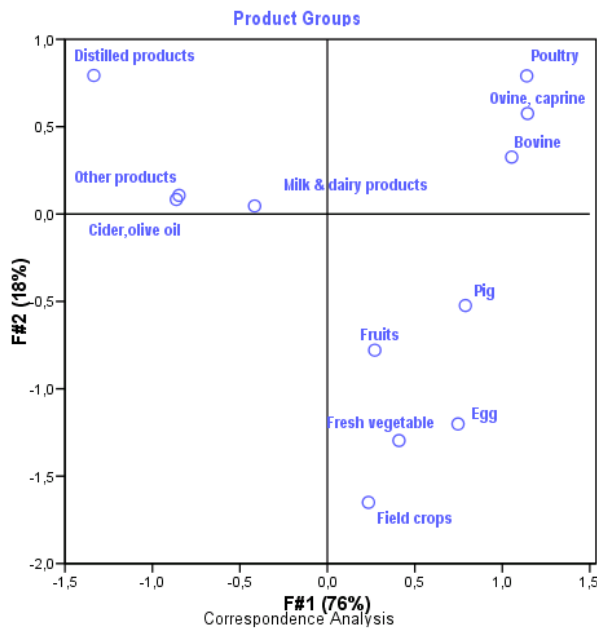


The projection of the product groups on this factorial plot (Graph 5) shows that the Agricultural Label relates to primarily the livestock productions: poultry, sheep, caprine, bovine, pig, egg. The other relations highlighted are:

- field crops related with organic farming;
- fresh vegetables with Codes of Good Practices;
- fresh fruits with Codes of Good Practices;
- distilled products with PDO;
- bovine meat products with Agricultural Label and Compliance Certificate
- ovine and caprine products with Agricultural Label and Compliance Certificate;
- poultries and Agricultural Label;
- pig with Compliance Certificate;
- milk and dairy products with PDO.

**Graph 5**

**CA of quality labels by products, factorial plot of products**



Source: According to the FADN-FAC data from SCEES.

These relations between labels and products lead us to privilege some groups of products to carry out our analysis of the quality approach valorisation. They belong to competing universes, which comprise various possibilities of differentiation. Analyses of differentiation strategies by the quality labels are thus possible, but the available information imposes a second selection of (products  $\times$  labels) couples. Table 14.1 presents the products and the labels that can be studied on the basis of the available data.

The valorisation analysis of the quality labels requires a second framework of selection for the farm holdings: the territory. Indeed, some regions have specific differentiation opportunities, which need to be clarified.

<b>Table 12.1</b>		<b>Field covered by the statistical analysis, products and quality labels</b>		
	<b>PDO</b>	<b>Label</b>	<b>CC</b>	<b>CGP</b>
Milk	x			
Poultry		x		
Pigs			x	x

### 14.3.2 Labels and regions

We proceed as for the relations between the labels and the products: we test initially the assumption of independence, and then carry out a correspondence analysis when the rejection of the test justifies the use of this exploratory tool. In a similar way with the products, the Chi-Square test leads us to reject the assumption of independence between the two criteria: quality labels and regions.

Again, the first factorial plot (Graph 6) summarizes the main part of information: the first factorial axis explains 50% of the inertia and the second 38%: thus, on the whole, this factorial plot accounts for 88% of total variability.

The first axis contrasts the Protected Designations of Origin with the Agricultural Labels. The second axis contrasts the Codes of Good Practices with the Agricultural Labels.

On the graph of the regions (Graph 7), one notes that the first axis contrast 'Champagne-Ardenne', 'Alsace', 'Poitou-Charentes' with Brittany, 'Pays de la Loire' and 'Limousin'. The second axis is structured by the contrast on the one hand, 'Languedoc-Roussillon', 'Nord-Pas-de-Calais', Picardy and Brittany, with on the other hand, 'Limousin' and 'Aquitaine'. A detailed analysis of the contributions to inertia shows in fact the existence of four poles:

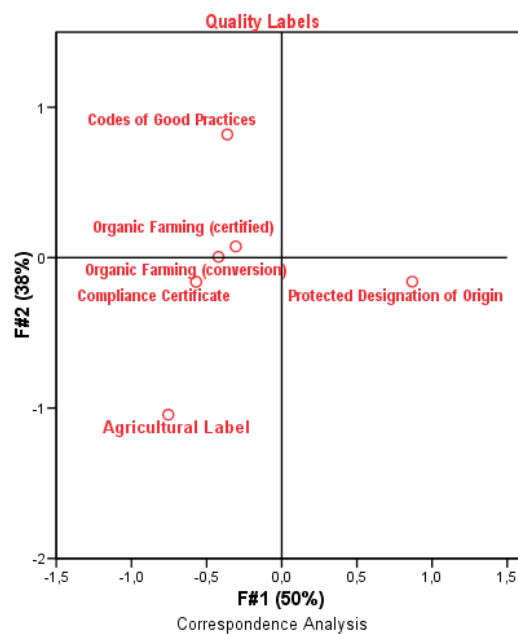
- a 'PDO' pole which comprises a higher proportion in Protected Designations of Origin;
- for 'Champagne-Ardenne', with less Agricultural Labels and Codes of Good Practices;
- for 'Franche-Comté', with less Codes of Good Practices;
- for 'Alsace', 'Poitou-Charentes' and 'Rhône-Alpes';
- for 'Aquitaine', a higher proportion in PDO and Agricultural Labels and a lower proportion of Codes of Good Practices;
- for 'Provence-Alpes-Côte d'Azur', with lower proportion in Agricultural Labels;
- a Label pole which comprises a higher proportion in Agricultural Labels;
- for 'Midi-Pyrenees';



- for 'Limousin' and 'Pays de la Loire', with less PDO;
- a 'CGP' pole which comprises a higher proportion in Codes of Good Practices;
- for 'Nord-Pas-de-Calais' and 'Lorraine', with a lower proportion in PDO;
- for Brittany, with less PDO and a higher proportion in Compliance Certificate,
- for 'Languedoc-Roussillon', with less Label and Compliance Certificate;
- a 'Compliance Certificate' pole which comprises a higher proportion of Compliance Certificates;
- for 'Basse-Normandie', with a lower proportion of PDO.

**Graph 6**

**CA of quality labels by regions, factorial plot of quality labels - for 'Basse-Normandie', with a lower proportion of PDO**



Source: According to the FADN-FAC data from SCEES.

- Thus, the space of quality labels seems to be structured on two dimensions:
- the first dimension contrasting the PDO on the one hand with on the other hand Labels, constitutes a differentiation separating the regions from the preferential PDO pole ('Champagne-Ardenne', 'Alsace', 'Franche-Comté', 'Poitou-Charentes', 'Aquitaine', 'Rhone-Alpes' and 'Provence-Alpes-Côte d'Azur') from the other regions;
  - the one second dimension allowing to distinguish between the regions not belonging to the PDO pole, a first subgroup of regions (Nord-Pas-de-Calais, Lorraine, Brittany and Languedoc-Roussillon) belonging to a CGP preferential pole, from a second subgroup of regions ('Midi-Pyrénées', 'Limousin' and 'Pays de la Loire') belonging to a Label preferential pole.

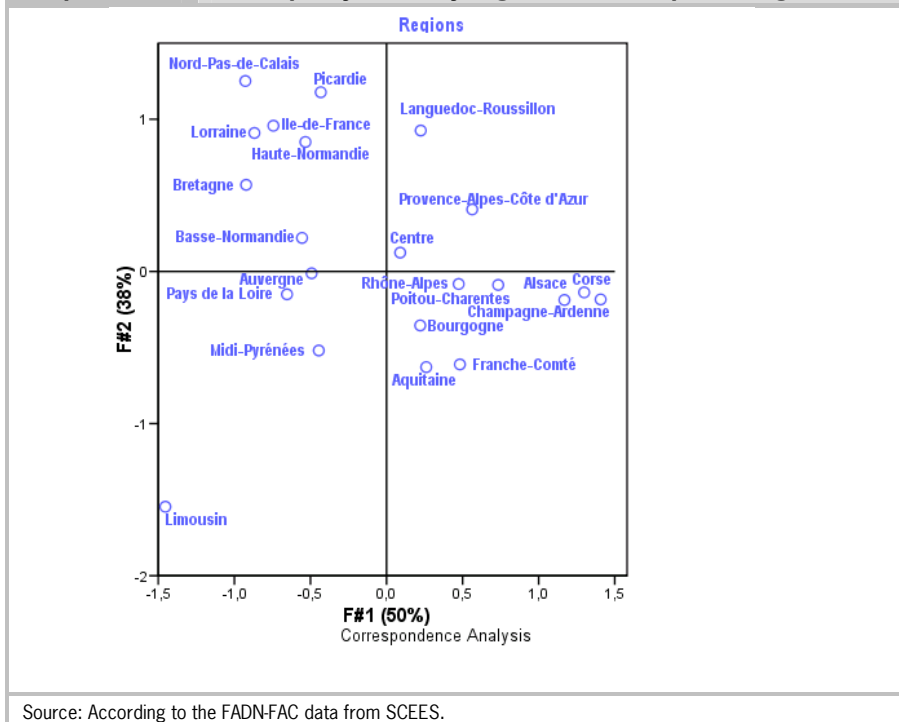
The Organic farming and Compliance Certificate labels are not highlighted by the study of the regions - labels links because they present little regional tropism, excepted for the Compliance Certificate association with 'Basse-Normandie.'

Major differentiations take place on the one hand in terms of labels between ('Champagne-Ardenne', 'Aquitaine'), ('Nord-Pas-de-Calais', Brittany, 'Languedoc-Roussillon') and ('Limousin', Midi-Pyrénées) for the regions, and on the other hand in terms of regions between PDO, Agricultural Label and Codes of Good

Practices for the quality labels. These particular relations between the regions and the labels lead us to analyze the valorisation of the quality labels on specific regional subsets.

Lastly, the relations between the economic size and the labels must be highlighted in order to prevent our analyses from biases related to by this scale factor.

**Graph 7 CA of quality labels by regions, factorial plot of regions**



### 14.3.3 Labels and farm holding economic sizes

To study the links between the quality labels and the farm holding economic sizes, we use the ESC, a European classification that is based on the standardized gross margin of the farm holdings. This classification enables us to define farm holding sub-populations of comparable economic size between different productive orientations (cf. box 4).

As for the previous analyses, the Chi-Square test leads to the rejection of independence between the two criteria: quality labels and economic size classes (ESC) of farm holdings are dependent.

**Box 4****The farm holding typology, from the standard gross margin (SGM) to classifications according to the type of farming (ToF) and economic size class (ESC)**

To analyze the agricultural diversity of the production systems in the context of the unified European market implies to have a reference framework making it possible to perceive the structural evolutions of the various farm populations. For this purpose, the European community 'acquis' as regards agricultural statistics uses since 1978 a typology established on the basis of the two following criteria of classification: the Types of Farming (ToF) indicating the type of productive specialization and the farm holding economic size class (ESC) assessing the scale of its productive potentialities.

These two criteria of classification, in their definition, are based on the key-concept of standard gross margin (SGM, as a balance between the standardized value of the production and the standardized amount of some costs, which are specifically dependent there.

The unit SGM of each agricultural product is given for each European region in order to take account of the diversity of the production conditions. Applied to the various plant and animal speculations of the farm holding, these unit coefficients are multiplied by the physical quantities expressed in terms of surface or cattle. The sum of the valorisations thus calculated for the overall set of farm products defines the MBS of the holding.

The SGM is expressed in a standardized way in European size units (ESU), a unit of this economic size measure being equivalent to the gross margin brought by 1,5 hectare of soft wheat or a milk cow, is approximately 1,200 euros.

The ToF categories form a classification of the farm holdings revealing, on the basis of the contribution profiles to the SGM, the majority share taken by the greater group of products generally joined or associated (for example 'field crops' 'market gardening and horticulture', etc) in the SGM of the farm holding. The category specialized in dairy production is the bovine 'milk' ToF (ToF 41 in the 17-categories nomenclature).

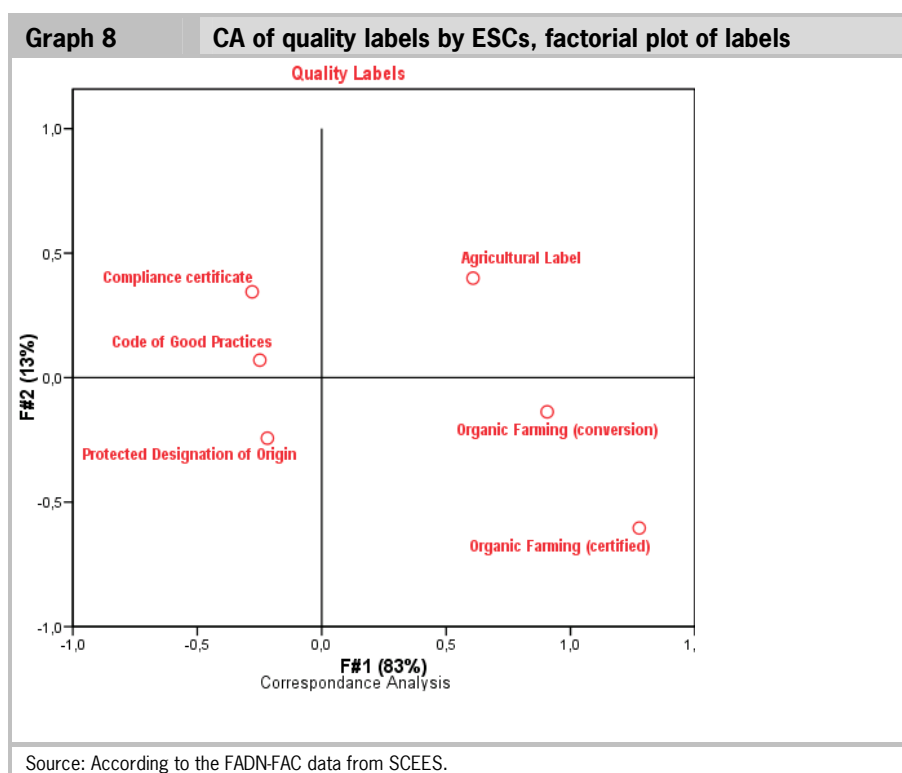
The ESCs constitute a classification of the farm holdings according to the scale of their standard gross margin (SGM) expressed in ESU, the holdings of the smallest economic sizes being gathered in the ESC 1, and the holdings of the largest economic sizes in the ESC 10.

On the first factorial plot (Graph 8), the first axis contrasts Organic Farming with Agricultural Label. The second axis contrasts Agricultural Label and Compliance Certificate with PDO and certified Organic Farming. On the whole, this first factorial plot represents 96% of the variability.

The analysis of the economic size class (ESC) locations (Graph 9) highlights that the first axis contrasts the ESC 5,6 and 7 with the ESC 9 and 10. The opposition between the ESC 10 and the ESC 8 structures the second axis. Explaining 83% of variability, the first axis plays the part of a scale in economic

size,<sup>1</sup> ordering the classes of economic size from the smallest one (ESC 5) to the largest one (ESC 10). The analysis of the contributions to the axis inertia shows that:

- the ESCs 5 & 6 have a higher proportion in certified Organic Farming;
- the ESC 7 has a higher proportion in certified Organic farming and Agricultural Label and a lower proportion in Code of Good Practices;
- the ESC 9 has a higher proportion in Code of Good Practices and a lower proportion in Labels;
- the ESC 10 has a higher proportion in PDO and a lower proportion in Labels.

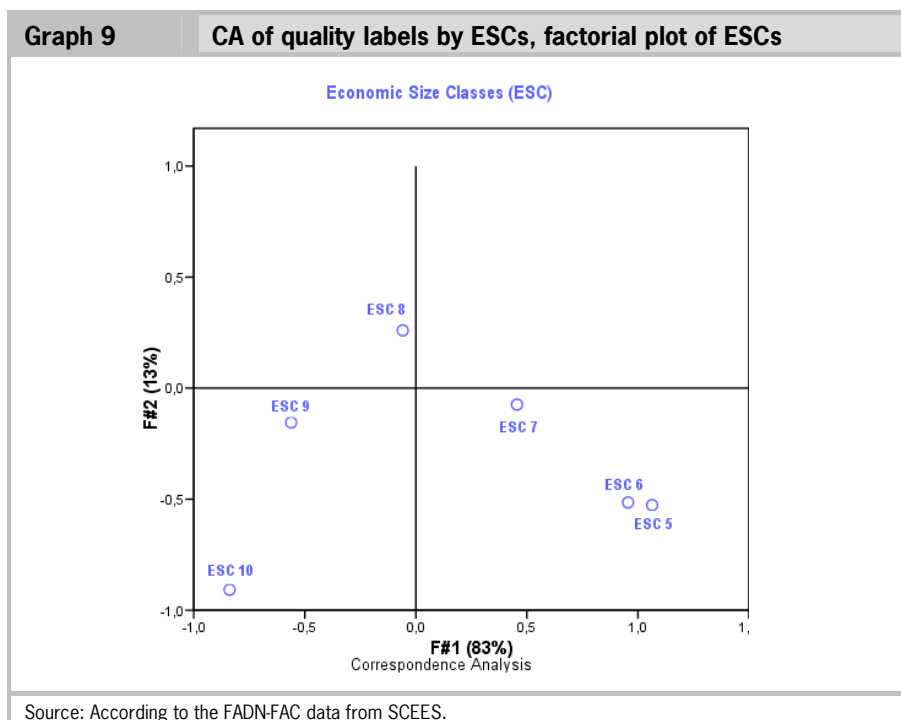


<sup>1</sup> It is noted that projections of the various ESCs in the first factorial plot is organized according to a Guttman effect: the classes whose marginal frequency is weaker (ESC 5,6 and 10) being located at the ends of the axis while the classes whose marginal frequency is larger are close to the barycentre of the graph (ESC 7,8 and 9).

Thus, the space of quality labels seems to be structured on several dimensions:

- the first dimension contrasts the ESC 5, 6 and 7, expressing preferentially the Organic Farming as a quality label, with the group of ESC 9 and 10 expressing an aversion for the Label;
- the second dimension characterizing well the preferential profile of the ESC 8, contrasts a relative tropism for the Label, Compliance Certificate and Code of Good Practices with a relative aversion for the Organic Farming and the PDO;
- major differentiations take place on the one hand in terms of labels for the classes of economic size between the ESC 9 and the ESC 7, and on the other hand in terms of ESC for the quality labels between the certified Organic Farming and the Agricultural Label.

To take account of the size effect in the study of the quality label valorisation, we carry out an analysis that comprises classes of economic size. Thus, we can reason controlling the possible biases induced by the economic size of the farm holding.



## 14.4 The valorisation of quality labels

### 14.4.1 Milk production: the PDO-based strategies of differentiation

The production of milk is characterized by structural changes in the competing environment. As in the illustrating case of poultry, the dairy production is in a fragmented universe at the beginning of the fifties. But in the middle of the Fifties, this universe swing over a universe of volume under the combined action of the milk industries, the overproduction which weights on the prices and favors the concentration, and of the professional organizations (Joint-Trade Council, Technical Institutes, Agricultural Cooperative Council).

This universe of volume leads to strategies of growth in the size of the farm holdings in order to reduce the costs. This orientation currently remains dominant.

From the middle of the eighties, there is a change of competing universe: differentiation becomes possible on important market segments. Two factors are combined: a new food request carried by the desire of authenticity, the search of a territorial rooting, a differentiation of the dairy products, in particular of cheeses, and the existence of public institutional measures which allow the recognition of qualitative specificities as official quality labels: PDO, Red Label, Organic Farming, and PGI. Some farm holdings specialize in particular on such milks making it possible to manufacture cheeses under PDO, or butters and creams under Red Label.

<b>Table 14.2</b>		<b>Economic weight of the dairy cow cheese productions under quality labels</b>			
<b>Sales at the first marketing</b>	<b>CC</b>	<b>Label</b>	<b>PDO</b>	<b>Total</b>	
<b>K€</b>					
Soft paste cow cheese	0	1,900	294,620	296,510	
Squeezed paste cow cheese (not cooked or half-cooked)	15,460	7,190	461,380	484,030	
Squeezes paste cow cheese (cooked)	2,140	64,020	288,430	354,590	
Spotted pasted cow cheese	0	0	94,150	94,150	
<b>Total cow cheese</b>	<b>17,600</b>	<b>73,110</b>	<b>1,138,570</b>	<b>1,229,280</b>	

Source: SOQQ Official Quality Label Survey 2004, SCEES.

In parallel, the transformation at the farm level and the direct sales constitute forms of differentiation very present in the dairy sector. These strategies develop in a universe marked by numerous possibilities for differentiation from a farm to another one, limiting the opportunities of competitive advantages.

Lastly, during the nineties, some new requirements appear: the sanitary characteristics are increasingly strict, the organization of the farm holding (the control of the risks, the traceability...) become factors of differentiation on the segment of the dairy products with the Compliance Certificate, in particular for the production of dairy products for the distributor trademarks. Other labels such as the codes of good practices attest of an organization which controls the risks and which respects professional reference frames. In the same way, animal well-being, or animal feed allow to build new strategies of differentiation based on with the prevention for the risks of some diseases (heart or brain cardiovascular attacks): for example, a food for cow comprising a proportion of linseeds in order to enhance the OMEGA3 content of milk which would allow the processing industry to differentiate their dairy products.

These various types of strategies coexist in the dairy sector. They often correspond to regional orientations. Graph 10 displays a representation of these strategies in 2007.

Thanks to the merging of the French Agricultural Census and the FADN-RICA files, we can analyze the valorisation of the various dairy farm holding strategies over the period 2000-2004. To give a measurement of the differences in valorisation, we study the price differences of milk at the agricultural stage taking into account its aptitude to carry quality labels.

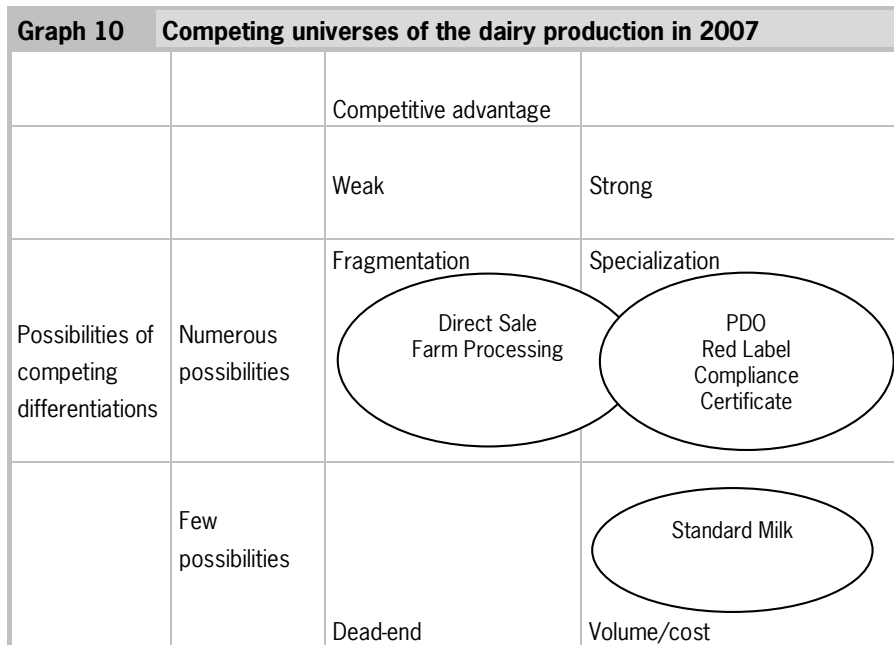
In the case of milk, many labels make it possible to build strategies of differentiation: 'General public' quality labels such as the Protected Designations of Origin, the Red Label or the Organic Farming, but also of the 'Professional' ones such as the Compliance Certificates or the Codes of Good Practices. These differentiated milk strategies are in competition with strategies based on the cost reduction or with a differentiation, which is defined within the sole client- supplier relationship.

Taking into account the available information, we must limit the analysis to the comparison of the strategies of differentiation based on the PDO with the strategies based on the cost reduction (absence of labels). Three classes of farm holding are distinguished according to their economic size in terms of dairy cow unit (DCU):

- ESC 6 & 7: from 16 to less than 40 DCU;
- ESC 8: from 40 to less than 100 DCU;



- ESC 9: 100 DCU or more.



In the case of the dairy production, we can analyze valorisation on the basis of the prices to which milks are sold.<sup>1</sup> But the price is not sufficient; we must analyze the profit margin that we estimate by the EBITDA.<sup>2</sup> We can thus study the rate of margin (EBITDA divided by the sales). Finally, we analyze the profitability of capital invested (EBITDA divided by the fixed assets) and the margin by agricultural working unit (AWU) in the farm holding.

On the overall farm holding population, the price differences between milks carrying a differentiation thanks to the PDO and milks without label are important and statistically significant: the difference in the averages of price is €3.88 hl in 2000 (table 14.3).

In 2004, the difference is even more important since this is on average €4.71 hl that separates «PDO» milks from 'no-quality-label' (NQL) milks. This increase in variation is explained by a slight increase in prices for PDO-milks against a fall in prices of NQL-milks.

<sup>1</sup> The price is equal on the total sales of milk of the farm holding divided by the quantities of delivered milk..

<sup>2</sup> In the case of French farm holdings, we can say that EBITDA (Earnings before interest, tax, depreciation and amortization) is roughly the same as *EBE (Excédent Brut d'exploitation)* upon which these analyses are based.

**Table 14.3** Average costs of PDO-differentiated milks and no-quality-label (NQL) milks according to the economic size classes

€/hl	2000			2004		
	ESC	PDO	NQL	Total	PDO	NQL
ESC 6 & 7	36.81	31.60	32.09	37.62	30.30	31.06
ESC 8	35.81	32.09	32.32	35.53	31.08	31.45
ESC 9	34.54	32.35	32.41	33.10	31.36	31.41
Total	35.95	32.07	32.30	35.76	31.04	31.37

Source: According to the FADN-FAC data from SCEES.

If we analyze the price differences to the average costs (32.30 € in 2000) according to the farm holding economic size, we note that the PDO factor has a distinct effect according to the classes of economic size.

**Table 14.4** Deviations of average costs between the Protected Designation of Origin (PDO)-milks and the No-Quality-Label (NQL)-milks according to the farm economic size classes

€/hl	2000			2004		
	ESC	PDO	NQL	Total	PDO	NQL
ESC 6 & 7	4.51	-0.70	-0.21	6.25	-1.07	-0.31
ESC 8	3.51	-0.21	0.02	4.16	-0.29	0.08
ESC 9	2.24	0.05	0.11	1.73	-0.01	0.04
Total	3.65	-0.23	32.30	4.38	-0.33	31.37

Source: According to the FADN-FAC data from SCEES.

On the one hand, the dairy farm holdings without quality labels are penalized in the level of prices when they are in the small size categories: the deviation with the global average of prices is negative for the ESC 6 & 7, and equal to -1.07 €/hl. On the other hand, the price differences are as more positive for these small size farm holdings as they benefit from a Protected Designation of Origin. This report for the year 2000 is more evident in 2004. For example, for the ESC 6 & 7, the price difference due to the PDO passes from 4.51 €/hl in 2000 to 6.25 €/hl in 2004.

Thus at the price level, differentiation by a Protected Designation of Origin results in appreciations which are all the more large as the farm holding is of small size.

The question arises now of knowing if these variations of selling price are found in the margin, which the farm holdings earn. The differentiation strategies

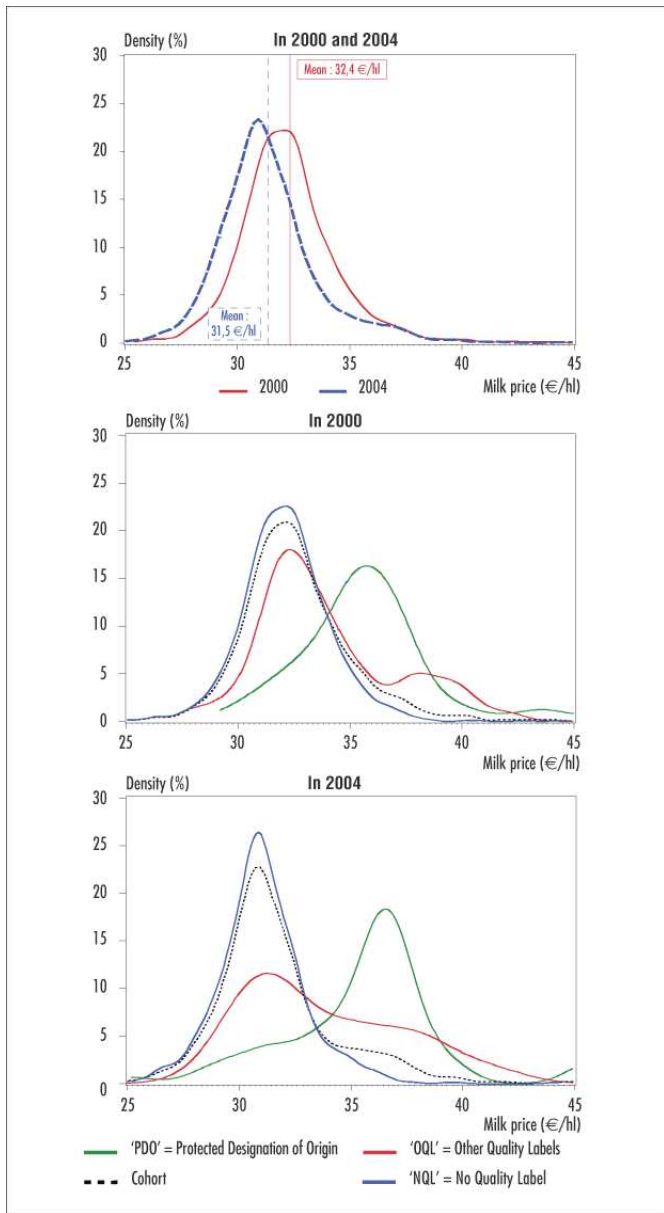
can be very expensive and generate only a low margin if the costs are higher than the added value. To assess the consequences of the dairy producer strategic choices, we analyze the rate of margin (EBIDTA/sales).

The analysis of the rates of margin shows that PDO milks have rates of margin higher than no quality label (NQL) milks for the overall of the farm holdings and significantly higher for the small economic size farm holdings. Thus, the increase in the associated costs to PDO does not absorb the added value generated. It is the same for the evolutions: the rate of margin of the farm holdings PDO-milks increases by 3 points between 2000 and 2004. However, unlike the prices, the rates of margin of the NQL farm holdings also increase (2 points) in spite of a fall of the prices.<sup>1</sup>

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<sup>1</sup> We make the assumption that this increase of two points of the rate of margin is ascribable to the payment of the direct dairy assistance granted to support the income of the dairy producers in the context of the reform of the common organization of market of milk envisaged by the Luxembourg agreement in June 2003; its amount in 2004 was established at €11.81 per ton of milk quota. Under this assumption, the impact of the PDO label could thus be evaluated to 1 point of the rate of margin.

**Graph 11** Towards a differentiation in the prices of milk at the production stage



*Reading the graph.* nonparametric estimates of the price density are displayed for 2000 and 2004. The slightly bimodal character of the density in 2004 seems to be explained by a growing price difference between milk under PDO and the other categories (other quality labels and no quality label), and an increasing dispersion of the prices for the official quality labels, namely the PDO (a more important share of PDO is paid at the modal price in 2004) or other labels (the fraction remunerated by levels equivalent to the PDO increased in 2004). The nonparametric estimate of density allows providing a plot of the density without carrying out assumption on the nature of the empirical distribution.

*Field:* population of the farm holdings producing bovine milk, cohort 2000-2004.

Source: French Agricultural Census - Farm Accounting Data Network 2000-2004.

**Table 14.5 Rate of margin (EBITDA/sales) in 2000 and 2004 in percentage, according to the economic size classes**

%	2000			2004		
	PDO	NQL	Total	PDO	NQL	Total
ESC 6 & 7	53.8%	49.0%	49.6%	60.4%	51.1%	52.3%
ESC 8	48.8%	47.1%	47.2%	51.6%	49.0%	49.2%
ESC 9	49.2%	48.2%	48.2%	a)	50.5%	50.0%
Total	50.7%	47.7%	48.0%	53.8%	49.7%	50.1%

a) Not available.

Source: according to the FADN-FAC data from SCEES.

In 2000, the analysis of the rates of margin per class of size again highlights that small-scale farm holdings (ESC 6 and 7) gain from the strategy of differentiation a benefit significantly higher than the larger farm holdings (ESC 8 and ESC 9). Indeed, the differences in rate of margin for the ESC 8 and ESC 9 are not significant.

In 2004, the interaction between the economic size factor and the quality label factor ends in a rate of margin significantly higher for the small-scale farm holdings producing under PDO while the intermediate size farm holdings producing without quality labels have a lower rate of margin.

Thus, the appreciation observed on the prices in 2000 leads indeed to a better valorisation (rate of margin) for all the farm holdings and, in particular, for the smallest ones. In 2004, this benefit obtained on the prices leads to a reinforcement of the positive effect of the PDO quality label on the rate of margin for the benefit of the small structures.

The rate of margin analysis is interesting because it informs us about the relationship between the appreciations and the over costs generated by

strategies of differentiation. It must be thorough by the analysis of essential resources to the various strategies: work and capital resources. To carry out this analysis, we study profitability (EBITDA/fixed assets) and the ratio (EBITDA/annual working unit on the farm holding).

The taking into account of the funded capital modifies the analysis of valorisations that we have observed with the prices and the rates of margin. Indeed, the profitability of the farm holdings, which follow PDO-based differentiation strategies, is equal to that of the NQL without quality label farm holdings in 2000. In 2004, the profitability of the farm holdings committed in differentiation strategies appears even lower than that of the farm holdings, which produce milks without quality label. However, this difference is not significant from a statistical point of view, taking into account the profitability dispersion.

In the same way, the variations observed between the classes of economic size are not either significant for the same reasons.

<b>Table 14.6 Profitability (EBITDA/fixed assets) in 2000 and 2004, according to the economic size classes</b>						
%	2000			2004		
ESC	PDO	NQL	Total	PDO	SS	Total
ESC 6&7	26.9%	27.1%	27.1%	28.1%	32.2%	31.7%
ESC 8	29.0%	28.7%	28.7%	26.1%	28.9%	28.6%
ESC 9	28.7%	29.7%	29.6%	a)	30.6%	30.4%
Total	28.2%	28.4%	28.4%	26.5%	30.0%	29.6%

a) Not available.  
Source: According to the FADN-FAC data from SCEES.

Thus, with regards to the profitability of capital, the strategies of differentiation do not lead to profitability of fixed assets different from the strategies based on the costs.

It remains to assess the effect of differentiation strategies on the remuneration of the labour as a productive factor that we analyze with the ratio (EBITDA/annual working unit on the farm holding). This ratio makes it possible to estimate the profit per annual working unit (AWU) on the farm holding. It supplements our analysis of the quality label valorisation.

**Table 14.7 EBITDA per annual working unit in 2000 and 2004, according to the economic size classes**

€	2000			2004		
	ESC	PDO	NQL	Total	PDO	NQL
ESC 6&7	26,050	21,070	21,670	32,060	22,600	23,820
ESC 8	34,370	31,220	31,490	33,400	32,610	32,700
ESC 9	41,450	42,180	42,140	a)	45,230	45,190
Total	31,740	29,890	30,060	33,090	32,020	32,130

a) Not available.

Source: According to the FADN-FAC data from SCEES.

If the valorisation by the PDO with regards to the capital does not seem in favour of this differentiation strategy, the valorisation by the PDO in terms of labour shows that this strategy is very interesting for the farmers who have taken this way. Indeed, in 2000, there is a variation of EBITDA per AWU statistically significant for the small or medium-size farm holdings between those that are committed in the PDO and those that do not have quality labels. The variation of €1,850 per AWU for the total of the farm holdings is not statistically significant taking into account the global dispersion of the results. However, if one analyzes the variations by economic size class, it clearly appears that the small-size farm holdings gain a much more important added value, i.e. €4,980 by AWU, that if they did not have quality labels. This relative profit is all the more noticeable as the EBITDA per AWU is lower than the average if these small-scale farm holdings do not have a quality label. The deviation of €3,150 for the ESC 8 farm holdings remains statistically significant (with a risk of first species lower than 10%). For the large farms, the PDO differentiation strategy does not seem efficient since one observes a depreciation of €730 per AWU which is however not statistically significant.

In 2004, the situation is less favorable to the PDO for the overall of the farm holdings since the deviation is not any more but of €1,070. The deviation dropped but it remains statistically significant at the 5% p-level for the small-size farm holdings. However, it is not statistically significant any more for the intermediate size farm holdings.

In 2004, the differences between the economic size classes remain statistically significant, as in 2000.

Thus, between 2000 and 2004, the PDO-based strategies of differentiation lost at the labour factor level their capacity of rebalancing between the small-scale farm holdings and the large ones. The cost-based strategies remain most powerful.

All in all, the differentiation policy of the dairy production by way of PDO is very powerful in 2000, in particular for the small-size farm holdings. It makes it

possible to compensate for production costs higher than the large farms by a service: the differentiation of dairy products, namely the PDO mainly based on cheeses. This strategy brings even an excellent valorisation of the labour factor for these farm holdings.

In 2004, these differentiation strategies are less efficient in terms of capital profitability and labour valorisation. But, these differentiation strategies continue to partly compensate for disadvantages the least competitive farm holdings in terms of production costs. In fact, it is necessary to wonder about the relevance of the differentiation strategies: it is not enough to make 'quality' or 'PDO', to generate a valorisation; it is still necessary that this differentiation would be relevant for the processing industries, the distributors and the consumers. What are needed are services for the industry and eventually for the consumer: it is clearly the case in 'Franche-Comté'.

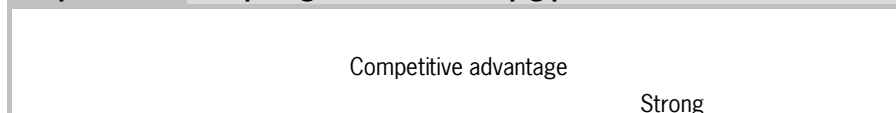
#### 14.4.2 Pig production: the differentiation strategies with Compliance Certificates and Codes of Good Practices

Like the other agricultural productions, the pig production knew intense upheavals since the Fifties. The production was 'industrialized:' automation of the labour operations, food with free-access to feeders, and gratings to collect the dejections in the form of liquid manure easy to pump. These changes switched the porcine production in the universe of volumes in an all the more powerful way as was founded a free-competition European market. The 'pig cycle' is one of the evidences deriving from this competing environment. For little differentiated products, commercial mechanisms of supply control the price and offer. In this competing context, the differentiation strategies relate to some niches that are dependent on the products or particular commitments as regards schedules of conditions.

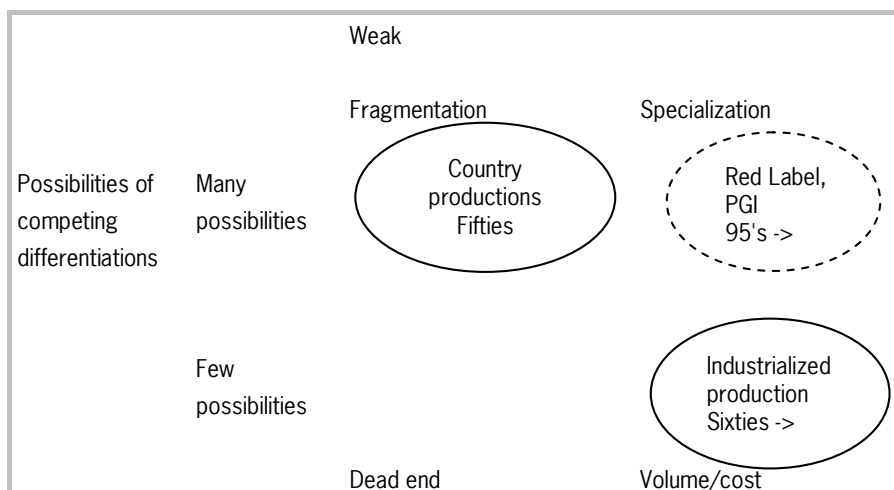
Taking into account the available information, we analyze two types of quality labels: the Compliance Certificates and the Codes of Good Practices.

The dominating productive model has eliminated the smallest size farm holdings, so that we limit the study to the two economic size classes of farm holdings expressed in fattened swine equivalent (FSE): ESC 8 (from 700 to less than 1,700 FSE) and ESC 9 (1,700 FSE and more).

**Graph 12** Competing universes of the pig production







**Table 14.8** Distribution of quality labels among the 2000 cohort of pig producers according to the economic size classes (metropolitan French territory)

Population	Quality Label			France
	CC	CGP	NQL	Total
ESC 8 (from 700 up to 1,700 FSE)	1,100	1,330	3,740	8,020
ESC 9 (1,700 FSE and more)	1,220	1,820	2,470	6,170
Total	2,320	3,150	6,210	14,190

Source: According to the FADN-FAC data from SCEES.

Moreover, Brittany occupying a particular place, the analysis of differentiation relates to this region.

As for the dairy production, we can analyze valorisation on the basis of the prices to which the pigs are sold: the price is equal to the whole sales of the fattened swine divided by the number of sold animals. Countable information does not enable us to analyze the prices per unit of weight. This absence of information on the weight poses problem because the weight per animal can be

**Table 14.9** Distribution of quality labels among the 2000 cohort of pig producers according to the economic size classes (Brittany)

Population	Quality Label			Brittany
	CC	CGP	NQL	Total
ESC 8 (from 700 up to 1,700 FSE)	580	1960	1350	3380
ESC 9 (1,700 FSE and more)	570	2260	1060	3310
Total	1150	4220	2410	6690

Source: According to the FADN-FAC data from SCEES.

variable.<sup>1</sup> This restriction is all the more important as the weight of the animals is one of the rare factors of differentiation with regards to the use of this animal: for example, there exists a particular request for heavy pigs to satisfy the needs for the dry transformation, in particular for dry hams. The heavier parts can indeed support long lives of drying and being covered with more intramuscular fat, they make it possible to develop the lipolysis and the flavours.

Thus, it would be necessary to relativize the estimates of valorisation derived from the prices. In any case, the price is not sufficient per se; we must analyze the raw margin, which we estimate by the EBITDA. On this basis, we can study the rate of margin (EBITDA divide by the sales). Lastly, we analyze the capital profitability (EBITDA divided by the fixed assets) and the margin per annual working unit in the farm holding makes it possible to estimate the impact of the differentiation strategy with regards to the labour factor.

Taking into account the productive orientation towards a model focusing on the cost reduction, it is relevant to analyze a possible size effect on the pig production preliminarily to the analysis of the differentiation strategies. In 2000 as in 2004, no factor differentiates the paid prices with the producers on France as a whole; the deviations, which can be observed, are not significant. It is the same when one analyzes France as a whole excluded Brittany. The economic size of the farm holdings does not lead to any price effect that could result from better logistic services, for example.

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<sup>1</sup> In 2000, according to the French Technical Institute of Pig (*IFIP*), the average weight of the fattened swine at exit of fattening is 110.2 kg with a standard deviation of 3.9 kg for the breeders-fatteners; the regions with lower regional average are in Northern France with 108 kg; the area with stronger regional average is South-western France with 112.5 kg; the regional average of Brittany is 110.2 kg.

**Table 14.10 Fattened swine average prices paid over the French producers in 2004, according to the economic size classes**

€	CC	CGP	NQL
ESC 8	115.8	110.7	114.5
ESC 9	111.6	110.0	114.5
Total	112.9	110.2	114.5

Source: According to the FADN-FAC data from SCEES.

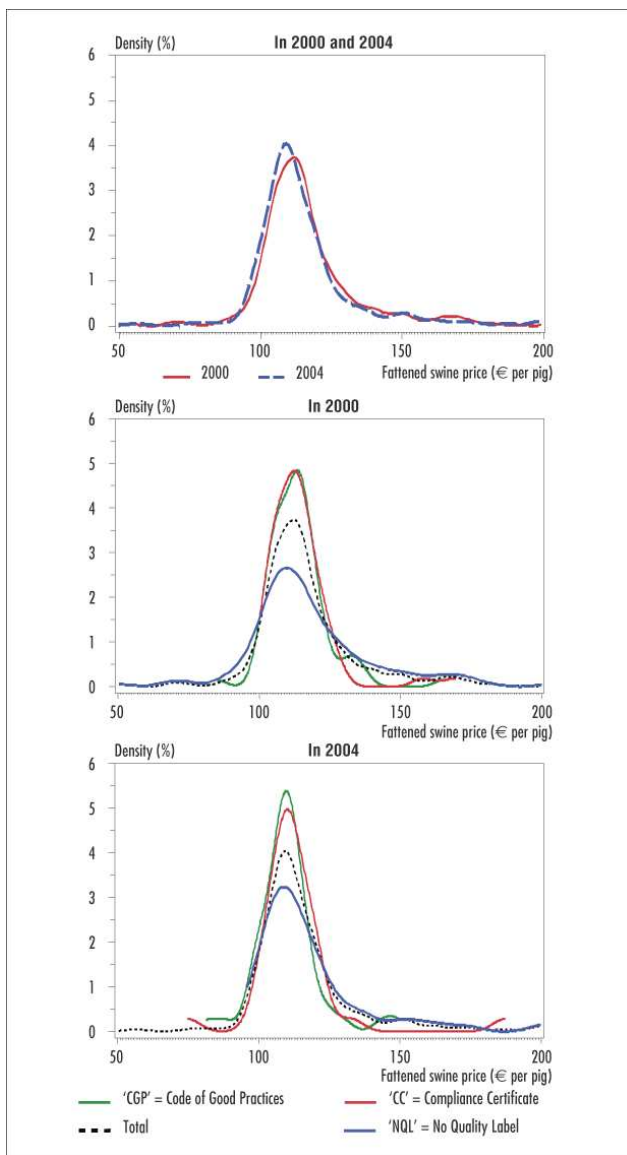
In this competing universe dominated primarily by logic of production costs, the strategies of specialized fattening swine producers can be analysed thanks to the ToF 50 subpopulation that joins together farm holdings specialized in porcine production.

The analysis is carried out on Brittany that constitutes a homogeneous territory from the regional point of view. This limitation of field is imposed by the French FADN sample size, which unfortunately does not allow analyzing the productions in the French South-West. In fact, the French South-West offers differentiation possibilities due to the 'Bayonnisable' ham productions, particularly with the 'Jambon de Bayonne' PGI. We analyze the valorisation of two types of quality labels: the 'Compliance Certificate' and 'Code of Good Practices' certified by third parties.

In Brittany, for the year 2000, if it appears price differences, they are small and not statistically significant: neither the economic size classes nor the quality labels lead to a significant differentiation in the prices paid to the producer. But it shall be noted that the combination of the two factors can lead to significant price differences. For example, the absence of labels and a smaller farm holding economic size (ESC 8) in Brittany lead to an average price significantly lower than the average price computed over the other producers.

In Brittany, the comparison between specialized and not specialized producers shows the same price standardization: the Compliance Certificates and the Codes of Good Practices do not bring more added-value to the breeders who adopt these systems of production, compared to those which produce without official quality label. In the same way, the economic size class criterion (ESC 8 versus ESC 9) does not constitute a factor of price differentiation.

**Graph 13** No price differentiation for the professional quality labels



Reading of the graph: the professional quality labels most widespread in pig do not lead to a differentiation by the prices, but rather to a standardization of the prices and a smaller dispersion compared to the reference group with no quality label.

Source: According to the FADN-FAC data from SCEES.

<b>Table 14.11 Fattened swine average prices paid over the Brittany producers in 2000, according to the economic size classes</b>			
<b>€</b>	<b>CC</b>	<b>CGP</b>	<b>NQL</b>
ESC 8	113.5	108.8	105.4
ESC 9	110.9	112.2	114.4
Total	112.0	110.9	110.3

Source: According to the FADN-FAC data from SCEES.

<b>Table 14.12 Fattened swine average prices paid over the Brittany specialized producers in 2000, according to the economic size classes</b>			
<b>€</b>	<b>CC</b>	<b>CGP</b>	<b>NQL</b>
ESC 8	115.45	112.03	107.73
ESC 9	111.24	113.33	108.08
Total	113.83	112.83	107.92

Source: According to the FADN-FAC data from SCEES.

In 2004, the situation slightly changed for the specialized producers in Brittany. Indeed, for the not specialized producers, no factor of differentiation, taken separately, appears: neither the economic size classes nor the quality labels allow obtaining significantly more added value for a producer. However, one notes as in 2000 a penalization of the ESC 8 producers that does not have official quality labels: there is a significant effect of the combination of the 'size' and 'label' factors.

For the specialized breeders, on the one hand we observe an evolution in favour of the 'Compliance certificate' label, namely: there is a variation of €8.5 between the prices of a pig having a Compliance Certificate compared to a pig without quality label. This deviation is statistically significant. On the other hand, the price differences between the economic size classes are not significant. In the same way, the Codes of Good Practices do not bring significantly more added value to the producers.

The prices not being different in 2000, the analysis of the rates of margin does not show any significant difference in the rates in margin in 2000. In 2004, the price differences observed for the specialized producers are not reflected at the level of the rates of margin.

**Table 14.13** Fattened swine average prices paid over the Brittany producers in 2004, according to the economic size classes

€	CC	CGP	NQL
ESC 8	114.5	107.3	105.1
ESC 9	107.7	110.3	111.8
Total	109.8	109.4	109.1

Source: According to the FADN-FAC data from SCEES.

**Table 14.14** Fattened swine average prices paid over the Brittany specialized producers in 2004, according to the economic size classes

€	CC	CGP	NQL
ESC 8	121.1	108.6	106.4
ESC 9	112.5	110.3	108.3
Total	115.9	109.7	107.4

Source: According to the FADN-FAC data from SCEES.

**Table 14.15** Rate of margin of the specialized fattened swine producers

%	CC	CGP	NQL
ESC 8	24%	23%	15%
ESC 9	18%	20%	21%
Total	20%	21%	18%

Source: According to the FADN-FAC data from SCEES.

To estimate the capital profitability, we use the relationship between the EBITDA and the fixed assets, as in the dairy production. Again, there are no statistically significant differences in profitability between the producers committed in quality labels and producers who do not have any label. This situation in 2000 is found again in 2004. Thus we do not observe statistically significant effects on the profitability from the differentiation strategies in the porcine production. At the capital level, there is no valorisation of the 'Compliance Certificate' label, or for the other official quality labels, in spite of empirically noticeable deviations. These observations must be extended to larger samples.

**Table 14.16** Capital profitability (EBITDA/fixed assets) of the specialized fattening swine producers of Brittany in 2000, according to the economic size classes

%	CC	CGP	NQL
ESC 8	33%	42%	40%
ESC 9	28%	27%	33%
Total	31%	33%	36%

Source: According to the FADN-FAC data from SCEES.

It remains to assess the effect of differentiation strategies in terms of labour force valorisation. The indicator used is the ratio between the EBITDA and the annual working unit of farm holdings.

**Table 14.17** Capital profitability (EBITDA/fixed assets) of the specialized fattening swine producers of Brittany in 2004, according to the economic size classes

%	CC	CGP	NQL
ESC 8	40%	36%	20%
ESC 9	24%	30%	31%
Ensemble	31%	32%	25%

Source: According to the FADN-FAC data from SCEES.

In 2000 as in 2004, for the specialized or not specialized producers of Brittany, the differentiation strategies based on quality labels lead to any significant return for the breeders at the labour force level. The valorisation deviations are not statistically although we observe a positive variation for the ESC 8 farm holdings producing within the Compliance Certification framework. In the same way, on the one hand, the differences between economic size classes are not significant in Brittany; on the other hand over France, even more in France excepting Brittany, the valorisation deviations are significant for farm holdings of different sizes.

In the case of the porcine production, the official quality label does not pay for the productions labeled by the 'Compliance Certificate' or the 'Code of Good Practices' certified by third parties. No valorisation indicator shows a positive and statistically significant deviation in favour of these differentiation strategies.

This report can be explained by some theoretical considerations.

The universe of the pig production of is a competing universe dominated by logic of production costs. The farm holdings having the optimal size cannot

resist a competition by the costs. Finally, it would be necessary to analyse the other differentiation factors such as the animal weight, which can be major factors of valorisation. Indeed, the heavier animals are included in the 'No Quality Label' productions what can tend to reduce the deviations with the products differentiated by official quality labels.

<b>Table 14.18</b>			
<b>Valorisation of the labour factor (EBITDA/annual working units) for the Brittany specialized producers in 2000, according to the economic size classes</b>			
<b>€</b>	<b>CC</b>	<b>CGP</b>	<b>NQL</b>
ESC 8	51,210	42,850	36,340
ESC 9	46,910	48,450	46,370
Total	48,820	46,380	41,770

Source: According to the FADN-FAC data from SCEES.

<b>Table 14.19</b>			
<b>Valorisation of the labour factor (EBITDA/annual working units) for the Brittany specialized producers in 2004, according to the economic size classes</b>			
<b>€</b>	<b>CC</b>	<b>CGP</b>	<b>NQL</b>
ESC 8	67,280	39,860	40,850
ESC 9	47,410	49,780	59,670
Total	53,520	46,680	52,030

Source: According to the FADN-FAC data from SCEES.

Unlike the dairy production where strategies of differentiation made it possible to compensate production cost differences, it is not the case in the porcine production. Indeed, diversity is more reduced and the differentiation of live animals does not generate any differentiation perceptible by the consumer so much for the cooked pork meats, as for the cooked dishes or the fresh meat. It is not either carrying a history or a particular image. This absence of difference perception does not make it possible to create a valorisation capacity. Moreover the 'Compliance Certificate' or 'Code of Good Practices' labels are not readable by the consumers. In fact professional labels can guarantee some outlets but which do not bring added value. Lastly, it is remarkable to notice that evidences prevailing in Brittany are found in the other regions: the analyses we carried out on France excepting Brittany lead to the same report. The differentiation strategies by the 'Compliance Certificate' or the 'Code of Good Practices' do not bring any statistically significant added value to the producers.



#### 14.4.3 Table fowls production: the strategies of differentiation by Red Labels, Compliance Certificates and Codes of Good Practices

The production of table fowls knew many phases, which we already introduced to illustrate the competing universes (cf. supra §1). The current period is marked by the questioning of historical differentiation brought by the Red Label. The Compliance Certificates, the Codes of Good Practices, the progresses made by the standard productions and the first-price chicken importation created a competitive market very open to third countries contrary to the porcine production.

The differentiation capacity of poultry is found in the spectrum of prices offered. The density estimates of prices make it possible to visualize the extent of those prices. It is necessary however to keep in mind that it is expressed in price per chicken and not in price per kilogram, because available information relates to the sales and the number of chickens sold.

This price dispersion leads to many paradoxes when one analyzes the prices according to the various quality labels like the Red Label, the Compliance Certificates, the Codes of Good Practices and table fowls without quality label (NQL). The sample available for the Compliance Certificates and the Codes of Good Practices being insufficient to make a deepened statistical analysis, we limit ourselves to the performance analysis of the producers under Label compared with those of the reference group, which constitute the producers without quality labels (NQL).

First of all, the analysis of the price dispersion can be run according to the economic size factor categorized in three classes: a first class gathering the ESC 5, 6 and 7, going from 5,000 to less than 33,000 equivalent-table fowl (ETF); one second class corresponding to the ESC 8, going from 33,000 to less than 83,000 ETF; and a third class corresponding to the ESC 9, corresponding to 83,000 ETF and more.

**Table 14.20** Unit prices of table fowls sold for France in 2000, according to economic size classes

€	Label	NQL
ESC 5 & 6 & 7	2.7	6.5
ESC 8	3.0	4.9
ESC 9	2.8	2.9
Total	2.9	4.5

Source: According to the FADN-FAC data from SCEES.

It appears that the 'No Quality Label' chickens are sold more expensive than those that have a label, in particular in the ESC 5 to 7. A thorough analysis shows this paradoxical situation corresponds to a possibility of direct sales in the production of poultry. This type of marketing is, in a statistically significant way, more present in the small-size farm holdings than in the ESC 9 farm holdings. Moreover, the direct sales are, in a statistically significant way, fewer presents in the producers under Label than in the other producers.

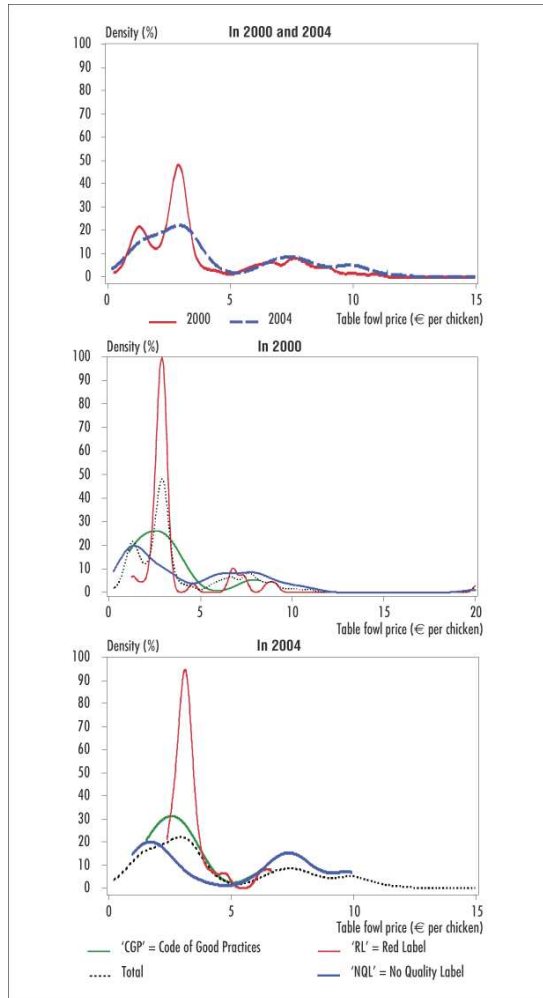
**Table 14.21** Unit prices of table fowls sold for France in 2000, according to the type of marketing

€	Label	NQL	Total
Without direct sales	2.9	2.8	2.8
With direct sales	3.0	6.9	5.6
Total	2.9	4.5	3.7

Source: According to the FADN-FAC data from SCEES.

**Graph 14**

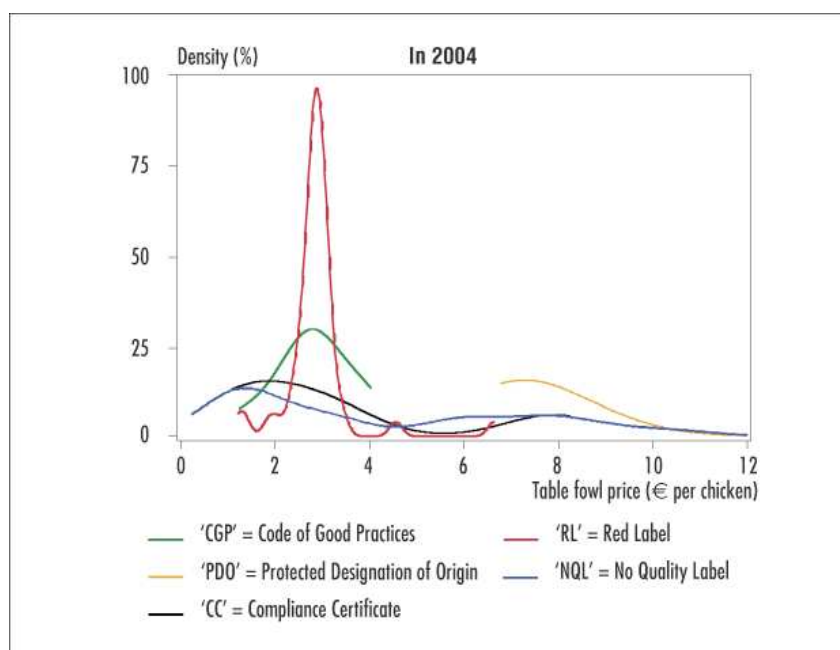
**For the table fowl, the label induces a concentration of prices at the production stage as an index of the product homogeneity**



Reading the graph: the Red Label lead to a distribution of the unit prices much more concentrated than the Code of Good Practices, for which we note a decreasing price in 2004.

Source: according to the FADN-FAC data from SCEES.

**Graph 15** Table fowl price in 2000, heterogeneity in the scales of unit price



Source: according to the FADN-FAC data from SCEES.

The price differences between chickens with or without quality labels and with or without direct sales explain the result, which we obtain, about the prices of table fowls in France. The direct sales correspond to a service very well valued by the breeders. It is difficult to analyze the profitability of this differentiation strategy because generally it does not relate solely to table fowl. In addition, regional effects are noted. To eliminate these regional biases, taking into account the available information, we can focus the analysis on the Brittany and 'Pays de la Loire' regions and on the Red Label.

In Brittany and 'Pays de la Loire', it initially appears that the direct sales effect is highly statistically significant and very important in value. To eliminate the bias generated by the direct sales, we restrict the analysis to the farm holdings producing table fowls without direct sales in the Western France. Only the ESC 8 and 9 farm holdings are taken into account.

**Table 14.22** Unit prices of table fowls sold for Brittany and 'Pays de la Loire' in 2000, according to the type of marketing

€	Label	NQL	Total
Without direct sales	2.7	1.7	2.3
With direct sales	3.0	5.5	4.0
Total	2.7	2.3	2.5

Source: According to the FADN-FAC data from SCEES.

With regards to this productive context in 2000, the Red Label is valued in a very significant way since there is a considerable price difference: the price of chicken under Label is approximately the double of that without quality label. In 2004, the deviation is developed: the fall in the price of chickens without quality label being proportionally more important than the rise in price of the Red Label. Even if this deviation is statistically<sup>1</sup> less significant from the statistical point of view, the price dispersion is increasing in a more important way within the producers without quality labels than within the producers under Label.

**Table 14.23** Unit prices of table fowls sold for Brittany and 'Pays de la Loire' in 2000 and 2004, except direct sales

Average	2000		2004	
€	label	NQL	label	NQL
Total	2.70	1.27	3.27	0.95

Source: According to the FADN-FAC data from SCEES.

The price difference is found with the rates of margin in 2000. The rates of margin of the farm holdings that produce under the Red Label are equal to the double of the producing rate of margin of the table fowls farm holdings without quality label. Thus, the effect of the Red Label is highly significant from the statistical point of view, whereas we note no effect of the economic size class on the margin either within the producers under Label as within the producers without quality labels. In 2004, if the Red Label effect slightly developed, the rate of margin dispersion within each group also increased: on the whole, the difference in rate of margin remains however very significant.<sup>2</sup>

<sup>1</sup> The risk of first species to affirm wrongly that this deviation is significant, remains lower than 5 per thousand.

<sup>2</sup> With a risk of first species lower than 1%.

**Table 14.24 Rates of margin for the farm holdings producing table fowls sold in Brittany and 'Pays de la Loire', except direct sales**

Average	2000		2004	
	label	NQL	label	NQL
Total	34%	16%	36%	17%

Source: According to the FADN-FAC data from SCEES.

Again, as in the milk or pig productions, these differences grow blurred with the analysis of the capital profitability of the fixed assets. On an empirical level, the farm holdings producing without quality label appear more profitable than those producing under Red Label, but these differences are not statistically significant.

Lastly, there is no either significant deviation in terms of labour factor profitability (EBITDA/annual working units).

The difficulties encountered by the table fowl breeders under the Red Label can be explained by several factors: changes in poultry market regulation, attenuation of the differences between the various productions of table fowls, multiplication of quality labels and marks. These factors are well known, the analysis should be supplemented by a study of the service dimension in the Red Label production.

In the Red Label reference frame of table fowl, only the sale of whole poultries was authorized: the products resulting from cutting cannot be marketed with the Red Label. This limitation not only does not give access to a market of consumption in strong growth, but also almost prohibited some uses of the Red Label chicken. It is particularly the case in the out of home foodservice which uses practically only cutting because of the make-ready times, of the raw material optimization and the medical standards. In this case, the product of higher intrinsic quality, namely the Red Label poultry, does not render service to a major actor of the food industry. Currently, the reform of the Red Label reference frame in poultry make it possible to raise this obstacle to the valorisation of the Red Label.

From the same point of view, the 'direct sales' bring many services that can be developed to the benefit of the consumer as well as the producer's one.

## 14.5 Discussion

Innovation is the heart of the food market dynamics. Food industry is the main actor of the food innovation processes: during the sixties and the seventies, the time-saver in the meal preparation and the fall in the food prices were the independent factors of the food consumption development. The modern forms of distribution then played a crucial role in this dynamics that directed the change of the agricultural production during this period.

In the middle of the eighties, the food innovation rested on a new type of innovations: the differentiation of the agricultural raw material. The idea and its implementation are old (wines, cheeses, poultryes), but they extend to new products and broad segments from the food offer during the eighties. This form of innovation rests on public measures, within French regulations then extended to European ones: the 'official quality labels'. Many farmers seized themselves of this new productive orientation: they invested and committed into the new schedules of conditions for these reference frames of production under official quality labels.

Which judgements can be issued about the economic results of these strategic choices? Such is the question to which we bring moderated answers either for the known-by-consumer official quality labels or the only known-by-professional ones. According to the economic context, valorisations are different.

The financial interest of a production under official quality labels is variable according to the productions, the regions, and the types of farm holdings. In the dairy production, the 'PDO' label make it possible farm holdings of small sizes to compensate for deviations as regards production costs. It is particularly sensitive in regions that could accompany differentiation of agricultural milks and regional cheeses at the national level, for example with strong trademarks

In the porcine production, differentiation by the 'Compliance Certificate' or the 'Code of Good Practices' does not bring additional valorisation. Excellence as regards production costs on the schedules of conditions defined by the customers remains the main leverage of economic performance. The deviations observed on an empirical basis are not validated by statistical tests: hence, these deviations cannot be taken in account.

In the poultry production, it is almost the same. We observe prices significantly different, but the valorisation of the 'Red Label' in terms of capital profitability or labour earnings is not significantly established by statistical methodology that we implemented. Only the direct sales lead to significant

deviations, but for productions that remain marginal on the scale of the table fowl consumption in France.

The 'PDO' label and the 'Red Label' are known of the general public: they can generate in some economic contexts more added value. For the professional labels, namely the 'Compliance Certificate' and the 'Code of Good Practices', we could not highlight significantly different valorisations neither of the capital nor of the labour force. In general, their prices are higher than those of the products without official quality label, for which there are no third intervening parties. However, these prices do not seem to compensate for the over costs in capital or labour.

Taking into account the available information, these results must be regarded with prudence and as incentives for further statistical studies: the CAP reform leads to a reinforcement of the client/supplier relationships compared to a logic of market on which operate anonymous actors. The prices resulting from these commercial relations comprise the particular payment for services that does not appear in quotations on the standardized product markets. The valorisation analysis of these services must deepen with the liberalization of the agricultural markets: the quantitative studies on the differentiation of the agricultural products must be reinforced. In this concern, these results constitute an encouragement to reason on the services rendered by the products under official quality label, as these services are rendered to the ultimate consumer or to the operators in the food industry.

Lastly, the mitigated results that we obtain about the valorisation of the official quality labels from the beginning of the year 2000 can be interpreted like the exhaustion of a source of innovation in the food products: the differentiation of the agricultural raw material on the basis of traditional value, regional or farm traditions becomes standardised vis-à-vis the new orientations of food industry, in particular the linkage between health and food. A fraction of the agricultural production 'without official quality label', which constitutes our control sample, probably begins to answer to these new orientations of the food industry. In this economic context, the 'food engineering' and the marketing of the industrial companies would again be the principal leverages of the food consumption dynamics: the identity of the agricultural products would not be central anymore.



## 14.6 Appendix A; Reshaping the valorisation public measures of agricultural products

Introduced by article 73 of 5 January 2006 law of agricultural orientation, the reform of public valorisation measures for agricultural products and food promulgated by the ordinance of 7 December 2006 aims to reinforce the policy of the 'quality' approaches.

First point of this reform, the new system structures the approaches of valorisation for the agricultural produce around three complementary categories:

- identification labels of quality and origin which are the Protected Designation of Origin (PDO),<sup>1</sup> the Protected Label of Origin (PLO),<sup>2</sup> and the Protected Geographical Indication (PGI)<sup>3</sup> for the valorisation of the origin, the Red Label<sup>4</sup> for the guarantee of a higher quality, the Traditional Speciality Guaranteed (TSG)<sup>5</sup> and Organic Farming<sup>6</sup> (AB);
- the valorizing mentions which are the denomination Mountain,<sup>7</sup> the Farm Product,<sup>8</sup> the Local Product<sup>9</sup> and the Local Wine;<sup>10</sup>
- the certification approaches of various products.

Second point of the reform, the inspecting procedure of the products is unified for its reinforcement. From January 1, 2007, the National Institute for Origin and Quality,<sup>11</sup> new public corporation always identified by acronym *INAO*, takes again the competences exerted by the National Institute for the Labels of Origin and by the National Commission for Labels and Certifications (*CNLC*)<sup>12</sup> which both disappear. Certification bodies accredited by the French Committee for Accreditation<sup>13</sup> ensure the control of the product certification procedures.

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<sup>1</sup> In French, 'Appellation d'origine contrôlée (AOC)'.  
<sup>2</sup> In French, 'Appellation d'origine protégée (AOP)'.  
<sup>3</sup> In French, 'Indication géographique protégée (IGP)'.  
<sup>4</sup> In French, 'Label Rouge (LR)'.  
<sup>5</sup> In French, 'Spécialité traditionnelle garantie (STG)'.  
<sup>6</sup> In French, 'Agriculture biologique (AB)'.  
<sup>7</sup> In French, 'Montagne'.  
<sup>8</sup> In French, 'Produit fermier'.  
<sup>9</sup> In French, 'Produit de pays'.  
<sup>10</sup> In French, 'Vin de pays'.  
<sup>11</sup> In French, 'Institut national de l'origine et de la qualité (INAO)'.  
<sup>12</sup> In French, 'Commission nationale des Labels et des Certifications'.  
<sup>13</sup> In French, 'Comité français d'accréditation'.

The French valorisation policy of the agricultural produce and food strongly inspired the European regulation on the matter (cf. regulations CE 509 and 510 published in 2006): the PDO (European equivalent of the French 'AOC') guarantees quality resulting from a soil; the PGI (European equivalent of the French 'IGP') offers a guarantee of the quality of a product drawing its specificities from the geographic origin; the TSG traditional speciality (European equivalent of the French 'STG') guarantees the traditional aspect of a product.

## 14.7 Appendix B; Testing the effects Statistical tests of the effect for a qualitative criterion

### *Pair wise comparisons*

The pair wise comparisons (i.e., between two groups) of this study are validated using the following statistical tests: the Student test for the comparison of averages, the Wilcoxon signed W test for the comparison of medians. The first test supposes the normality of the observed value distribution (parametric test) while the second, based on ranks, is carried out independently of the nature of the observed value distribution (nonparametric test).

The tests on the rows are used since the distributions of price or ratio are considered to be asymmetrical. Less powerful in a Gaussian context than the parametric tests on the averages (relative effectiveness of 95%), the nonparametric tests can in a no Gaussian context being arbitrarily more powerful than a Student test and prove more robust with regards to the sampling fluctuations.

### *Comparison of averages: the Student T test*

The tests of Student are carried out on the basis of the statistic  $t = \frac{\bar{x} - \mu_0}{s^*/\sqrt{n}}$  where  $\bar{x}$  is the empirical average,  $\mu_0$  the average of the population of reference,  $s^*$  the standard deviation of sampling, and  $n$  the sample size.

For the comparison of two independent samples (types of quality labels, classes of economic dimension, regions), the null assumption  $H_0$  tested is the equality of the averages for the factor of studied interest (price or management ratio). For the comparison of two matched samples (test of temporal evolution between 2000 and 2004), the null assumption tested is the nullity of the average of the individual differences. The Student tests are implemented by means of UNIVARIATE or TTEST procedures from the statistical software SAS.

### *Comparison of medians on matched samples: Wilcoxon signed W test*

The Wilcoxon signed W tests are carried out on the basis of the statistic

$$W_+ = \sum_{i: y_i - x_i > 0} r_i^+ - \frac{n_t(n_t + 1)}{4}$$

where  $r_i^+$  is the rank of the absolute difference  $|y_i - x_i|$  between the two matched values for the farm holding  $i$ ,  $n_t$  the number of values  $|y_i - x_i| \neq 0$ , while assigning to the tied, the average of their respective rows.

For a size of sample  $n \leq 20$ , the probability of  $W_+$  is calculated on the basis of the exact distribution, as a convolution of binomial distributions. For a sample size  $n > 20$ , the probability of  $W_+$  is approximated by considering the statistics

$$t_w = \frac{W_+}{\sqrt{(nV - W_+^2)/(n-1)}}$$

with

$$V = \frac{n(n+1)(2n+1)}{24} - \frac{1}{48} \sum_j t_j(t_j+1)(2t_j+1)$$

where  $t_j$  is the number of tied for *the*  $j^{\text{th}}$  tied group, which then follows a Student distribution with  $(n-1)$  degrees of freedom. For the comparison of two matched samples (test of temporal evolution between 2000 and 2004), the null assumption tested is the nullity of the individual difference median (Hodges-Lehmann's estimator). The Wilcoxon signed W tests are implemented by means of UNIVARIATE procedures from the statistical software SAS.

#### *Comparison of medians on independent samples: Mann-Whitney U test*

The Mann-Whitney  $U$  test, still called Mann-Whitney-Wilcoxon test (*MWW*) or the Wilcoxon sum of ranks test, is based on a linear statistic of the ranks

$$U = \sum_{i=1}^n \delta_1^i \times s(R_i)$$

where  $\delta_1^i$  is a membership index function of the farm holding  $i$  to the class  $C_1$  presenting the lowest ranks,  $s(R_i)$  the rank score  $R_i$  of the farm holding  $i$ , et  $n$  the total number of farm holdings in the FADN sample.

For the comparison of two independent samples (quality label types, economic size classes, regions), the null assumption tested is the equality of

the two probability distributions. Although this assumption is not strictly equivalent to the median equality assumption that is often deduced from it, the test is usually used as a median equality test.

For a sample size of  $n > 20$ , the probability of  $u_{obs}$  (value drawn from the observations) is asymptotically calculated by considering the test statistic

$$\bar{s} = \frac{1}{n} \sum_{i=1}^n s(R_i) \quad \text{with } n_1 \text{ the class size of } C_1, n_2 \text{ the class size of } C_2,$$

$$z_u = \frac{u_{obs} - E_0[U]}{\sqrt{Var_0[U]}} \quad \text{the average score,}$$

$$E_0[U] = \frac{n_1}{n} \sum_{i=1}^n s(R_i) \quad \text{the mathematical expectation of } U \text{ under the null hypothesis, and}$$

$$Var_0[U] = \frac{1}{(n-1)} \frac{n_1 n_2}{n} \left[ \sum_{i=1}^n (s(R_i) - \bar{s})^2 \right]$$

the variance of  $U$  under the null hypothesis, this statistic following a standardised normal distribution. In this paper, the score function used is the Wilcoxon score:  $s(R_i) = R_i$ . The Mann-Whitney U tests are implemented by means of NPAR1WAY procedure of the statistical software SAS.

#### *Proper and joint effects of qualitative factors: quality label and economic size*

Generally, the impact of the quality label have been controlled with the impact of the economic size class testing the possible interaction of the two criteria by a two criteria with interaction analysis of variance with an unbalanced design (groups with unequal size). The estimates were computed using the additive two-factors analysis of variance or with or without interaction depending it is relevant or not, otherwise tests of multiple comparison when only one of the factor presents a statistically significant effect.

#### *Analysis of variance*

The impact of qualitative factors such as quality labels or economic size classes on the variable of interest, consisted of the producer prices or the farm holding earnings, even a management ratio, can be tested via an analysis of variance model with fixed levels (factor categories being a priori chosen). The sum of squared deviations of the individual values to the median values breaks up into two independent sums: the sum of the squared deviations explained by the model (e.g. price deviations explained by the presence of a quality label) and the

sum of squared residuals (i.e. gathering the deviations due to the set of uncontrolled factors).

The comparison of these sums is carried out dividing them by their respective degrees of freedom (i.e. the number of independent deviation sources), operation whose result gives the mean square (MS), as an estimate of variability.

One then compares the explained mean square with the residual mean square via the ratio

$$F = \frac{MS_{EXPLAINED}}{MS_{RESIDUAL}}$$

Under the null assumption stating that the analyzed factor has no effects, the ratio F follows a Fisher-Snedecor distribution. The observation of values much higher than 1 for the F ratio will lead to the rejection of the null assumption and thus to the assertion of a statistically significant effect of the factor analyzed on the variable of interest, with a computable associated risk of error (p-level) to this assertion. The homogeneity of variance assumption founding the analysis of variance model is tested by means of the Levene statistic (analysis of variance on the absolute values of the deviations). If the variance homogeneity assumption is rejected by the Levene test, we use the Welsch statistic (analysis of variance weighted by the standard deviation of each class) to test the effect of the criterion considered.

The analyses of variance related to unbalanced designs (groups with unequal size), the variance analyses are carried out by means of the GLM procedure (Generalized Linear Model) of the SAS statistical software.

#### *Multiple comparisons*

The multiple comparisons (i.e., between more than two groups) of this study are validated using the following statistical tests: one-way analysis variance for the effect of a qualitative criterion, the test of Kruskal-Wallis for the multiple comparisons of medians. The first test supposes the normality of the distributions (parametric test) while the second, based on the ranks, is carried out independently of the distributional nature of observations.

The multiple comparison tests a posteriori carried out (SMM - Studentised Maximum Modulus) aim establishing which are the categories (even which groups of categories) of the criteria studied that induce statistically significant differences for the mean levels of the factor analyzed, while controlling the multiple risk of comparison.

*Multiple comparisons a posteriori: studentised maximum modulus (SMM) test*

Suggested by Hochberg, the SMM test, or GT2 test, is an alternative of the multiple-comparison -Tukey-test based on the studentised absolute deviations and conceived for the balanced designs (groups of equal size). The test SMM makes it possible to control the experimental error of multiple comparisons (MEER-Maximum Experiment wise Error Rate) on a fixed level for unbalanced designs (groups of unequal size). The Test SMM is less powerful (more conservative) than the Kramer-Tukey test, adaptation of the Tukey test of for the groups of unequal size.

*Multiple comparisons of medians: Kruskal-Wallis test*

The Kruskal-Wallis multiple comparison test is based on the statistic of test  $KW$  as a sum of squares of the score (rank function) deviations to their mathematical expectation which, under the null hypothesis assuming identity of the distributions related to the  $K$  sub samples defined by the membership to the studied criterion categories, asymptotically follows a Chi-Square distribution  $\chi^2$  with  $(K - 1)$  degrees of freedom:

$$KW = \frac{1}{S^2} \sum_{k=1}^K \frac{1}{n_k} (T_k - E[T_k])^2$$

where  $T_k = \sum_{i=1}^n \delta_k^i \times s(R_i)$

is the score total of the class  $C_k$ ,

$$E_0[T_k] = \frac{n_k}{n} \sum_{i=1}^n s(R_i)$$

is the mathematical expectation  $T_k$  under the null hypothesis,

$$S^2 = \frac{1}{(n-1)} \left[ \sum_{i=1}^n (s(R_i) - \bar{s})^2 \right]$$

is the sampling la variance of the scores, and

$$\bar{s} = \frac{1}{n} \sum_{i=1}^n s(R_i) \quad \text{the average score.}$$

#### *Nonparametric estimate of the density*

The nonparametric estimate of density makes it possible to provide a density plot without assuming the nature of the empirical distribution. The nonparametric estimate of density is carried out by means of a density estimation method based on a Gaussian kernel (procedure *KDE - Kernel Density Estimate* STAT module of the statistical analysis software *SAS*).

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## **14.8 Appendix C; Quality in questions**

In 2000, the agricultural census introduces questions about the quality labels of the farm holding products: the raw or processed products are concerned

A quality label is never allotted on a simple declaration of the producer, but must on the contrary be allotted and controlled by an approved organization. The official quality labels (Organic Farming, Labels, Compliance Certificates) are those whose schedule of conditions is recognized by the public authorities or the National Commission of Labels and Certifications.

The French ministry for Agriculture and Fishing allots the 'Organic farming' denomination (*AB* logo). An organic farming product is either an agricultural produce or a foodstuff whose conditions of production are in conformity with the European regulation (crop products) or with the national schedules of conditions approved (produced animal) as regards the production mode

(limitation of the inputs, primacy to the natural inputs, exclusion of the majority of the synthesis chemical compounds), work methods (recycling the organic matters and rotating crops), biological fight and respect of the 'conversion towards the organic farming' schedule. The organic farming producer is held to declare itself with the county department service of Agriculture and the Forest and is subjected to the control of an independent certification body approved for the Organic Farming ('Ecocert', 'Qualité France'). Before being able to use the 'AB' logo, the farmer must respect a minimum two years period for the annual cultures, three years for the perennial cultures, and two years for the animals, except out-ground breeding where the period of conversion is lower than one year

**Table C.1** Quality Labels of the farm holding products, the FAC 2000 form

10.1 Signes de qualité des produits de l'exploitation						
	Code	Agriculture biologique	AOC	Label	Certification de conformité	Autres avec cahier des charges
		oui = 1 conversion = 2 non = 0	oui = 1, non = 0			
Grandes cultures (céréales, cult. ind., légumes secs et protéagineux) .....	01	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Légumes frais (y c. fraise, melon) .....	02	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruits .....	03	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cidre, huile d'olive .....	04	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Produits distillés .....	05	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bovins .....	06	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ovins, caprins .....	07	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Porcins .....	08	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lait, produits laitiers .....	09	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volailles (y c. palmipèdes gras) .....	10	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Œufs .....	11	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Autres produits .....	12	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>VÉRIFICATION INFORMATIQUE (01 à 12) .....</b>	<b>13</b>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Source: French Agricultural Census (FAC 2000) SCEES.

A Protected Designation of Origin (PDO) protects the geographical denomination applied to a product whose quality of manufacture, being based on traditional know-how of the producers, is founded on tradition and soil. The



PDO, originally developed for the wines and cheeses, has been extended to a larger set of food products. In order to obtain the PDO official recognition pronounced by decree published in the Official Journal, the certification must be submitted to the National institute for Labels and Origins (INAO).

The agricultural Label announces for a food product of t specific characteristics, fixed as a preliminary, establishing a level of quality higher than the similar products, directly perceptible by the consumer. In 2000, one distinguishes two types of Labels: the Red Label, marks collective ministry for Agriculture, and the regional Labels presenting the more specific characters of a region. In 2002, the regional Labels were transformed into Protected Geographical Indication (PGI). A «quality consortium», collective structure gathering the various operators and holding the property of the schedule of conditions, manages each Label. The request for homologation of the Label is carried out by the National Commission of Labels and Certifications (CNLC) and becomes effective by joint decree of the ministers in charge for agriculture and consumption. An independent certification body approved for the products concerned must control the producers operating under a Label.

The Compliance Certification (CC) of products attests that a not processed agricultural produce or a foodstuff is in conformity with specific characteristics or rules fixed as a preliminary bearing according to the cases on the origin, manufacture, the transformation and conditioning. Consigned in a schedule of conditions, the certified characteristics are different from those of the organic farming or of those determining a Label, and could not exclusively rest on the medical and hygienic obligations envisaged by the regulation, finally must be measurable and significant for the consumer. The National Commission of Labels and Certifications validates the schedules of conditions and the corresponding standards. An approved certification body controls the producers.

The Codes of Good Practices (CGP) relate to all the nonofficial quality labels for which there exists a pre-established schedule of conditions whose respect is controlled by a third party. A nonofficial label corresponds to a strictly private schedule of conditions that has not been the subject of a homologation by the public authorities or an opinion from the CNLC. Thus, the producer is subjected to the control of the conditions of production by the organization allotting the label, which can be possibly carried out by a certification body also intervening on official quality labels.

**Table C.2**

**Agricultural product direct sales from the farm holding to the consumer, transformed or not, the FAC 2000 question**

**10.2 Vente de produits agricoles de l'exploitation, transformés ou non, directement au consommateur**  
oui = 1, non = 0 .....

Source: French Agricultural Census (FAC 2000) SCEES.

The direct sales relate to the current practice for some farm holding products directly sold to the consumer: it can take place with the farm, in edge of road, on a market, in shop, with the restoration, etc. The direct sales includes the sales to the restaurants, the coffee shops, the work councils and other groups of private individuals, including the sales actual via an Economic Interest Group.<sup>1</sup>

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<sup>1</sup> In French, '*Groupement d'intérêt économique*'.

