Prin 2007 PUE&PIEC

Politiche dell'Unione Europea, Processi di Integrazione Economica e Commerciale ed esiti del negoziato Wto

Impact of the Health Check on structural change and farm efficiency: a comparative assessment of three European agricultural regions

Filippo Arfini *(University of Parma)* and ***Michele Donati*** *(University of Parma)*

UNIVERSITÀ DELLA CALABRIA

ROMA TRE UNIVERSITÀ DEGLI STUDI

Working Paper 10/6

Prin 2007 PUE&PIEC is a Research Project on *"European Union policies, economic and trade integration processes and WTO negotiations"* financed by the Italian Ministry of Education, University and Research (Scientific Research Programs of National Relevance, 2007).

Information about the project, the partners involved and its outputs can be found at

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OECD Workshop on the Disaggregated Impacts of CAP Reform

10-11 March 2010

Impact of the Health Check on structural change and farm efficiency: A comparative assessment of three European agricultural regions*

Filippo Arfini and Michele Donati

Department of Economics, University of Parma
filippo.arfini@unipr.it
michele.donati@unipr.it

Paris OECD Conference Centre

* *Financial support received from the European Commission (Research project "FACEPA - Farm Accountancy Cost Estimation and Policy Analysis of European Agriculture", FP7/2007-2013 contract no. 212292) and the Italian Ministry of Education, University and Research (Scientific Research Program of National Relevance 2007 on "European Union policies, economic and trade integration processes and WTO negotiations") is gratefully acknowledged.*

Abstract
An assessment of the effect of regionalized single payment system on farm behaviour and farm economic performances is proposed for understanding the potential consequences for European farms. The methodology adopted for this purpose is based on the positive mathematical programming (PMP) integrated with a cluster analysis technique (CA). The PMP model is used for assessing farm responses towards changes in policy and market scenarios, while CA is implemented for mapping the characteristics of the farms before and after the regionalization introduction observing thus the dynamics in production composition and economic results. The simulations have demonstrated a different capability for farms to react to new policy and market scenarios, and how regionalization contributes to uniform the production and economic characteristics of the investigated farms.

Key words: CAP, Regionalization, Positive Mathematical Programming, Cluster Analysis.

1. Introduction

The European Commission has always considered the Common Agricultural Policy (CAP) as a dynamic political tool that aims to link the agricultural sector with the evolving of the economic, financial, social and political dynamics that distinguish the Member States of the European Union. From this standpoint, the Health Check (HC) is much more than a simple assessment of the state of health of European agriculture; it is a drawing up of the "new rules" that manages the relations between farms and the market, on which the future efficiency and survival of the said farms, and the production sectors that characterise entire European agricultural regions, will depend.
The new Regulation EC n. 73/2009 has reached the objective of reforming the current structure of the CAP and has continued the modernisation process introduced in 2003 by the Fischler's reform (DG Agri, 2009, Borchard, 2008). The aim of the Commission is to set up a legislative framework geared to prepare European agriculture for the real new reform which is to be defined after the review of the European Union budget. In the meantime, the goals set are not so much of the strategic type but rather more of the *tactical* type, and they are founded on the attempt to render European agricultural policy more "simple", "efficient" and "effectiveness" and more focused on coping with the changes that most closely concern European society, and hence the Commission itself: food security, land management, viable rural areas, competitiveness in a global market, climate change, water management, the development of renewable energy sources and the preservation of biodiversity.
One of the aspects that distinguishes the Regulation EC n. 73/2009 is the maintaining of the decoupled payment in order to guarantee farmers a certain level of financial security, allowing them to respond better to signals from the market, to supply the food sector, and to create a basis for providing public goods (DG Agri, 2009, Borchard, 2008). The latter action is developed by the full implementation of direct payments fully decoupled from farmers production decision without influencing their market orientation. In this framework the

hypothesis to move from the concept of rights acquired by the farms in the past to the adoption of decoupled payments calculated on a regionalised basis can be a challenge for many farms and for the entire agriculture sector. The change proposed, which is accompanied by other measures that are maintained (cross compliance) and introduced (stronger modulation), in addition to bringing about a redistributive effect between regions and farms (Anania 2008; Arfini, 2006) could also lead to a redistributive effect between production sectors, affecting the competitiveness of the farm activities and of the sectors to which such farm activities belong. All this could lead to a variation in the competitiveness of the farms and hence of the sectors involved.

The aim of this paper is, therefore, to assess the effects of this "*non-reform*" on the competitiveness of farms, considering the goals set as regards the role of decoupled aid, the capacity to react to market variations in different European environments (Frascarelli, 2008; Canali 2008).

It is therefore justifiable to wonder, in this sense, how the measures provided for by the HC (regionalised SPS, modulation, absence of set-aside and milk quotas) can affect the competitiveness of European farm businesses, i.e. the capacity to adapt the organisation of the farm production, improving its productive and economic performance compared to the "historical" SPS currently in force. In this context, farms are under the framework of SPS and receive a full decoupled payment. The real innovation introduced by the reform that potentially can modify the existing equilibrium of farm holders is the regionalization of directs subsidies according to the average aid per Ha calculated for a homogeneous region: specific European region or the entire Europe. In theory, the modification of subsidy level will not change the land allocation but, will change the farmer income and will modify (in better or worst) the farmer sensibility to market price variation.

It is, furthermore, justifiable to wonder whether these measures work in different ways in the different European agricultural regions, creating comparative advantages that make certain regional supply chains more efficient than others. For this reason, the analysis considers all the farm holders belonging to the FADN sample of three European agricultural regions: Veneto (IT), Ile-de-France (F), Belgium. At the same time, the objective of this work is also to capture the strategy of this farm holders and to observe their trajectory with respect to the research of a more efficient situation.

2. Methodology

The assessment of the effects of the HC regulation by the introduction of regionalization of SPS on European farms shall be conducted by analysing, in addition to economic performance and farming system, also the change in the farm's strategy as consequences of new policy and market scenario.

We propose the adoption of a model that integrates the Positive Mathematical Programming (PMP) approach – which represents the characteristics of the farms and simulates the effects of the agricultural policy measures - with a cluster analysis technique able to group farms characterized by the same production strategy and economic characteristics.

2.1 The PMP model

The PMP in its classical approach, presented in the paper by Paris and Howitt (1998), is an articulated method consisting of three different phases, each of which is geared at obtaining additional information on the behaviour of the farm so as to be able to simulate its behaviour in conditions of maximization of the gross margin (Paris and Howitt, 1998; Arfini and Paris, 2000). The PMP method has been widely used in the simulation of alternative policy and market scenarios, utilising micro technical-economic data relative both to individual farms and to average farms that are representative of a region or a sector (Arfini et al., 2005). The success of the method is to be largely attributed to the relatively low requirement for information on the farm activities and, first and foremost, to the possibility to use data banks, among which also the FADN data bank (Arfini *et al*., 2005) .

Notwithstanding the numerous studies that adopt the PMP approach using the FADN data, the methodology nonetheless comes up against a limitation consisting of the lack on specific production costs per process. The lack of this information poses a problem during the calibration phase of the model, when the estimation of the cost function requires a non negative marginal cost for all production processes activated by a single holding (Paris and Arfini, 2000).

This problem is dealt with in this analysis by resorting to an approach that utilises dual optimality conditions directly in the estimation phase of the non linear function. The approach qualifies itself as an extension of the Heckelei proposal (2002), according to which the first phase of the classical PMP method can be avoided by imposing first order conditions directly in the cost function estimation phase by introducing the value of the rented land, given from the market, as dual value. This procedure obliges to use external information from the FADN dataset provided by experts or by regional investigations. The main disadvantage of this procedure is that the external data are not always homogeneous with the characteristic of the observed farms collected in the FADN sample. The value of the rent of the land may change within the region according to several reasons and the dual price of the land may be also quite different for different farms typology according to their production sector (milk or cereals), their size, their level of specialization and to the specific characteristics of each farm holder. In sum the value of the rented land is not easy to collect and can lead to misspecification of the PMP models.

Moreover, as a guide to the correct estimation of the explicit production cost per crop, we propose to consider the information relative to the total variable costs available in the European FADN archive. This “innovation” becomes particularly important as it enables us to perform analyses utilising the European data bank without having to resort to parameters that are exogenous to the model.

According to this new approach, the PMP model falls into two phases: a) the aim of the first is to estimate specific accounting variable costs per crop through the reconstruction of a non-linear function of the total variable cost observed for each individual farm of the FADN sample; b) the aim of the second is the calibration of the observed production situation

through the resolving of a farm gross margin maximization problem, in the objective function of which the cost function estimated in the previous phase is considered.
The first phase is defined by an estimation model of a quadratic cost function in which the squares of errors are minimised:

$$\min_{u} LS = \frac{1}{2}\mathbf{u}'\mathbf{u} \qquad (1)$$

subject to

$$\mathbf{c} + \boldsymbol{\lambda} = \mathbf{R}'\mathbf{R}\bar{\mathbf{x}} + \mathbf{u} \qquad \text{se } \bar{x} > 0 \qquad (2)$$

$$\mathbf{c} + \boldsymbol{\lambda} \leq \mathbf{R}'\mathbf{R}\bar{\mathbf{x}} + \mathbf{u} \qquad \text{se } \bar{x} = 0 \qquad (3)$$

$$\mathbf{c}'\bar{\mathbf{x}} \leq TVC \qquad (4)$$

$$\mathbf{u}'\bar{\mathbf{x}} + \frac{1}{2}\bar{\mathbf{x}}' \ \mathbf{R}'\mathbf{R} \ \bar{\mathbf{x}} \geq TVC \qquad (5)$$

$$\mathbf{c} + \boldsymbol{\lambda} + \mathbf{A}'\mathbf{y} \geq \mathbf{p} + \mathbf{A}'\mathbf{s} \qquad (6)$$

$$\mathbf{b}'\mathbf{y} + \boldsymbol{\lambda}'\bar{\mathbf{x}} = \mathbf{p}'\bar{\mathbf{x}} + \mathbf{s}'\bar{\mathbf{h}} - \mathbf{c}\bar{\mathbf{x}} \qquad (7)$$

$$\mathbf{R} = \mathbf{L}\mathbf{D}^{1/2} \qquad (8)$$

$$\sum_{n=1}^{N} u_{n,j} = 0 \qquad (9)$$

By means of the model (1)-(9) a non-linear cost function can be estimated using the explicit information on the total farm variable costs (TVC) available in the FADN data bank. The restrictions (2) and (3) define the relationship between marginal costs derived from a linear function and marginal costs derived from a quadratic cost function. $\mathbf{c}+\boldsymbol{\lambda}$ defines the sum of the accounting variable costs and the differential marginal costs. This latter are implicit in the decision-making process of the entrepreneur and not accounted for in the holding's bookkeeping. Both components are variables that are endogenous to the minimization problem. To guarantee consistency between the estimate of the total specific costs and those effectively recorded by the farm accounting system, the constraint (4) imposes that the total estimated explicit cost should not be greater than the total variable cost observed in the FADN data bank. Equation (5) defines that the costs estimated by the model, where the non linear cost function must at least equal to the value of the total variable cost (TVC) measured. In order to guarantee consistency between the estimation process and the optimal conditions, restriction (6) introduces the traditional condition of economic equilibrium, where total marginal costs must be greater than or equal to marginal revenues. The total marginal costs also consider the use cost of the factors of production defined by the product of the technical coefficients matrix $\mathbf{A}'$ and the shadow price of the restricting factors y ; while the marginal revenues are defined by the sum of the products' selling prices, *p*, and any existing public coupled subsidies. The additional constraints (7) defines the optimal condition, where the value of the primal function must correspond exactly to the value of the objective function of the dual problem. In order to ensure that the matrix of the quadratic cost function is symmetric positive semidefined, the model adopts Cholesky's decomposition method, according to which a matrix that respects the conditions stated is the result of the product of a triangular matrix, a diagonal matrix and the transpose of the first triangular matrix (8). The estimated matrices are presented in Appendix 1. Last but not least, restriction (9) establishes that the sum of the errors, u, must be equivalent to zero.

The cost function estimated with the model (1)-(9) may be used in a model of maximization of the corporate gross margin, ignoring the calibration restrictions imposed during the first phase of the classical PMP approach. In this case, the dual relations entered in the preceding cost estimation model guarantee the reproduction of the situation observed. The model, therefore, appears as follows:

$$\max_{x \geq 0} ML = \mathbf{p'x} + \mathbf{s'h} - \left\{ \frac{1}{2} \mathbf{x'\hat{Q}x} + \mathbf{\hat{u}'x} \right\} \tag{10}$$

subject to

$$\mathbf{Ax} \leq \mathbf{b} \tag{11}$$

$$A_j x_j - h_j = 0 \qquad \forall j = 1,...,J \tag{12}$$

The model (10)-(12) precisely calibrates the farming system observed, thanks to the function of non-linear cost entered in the objective function which preserves the (economic) information on the levels of production effectively attained. The matrix Q estimated is reconstructed using Choleschy's decomposition: $\mathbf{\hat{Q}} = \mathbf{\hat{R}}'\mathbf{\hat{R}} = \mathbf{\hat{L}\hat{D}\hat{L}}'$. Constraint (11) represents the restriction on the structural capacity of the farm, while the relation (12) enables us to obtain information on the hectares of land (or number of animals) associated with each process j. Once the initial situation has been calibrated through the maximization of the corporate gross margin, it is possible to introduce variations in the public aid mechanisms and/or in the market price levels in order to evaluate the reaction of the farm to the changed environmental conditions. The reaction of the farm production plan will take into account the information used during the estimation phase of the cost function, where it is possible to identify a real, true matrix of the firm choices, i.e. Q.

The described PMP model can be used in two different contexts: a) the estimation of the explicit variable accounting cost (c) related to each activity whose data are collected by the FADN, b) the estimation of the total variable cost per crop perceived by the farmers ($\mathbf{c} + \boldsymbol{\lambda}$). This latter allows to have the set of information useful for evaluating farm behaviour by means of the definition of a new profit function.

An additional element to consider is given by the introduction of full decoupling – and the related SPS - in the model. This aspect is given by a specific constraint that link ex-ante the entitlement value - per unit – to the number of entitlements. Only the eligible area represented by eligible crops can benefit of the decoupled payment.

$$ham_n \leq hdir_n \quad \forall n = 1,...,N \tag{13}$$

$$ham_n + hamd_n \leq \sum_{j=1}^{J} h_{n,j} \quad \forall n = 1,...,N \tag{14}$$

Equation (13) imposes that the variable related to the admissible area ham_n should be less than or equal to the number of entitlements in each farm $hdir_n$, where n represents the n-farm

($n=1,\dots,N$). The second constraint (14) means that the land admissible to the payment, ham_n, plus the land admissible but not payable because not linked to the number of entitlements owned, $hamd_n$, have to be les than or equal to the total land attributed to the eligible farm crops. Obviously only the variable ham_n is present in the objective function.
In case of regionalization the structure of the constraint does not change, while what changes is the value of each entitlements that will be equal for all the farms belonging to the same region. Moreover, the *j* admissible activities cover the whole farm surface.

2.2 The cluster analysis

The second methodological set trying to identify homogenous groups of farms able to describe their strategy in respect their structure and their production choice. For this purpose, the analysis has adopted a multivariate analysis technique articulated in the principal component detection and the method of cluster analysis (*k*-mean), that has contributed to identify a set of homogeneous farms in two different reference scenario: at the baseline scenario and at the new policy scenario. This picture allows us to describe the effect of the policy measure and the dimension of the new strategies adopted by each farm.

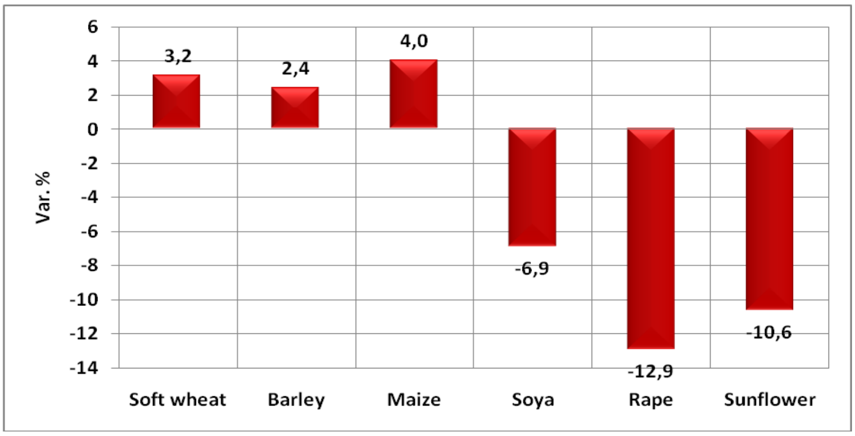
3. The scenarios

Considering the new Regulation of the Commission that put in practice the Health Check (Reg. EC n. 73/2009), three policy scenarios are considered and are compared with a Baseline scenario that reproduces the situation in term of land allocation and revenue, cost, subsidies and income existing before the Fischer-Boel reform:

1. Single region scenario “S_Reg”: payments are regionalized using specific flat rate differentiated for the three regions considered; the modulation rates are established at 10% (for the bracket between 5.000 and 300.000 Euros) and 14% (for the bracket higher than 300.000 Euros);
2. Single region and market scenario “S_Reg_P”: Health Check scenario with variation in market prices (at 2015); the price variations are added to scenario S_Reg.
3. European region and market scenario “EUReg_P”: payments are calculated on a flat rate at European level (EU15 as homogenous area); the modulation rates are established at 10% (for the bracket between 5.000 and 300.000 Euros) and 14% (for the bracket higher than 300.000 Euros); this scenario considers the market price variation at 2015 according FAPRI projections.

Market scenario is developed using the forecasted price scenario for the year 2015 provided by FAPRI projections (2008) (Fig. 1).

Figure 1. Price variation according to FAPRI projections 2015/2009



Source: our elaboration of FAPRI.

As already mentioned in the previous section, in the case of the transition from the historical SPS to the regionalised one, the unitary value of the payment and the overall number of the entitlements available to the individual farms change. This transition implies a process of redistribution, not only among farms but also among sectors. At the same time also the modulation generates redistributive effects inasmuch as it produces an “erosion” of the SPS in the farms under examination, affecting the overall economic result of the farm (Tab. 1). To this end, the transition from the "historical" SPS to the “regionalized” SPS will lead to a general reduction of the unitary subsidies received by the farms only in some regions - in case of homogeneous region equal to the single region -, while the adoption of homogeneous region corresponding to the entire Europe, will produce a general reduction of payments for all the three regions that are considered. The introduction of modulation reduces the level of payments specially in intensive regions.

Table 1. Value of entitlements across scenarios (€uro/ha)

Regions	**Baseline (2009)**	**S_Reg**	**S_Reg_P**	**S_EUReg_P**
	Without Modulation			
Veneto	450	307	307	264
Ile-de-France	311	284	284	264
Belgium	376	441	441	264
	With Modulation			
Veneto	426	286	286	246
Ile-de-France	292	259	259	241
Belgium	356	406	406	247

Source: our elaboration.

4. Initial data and results obtained

4.1 Initial data

The sample of data used consists of farms contained in the European FADN data bank for the year 2007 (Tab. 2). To be more specific, the farms considered are situated in three European regions that are all different as regards geographical location, productive and structural characteristics of their farming systems: Veneto, Ile-de-France, Belgium[1]. The regional sample of the farms was, moreover, stratified on the basis of the specialist production identified by the economic technical orientation (FT) to which they belonged. In the analysis in question, is considered only the Farm Type related to arable crops which is one of the most important sector at European level.

Table 2. Brief description of the FADN sample 2007 (Italy), 2006 (Ile-de-France, Belgium)

Region	no. of farms	Mean UAA	COP (with rice) Production (% of UAA)	Mean GSP (Euro/Ha)	Mean TVC (Euro/Ha)	Mean Subs. (Euro/Ha)
Veneto	211	41	88	1,973	750	426
Ile-de-France	141	140	94	1,045	473	292
Belgium	93	54	65	2,045	978	356

Source: our elaboration on FADN 2007

4.2 Impact on land allocation and farm revenue

The results provided by the analysis of three European regions observed by farms specialized on Farm Type 1 shows a different consequences with respect to the capability to react on policy scenario and market evolutions. Of course in the three regions the introduction of regionalization on regional basis will not produce evident changes in land allocation. Considering all the farms, in average, only in Veneto there is a small change due to the presence of rice in some farms where the payment are still high and partially coupled and will be fully decoupled under the HC implementation (Table 3a-b-c). Only in this case it exists a re-allocation of some crops with the introduction of the regionalization. It is possible to observe how the reduction of the entitlement value does not produce any variation in term of land allocation but only a variation in farm revenue (Table 4a-b-c).

With the introduction of scenario that combines policy intervention and price variation (scenario S_Reg_P and EUReg_P) is clear how only price variation induces farmers to modify their production plan. In this case, farmers are sensible to new market signals and need indication on how to interpret it. It is also interesting to note how the same crops will have different evolution in the three regions. If we consider maize, for instance, it would increase in Veneto and in Ile-de-France, but decreases in Belgium; instead soft wheat would increase in Veneto and Belgium but would have a reduction in Ile-de-France.

[1] The regions considered represent the sample used in the context of the UE-FACEPA research project, of which this paper is an output.

Table 3a. Veneto region Impact on land allocation

Crops	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(ha)	(Var. % wrt baseline)		
Wheat	2265	-0.1	6.3	6.3
Maize	2679	0.0	20.6	20.6
Rice	301	-11.2	-14.8	-14.8
Soya	2105	1.1	-32.3	-32.3
Sugarbeet	424	2.5	13.3	13.3
Tobacco	246	0.2	-0.3	-0.3
Temporary grass	318	0.3	-5.6	-5.6
Others	262	0.6	-2.8	-2.8
Total	**8600**	**0.0**	**0.0**	**0.0**

Source: our elaboration .

Table 3b. Ile-de France region Impact on land allocation

Crops	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(ha)	(Var. % wrt baseline)		
Wheat	9714	0.0	-4.1	-4.1
Barley	3798	0.0	8.5	8.5
Maize	437	0.0	21.7	21.7
Rape	3434	0.0	-25.5	-25.5
Dry Pulse	1044	0.0	80.6	80.6
Sugarbeet	875	0.0	8.4	8.4
Others	579	0.0	-11.1	-11.1
Total	**19880**	**0.0**	**0.0**	**0.0**

Source: our elaboration .

Table 3c. Belgium Impact on land allocation

Crops	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(ha)	(Var. % wrt baseline)		
Wheat	2230	0.0	6.0	6.0
Barley	864	0.0	-15.4	-15.4
Rape	105	0.0	-4.0	-4.0
Sugarbeet	739	0.0	0.5	0.5
Potato	652	0.0	-4.2	-4.2
Others	423	0.0	6.3	6.3
Total	**5013**	**0.0**	**0.0**	**0.0**

Source: our elaboration .

On the side of the economic impact (Table 4a-b-c) of the introduction of the regionalization at single region basis (scenario S_Reg) the reduction of gross margin is significant in Veneto (-8.4%), moderate in Ile-de-France (-3.8%), while in Belgium (that is one region) gross margin increases (+3.5%). Market intervention with regionalization (scenario S_Reg_P) push farmers to modify their specialization in cereals with different emphasis in the three regions according to their specialization. In Veneto, corn and wheat increase, in Ile-de-France corn and barley increase, while in Belgium only wheat increases. At the same time, the economic performance improves in all the farms but it is still rather negative with respect to the baseline for Veneto (-6.8%) and Ile-de-France (-2.4%), while in Belgium it grows up to 5.4%. The introduction of the regionalization scenario considering EU15 as a unique homogeneous region, the economic performances modify considerably in all the farms for all the three regions. By the effect of the reduction of the SPS values the gross margin reduces by 9.2% in Veneto, by 4.5% in Ile-de-France and by 6.1% in Belgium compared with the baseline scenario.

Table 4a. Veneto region, Economic impact

Economic Variables	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(Euro/ha)	(Var. % wrt baseline)		
GSP	1973	-0.1	3.8	3.8
Net Aids	426	-32.9	-32.9	-42.1
Modulation	25	-12.8	-12.8	-28.9
Total Variable Costs	750	-0.3	6.2	6.2
Gross Margin	1650	-8.4	-6.8	-9.2

Source: our elaboration .

Table 4b. Ile-de France region, Economic impact

Economic Variables	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(Euro/ha)	(Var. % wrt baseline)		
GSP	1045	0.0	0.8	0.8
Net Aids	292	-11.1	-11.1	-17.3
Modulation	19	28.9	28.9	18.6
Total Variable Costs	473	0.0	-0.6	-0.6
Gross Margin	864	-3.8	-2.4	-4.5

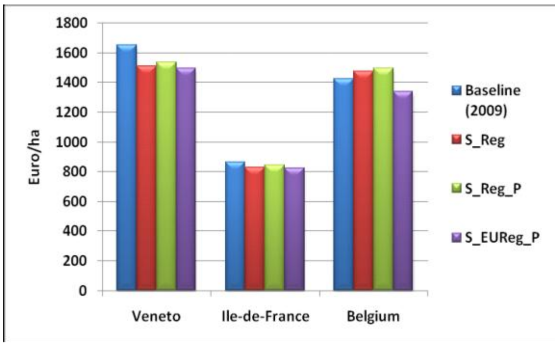
Source: our elaboration.

Table 4c. Belgium Economic impact

Economic Variables	Baseline (2009)	S_Reg	S_Reg_P	S_EUReg_P
	(Euro/ha)	(Var. % wrt baseline)		
GSP	2045	0.0	0.4	0.4
Net Aids	356	14.0	14.0	-30.8
Modulation	20	73.4	73.4	-14.0
Total Variable Costs	978	0.0	-1.5	-1.5
Gross Margin	1424	3.5	5.1	-6.1

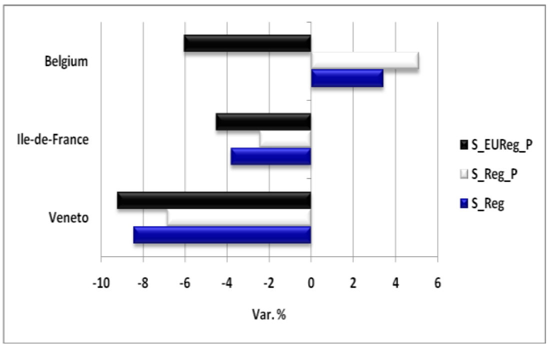
Source: our elaboration .

Figure 2a. Gross Margin comparison between regions – Euro/ha



Source: our elaboration.

Figure 2b. Gross Margin comparison between regions – Var. %



Source: our elaboration.

4.2 Impact on farm strategies

Farm strategies is here evaluated considering the dynamics of observed farms considered as single entities. In this case using a cluster analysis it is possible to observe the behaviour of groups of homogeneous farms under the policy scenario that introduces regionalization considering EU as a single region and price variation according to the FAPRI projections. The variables considered in the clustering process are the GSP per hectare, the total variable costs per hectare, the subsidy level per hectare, the incidence of cereal production of the total UAA and, finally, the class of UAA of each farm.

In each region six groups of farms are detected according to their specific structural characteristics:

- Veneto: Cluster 1 - Small and low intensive farms; Cluster 2 - Small and cereal specialized farms; Cluster 3 - Small and low efficient farms, Cluster 4 - Large, intensive tobacco farms; Cluster 5 - Large and extensive farms, Cluster 6 - Small very low intensive farms.
- Ile-de-France: Cluster 1 - Large cereal oriented farms; Cluster 2 - Huge, high intensive farms; Cluster 3 - Small, low intensive farms; Cluster 4 - Small, cereal oriented farms ; Cluster 5 - Average cereal farms; Cluster 6 - Huge cereal farms;
- Belgium: Cluster 1 - Extensive cereal oriented farms; Cluster 2 - Low intensive non-cereal farms ; Cluster 3 - Large intensive non-cereal farms; Cluster 4 - Intensive cereal farms; Cluster 5 - Huge intensive farms; Cluster 6 - Small, cereal oriented farms;

The introduction of the scenario of the European regionalization (EUReg_P) highlights a common trend for the farms belonging to the three regions: a reduction in the degree of disparity among groups of farms. The six groups of farms identified for each region have been characterized by a dynamic of concentration in some specific clusters. More specifically, Veneto region shows a migration towards cluster 1 (62 farms), cluster 2 (50 farms) and cluster 3 (37 farms) while farms belonging to cluster 4 and cluster 5 do not change due to the presence of tobacco and the extensive method adopted in their farm management (Appendix 2). In Ile-de-France a relevant group of farms changes the initial cluster for moving to the fifth group (average cereal farms) that becomes the most representative (from 17 to 48 farms) cluster. Only two farms belonging to cluster 2 (huge, high intensive farms) do not change their global strategies. In Belgium, there is also a polarization from intensive farms to more extensive farms specialized in cereals (cluster 1 and cluster 6), while huge intensive farms are quite stable (see Table 5a-b-c).

Table 5a. Distribution of farms among clusters -Veneto

Clusters		**S_EUReg_P**						**Total**
		1	**2**	**3**	**4**	**5**	**6**	
Baseline	**1**	6	3	13				22
	2	47	45					92
	3	4	2	14				20
	4				4			4
	5					58		58
	6	5		10				15
Total		62	50	37	4	58		211

Source: our elaboration.

Table 5b. Distribution of farms among clusters - Ile-de-France

Clusters		**S_EUReg_P**						**Total**
		1	**2**	**3**	**4**	**5**	**6**	
Baseline	**1**	19				10	3	32
	2		2					2
	3			19		20		39
	4	4		2	14			20
	5	3		6	1	6	1	17
	6					12	19	31
Total		26	2	27	15	48	23	141

Source: our elaboration.

Table 5c. Distribution of farms among clusters -Belgium

Clusters		**S_EUReg_P**						**Total**
		1	**2**	**3**	**4**	**5**	**6**	
Baseline	**1**	14			2		7	23
	2	11	3		1			15
	3		4	6	1	2		13
	4	6	2		8		2	18
	5	2	2			15		19
	6	1					4	5
Total		34	11	6	12	17	13	93

Source: our elaboration.

5.Conclusion

The methodological approach developed in this work allows to fully use the FADN information for having useful appraisals about the farm dynamics induced by market evolution and agricultural policy mechanisms. The achieved results show a different capability to react to policy measures and to market conditions by farms belonging to the same farm type in three different European regions where efficiency is related to the capacity to adapt to new market scenarios. In addition, it is clear how regionalization may contribute to reduce the difference among farms introducing a more equitable CAP instrument as wished by the last reform, but the redistribution effects among regions might induce some regions to manage in more difficult way the challenges provided by the market and drastically reduce the meaning of the "safety net" for many farms.

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Appendix 1 - Estimated Q Matrix

Veneto

	durum wheat	soft wheat	maize	barley	rice	soya	sugar beet	tobacco	alfalfa
durum wheat	**0.07715**	0.02290	0.01451	0.01181	0.01149	-0.01553	0.00216	-0.03009	0.00540
soft wheat		**0.03611**	-0.01200	0.00305	0.01331	-0.01066	0.00064	-0.09271	0.01680
maize			**0.02521**	0.01994	0.01810	0.01830	0.00079	0.06566	-0.00446
barley				**0.07953**	0.03432	0.02461	0.00054	0.03126	0.00693
rice					**0.05703**	0.04033	0.00195	0.01189	0.00017
soya						**0.04393**	0.00107	0.06121	-0.01068
sugarbeet							**0.00114**	0.00179	0.00089
tobacco								**0.30201**	-0.04036
alfalfa									**0.01953**

Source: our elaboration.

Ile-de-France

	soft wheat	durum wheat	barley	maize	dry pulse	sugar beet	rape	sun flower	other industrials
soft wheat	**0.01200**	0.04650	0.02304	0.02625	0.03063	0.00543	0.02086	0.01769	0.04205
durum wheat		**0.18011**	0.08927	0.10170	0.11864	0.02101	0.08087	0.06855	0.16286
barley			**0.11317**	0.09380	0.06914	0.00378	0.21084	0.13541	0.01838
maize				**0.13314**	0.09978	0.01065	0.16138	-0.04753	0.12848
dry pulse					**0.14119**	-0.00031	0.02559	-0.02849	0.20911
sugar beet						**0.00840**	0.01384	-0.00705	0.01160
rape							**0.54237**	0.27381	-0.13686
sunflower								**0.64857**	-0.26356
o industrial									**0.45949**

Source: our elaboration.

Belgium

	soft wheat	barley	maize	dry pulse	potato	sugar beet	other indust	vegetables	rape
soft wheat	**0.02923**	0.06010	-0.00393	-0.00272	0.01606	0.00833	0.02561	0.03687	0.00938
barley		**0.16198**	-0.00803	-0.00494	0.02815	0.01556	0.05831	0.06923	0.01063
maize			**0.00461**	0.00851	0.00751	-0.00006	0.00033	0.01075	0.01003
dry pulse				**0.01650**	0.01773	0.00133	0.00524	0.02783	0.02153
potato					**0.03240**	0.00731	0.02230	0.05840	0.03306
sugar beet						**0.00272**	0.00806	0.01490	0.00599
other indust							**0.02676**	0.04588	0.01739
vegetables								**0.10826**	0.05689
rape									**0.03628**

Source: our elaboration.

Appendix 2 - Characteristics of farm type by regions at the baseline scenario

Veneto

Clusters	GSP	Variable Costs	Net Aids	Class of UAA	Cereal incidence
	(euro/ha)				(% on UAA)
1	1,901	523	408	2	62.4
2	2,049	745	425	1	99.3
3	1,570	759	434	2	51.2
4	5,680	3,592	2,713	4	14.3
5	1,866	625	379	5	62.2
6	1,695	492	426	1	14.6

Source: our elaboration.

Ile-de-France

Clusters	GSP	Variable Costs	Net Aids	Class of UAA	Cereal incidence
	(euro/ha)				(% on UAA)
1	970	374	290	4	85.3
2	4,098	2,176	224	5	57.9
3	910	391	283	2	73.2
4	894	414	304	2	92.3
5	942	461	352	3	74.3
6	1,040	487	283	5	72.6

Source: our elaboration.

Belgium

Clusters	GSP	Variable Costs	Net Aids	Class of UAA	Cereal incidence
	(euro/ha)				(% on UAA)
1	1,259	491	350	3	78.2
2	1,778	537	295	3	53.7
3	3,937	2,344	255	4	42.4
4	1,642	1,021	467	3	64.0
5	2,027	921	344	5	64.3
6	1,360	720	739	2	91.4

Source: our elaboration.