HEALTH CHECK AND FARM EFFICIENCY: A COMPARATIVE ASSESSMENT OF FOUR EUROPEAN AGRICULTURAL REGIONS♦

Filippo Arfini and Michele Donati

Department of Economics, University of Parma

Contact: filippo.arfini@unipr.it, michele.donati@unipr.it

European Association of Agricultural Economists

Università degli Studi della Tuscia

Istituto nazionale di Economia Agraria

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Abstract

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 are to manage 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. In this context, the aim of this paper is to present and analyse the "innovations" of the future CAP compared to the current subsidy management system. In particular, the impact of the modifications of the HC – relative to the methods for funding farms due to the transition to the regionalised Single (Farm) Payment Scheme (SPS) and to the new rates of modulation – on the competitiveness of farms specialised in certain production sectors of four European regions will be considered: Emilia-Romagna (IT), Kassel (DE), Anatoliki-Makedonia-Thraki (GR) and Ostra Mallansverige (SE).

The assessment of the impact of the HC on the competitiveness of farms is made by taking the technical efficiency index, estimated by a DEA model, as a proxy for the capacity of farms to use factors of production to their best advantage with respect to the farming system adopted and hence to be able to be competitive with other enterprises in the same sector. At the same time, the analysis of the impact of the HC measures is carried out using the "generalised" Positive Mathematical Programming method in order to enable a comparison between European regions. The integration of the two methods applied to the data of the European FADN enables an in-depth assessment of the impacts and a critical evaluation of the goals that the Community reform proposal is expected to attain.

Key words: Health Check, Single Farm Payments, Technical Efficiency Index, DEA model, Positive Mathematical Programming.

JEL:Q10, Q12, Q18.

Introduction

The proposal forwarded by the European Commission to update the CAP through the Health Check does not so much set itself the objective of reforming the current structure of the CAP as to continue the modernisation process commenced with the "real" reform of the CAP introduced in 2003 (Borchard, 2008). The aim of the Commission's recent document 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: climate change, water management, the development of renewable energy sources and the preservation of biodiversity.

One of the aspects that distinguish the Commission's current proposal is the maintaining of the decoupled payment in order to guarantee farmers a certain level of financial security and allow them to respond better to signals from the market (Borchard, 2008). The latter action is developed by proposing a departure from the concept of rights acquired by the farms in the past and adopting a decoupled payment calculated on a regionalised basis. 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 businesses and of the sectors to which such farm businesses belong. All this could lead to a variation in the efficiency and 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 and the maintenance of the environmental function by the farm businesses (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 efficiency, and hence the competitiveness, of European farm businesses, i.e. the capacity to adapt the organisation of the farm's production, improving its productive and economic performance compared to the "historical" SPS currently in force. Efficiency can, in actual fact, be considered a component of corporate competitiveness inasmuch as an improvement in corporate efficiency always corresponds to a greater capacity of the business to compete on the market. 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 the farm businesses of four European agricultural regions (Emilia Romagna, Anatoliki-Makedonia-Thraki, Kassel and Ostra Mellansverige), specialised in cereal and zootechnical productions, assessing their main performances, their capacity to respond to new scenarios and their level of technical efficiency.

Methodology

The assessment of the effects of the HC document on European farms shall be conducted by analysing, in addition to economic performance and farming system, also the change in the farm's efficiency level in the agricultural policy scenarios described in the HC document.

So to assess the effects of the new agricultural policy measures on the organisation of production, we propose the adopting of a model that integrates the Positive Mathematical Programming (PMP) approach with the Data Envelopment Analysis (Dea) approach. The purpose of the PMP model is to represent the characteristics of the farms and simulate the effects of the agricultural policy measures, while the purpose of the DEA model is to measure the level of farm technical efficiency in the situation before and after the reform.

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 (Howitt and Paris, 1998; Paris and Arfini, 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 mean 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 business and, first and foremost, to the possibility to use data banks, among which also the FADN data bank (Arfini, 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 of FADN data 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 second cost function estimation phase. Moreover, as a guide to the correct estimation of the explicit corporate costs, the model considers the information relative to the total corporate 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 cultivation costs through the reconstruction of a non linear function of the total variable cost that considers the exogenous information on the total variable costs observed for the individual farm; 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 entered.

The first phase is defined by an estimation model of a quadratic cost function in which the squares of errors are minimised:

$$\min_{u} LS = \frac{1}{2}\mathbf{u}'\mathbf{u} \tag{1}$$

subject to

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

$$\mathbf{c} + \boldsymbol{\lambda} \le \mathbf{R}'\mathbf{R}\overline{\mathbf{x}} + \mathbf{u} \qquad \text{se } \overline{x} = 0 \tag{3}$$

$$\mathbf{c}'\overline{\mathbf{x}} \le TC \tag{4}$$

$$\mathbf{u}'\overline{\mathbf{x}} + \frac{1}{2}\overline{\mathbf{x}}'\left(\mathbf{R}'\mathbf{R}\right)\overline{\mathbf{x}} \ge TC \tag{5}$$

$$\mathbf{c} + \boldsymbol{\lambda} + \mathbf{A}'\mathbf{y} \ge \mathbf{p} + \mathbf{A}'\mathbf{s} \tag{6}$$

$$\mathbf{b}'\mathbf{y} + \boldsymbol{\lambda}'\overline{\mathbf{x}} = \mathbf{p}'\overline{\mathbf{x}} + \mathbf{s}'\overline{\mathbf{h}} - \mathbf{c}\overline{\mathbf{x}} \tag{7}$$

$$\mathbf{R} = \mathbf{L}\mathbf{D}^{1/2} \tag{8}$$

$$\sum_{n=1}^{N} u_{n,j} = 0 \tag{9}$$

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 (TC) 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 explicit process costs and the differential marginal costs, i.e. the costs that 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 corporate accounting system, the restriction (4) imposes that the total estimated explicit cost should not be more than the total variable cost observed in the FADN data bank. Restriction (5) defines a further restriction on the costs estimated by the model, where the non linear cost function must at least equal the value of the total cost (TC) 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 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 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 subsidies. The additional restriction (7) defines the optimal condition, where the value of the primary 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 symmetrical, positive and semi-defined, 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). 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: $\mathbf{\hat{Q}} = \mathbf{\hat{R}}'\mathbf{\hat{R}} = \mathbf{\hat{L}\hat{D}\hat{L}}'$. Restriction (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 business will take into account the information used during the estimation phase of the cost function, in which it is possible to identify a real, true matrix of the firm choices, i.e. *Q*.

The scenarios

Considering the proposals made up till now by the Commission on the HC (Eu, 2008b), the scenarios constructed are essentially two: the first scenario reproduces the current situation, while the second follows the pattern of the CAP review proposal of May 2008, with a variation of the prices measured by Eurostat in the period 2004-2007 in the UE-15 countries (Tab. 1)[1].

For greater clarity, the scenarios considered in the assessment are listed below:

- "***BASIC***" scenario: the scenario reproduces the situation prior to the application of the Fischler reform, in which direct payments were coupled to the land area (COP productions) or to the agricultural production (industrial tomatoes).

- Fischler reform scenario "***SD1***": in this case, all the mechanisms of the Fischler reform are reproduced within the model. Decoupling on a historical basis, modulation of aid (5%), and the new decoupled intervention on the production of COP arable crops, sugar beet and industrial tomatoes have been considered in the scenario.

- Fischler reform scenario with variation in market prices "***SD2***": this scenario reproduces the conditions of scenario SD1 integrating them with the variation in the prices of the agricultural products recorded in the period 2004-2007 by Eurostat (Tab.1)..

- Health Check scenario "***SH1***": the scenario attempts to simulate the possible regionalisation of aid[2], allocating payments calculated on a flat rate basis to each farmer. In addition to regionalised payments, the scenario takes into consideration the new rates of modulation (on the basis of the brackets provided for, up to a maximum of 22%).

- Health Check scenario with variation in market prices "***SH2***": like the previous one, in which the variations in prices are added to scenario SH1 (Tab.1).

In scenarios SD1, SD2, SH1 and SH2, milk quotas have not been considered, leaving the model free to develop the production of milk on the basis of the levels of aid provided and market prices, and also enabling the allocative effect of the regionalised payment to be more clearly verified.

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[1] For the purpose of this analysis, we prefer the "theoretical" scenario geared at understanding the effects of regionalisation as opposed to analysing the effects deriving from the variation of market prices.

[2] The calculation of the value of the regionalised SPS has been made taking into consideration the national maximum and the total UAA (utilised agricultural area).

Table 1. Variation of the prices of the main agricultural products (2004-2007)

SOFT WHEAT	+51%	HOPS	5%
DURUM WHEAT	+57%	RICE	14%
CORN	+37%	FODDER CROPS	12%
BARLEY	+59%	TOMATOES	6%
RYE	+69%	POTATOES	36%
SILAGE	+21%	SUGAR BEET	25%
OTHER CEREALS	+48%	TOBACCO	4%
RAPE	+30%	MILK	10%
SUNFLOWERS	+53%	BEEF	12%
SOYA	+9%	SHEEP	3%
PROTEIN CROPS	+47%		

Source: Eurostat, 2008.

As already mentioned in the previous section, in the case of the transition from the historical SPS to the regionalised one, the unitary values of the payment and the overall number of the rights available to the individual farms are changed. This transition implies a process of redistribution, not only among farms but also among sectors, where the sector linked to animal production (FT 4) (FT = Farm Type) is the one that would suffer the greatest reduction of the SPS expressed in units of measure (Tab. 2). At the same time also the modulation introduced 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. 3). To this end, the transition from aid coupled to agricultural area to the "historical" SPS has led to a general increase in the unitary subsidies received by the farms, with significant situations emerging between farms with different activity specialization.

Table 2. Value of the mean SPS per Ha without modulation of the scenarios

Region	BASIC	SD1	SD2	SH1	SH2
	(€/ha)				
Emilia-Romagna					
FT 1	188	287	287	340	340
FT 4	174	500	500	340	340
Anatoliki-M-T					
FT 1	96	116	116	644	644
FT 4	491	510	510	644	644
Kassel					
FT 1	303	305	305	320	320
FT 4	180	294	294	320	320
Ostra Mellansverige					
FT 1	238	238	238	229	229
FT 4	144	214	214	229	229

Source: Our processing.

Table 3. Value of the mean SPS per Ha with modulation of the scenarios

Region	BASIC	SD1	SD2	SH1	SH2
	(€/ha)				
Emilia-Romagna					
FT 1	188	275	275	296	296
FT 4	174	479	479	307	307
Anatoliki-M-T					
FT 1	96	115	115	595	595
FT 4	491	502	502	624	624
Kassel					
FT 1	303	293	293	287	287
FT 4	180	283	283	289	289
Ostra Mellansverige					
FT 1	238	228	228	205	205
FT 4	144	205	205	204	204

Source: Our processing.

Initial data and results obtained

Initial data

The sample of data used consists of the farms contained in the European FADN data bank for the year 2004 (Tab. 4). To be more specific, the farms considered are situated in four European regions that are all different as regards geographical location, and also as regards the productive and structural characteristics of their farming systems: Emilia-Romagna, Anatoliki-Makedonia-Thraki, for the agriculture of Mediterranean Europe, Kassel for Central Europe and Ostra Mellansverige for Northern Europe[3]. 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, the most

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

significant FTs – as regards assessment of the impact of the HC – were considered: FT 1 (arable crops) and FT 4 (animal productions).

Table 4. The main characteristics of the FADN sample (2004)

Region	no. of farms	Mean UAA	COP Productions (% of UAA)	Mean no. of LU	Family AWU	Extra AWU	Mean GSP (Euro/Ha)
Emilia-Romagna							
FT 1	318	77	56.7	28	1.4	1.2	1411
FT 4	318	134	18.3	56	2.3	1.1	6162
Anatoliki-M-T							
FT 1	374	17	64.0	4	0.7	0.4	1467
FT 4	23	7	78.6	42	1.3	0.9	1588
Kassel							
FT 1	31	80	87.1	6	1.3	0.6	808
FT 4	78	104	40.7	26	1.5	0.6	1587
Ostra Mellansverige							
FT 1	69	111	81.1	25	0.8	0.2	482
FT 4	70	153	27.8	51	1.6	0.4	1057

Source: Our processing of FADN data, 2004.

Farm dynamics

The simulations performed (Tab.5) showed a considerable reaction with regard to allocative behaviour in the farms as a consequence of the introduction of decoupled payment with a historical SPS (SD1): for all of the FTs, a tendency to reduce COP crops is observed together with a significant increase in fodder crops. This data, borne out by numerous studies and by statistical evidence, may be explained by the tendency of the farmers, especially in the initial years of application of the reform, to prefer farming systems offering significant reductions in production costs. On the other hand, the increase in the prices of cereals (SD2) forces farms to undertake an in-depth reorganisation of their production, determining, with regard to the arable crop FTs, a resumption of investments in cereal growing to the detriment of fodder crops, the farmland of which is reduced considerably.

As regards the animal processes, we can report an increase in the production of milk hand-in-hand with the increase in prices on the milk market. For farms specialised in the breeding of animals, in the presence of a 10% increase in the price of milk, an increase of approximately 17% in the production of milk compared to the situation observed (scenario SD2 and SH2) takes place. Sheep breeding farms, on the basis of the FADN data processed with the PMP models, seem to be experiencing a structural weakness that exposes the farms negatively to declining, if minor (-3%), variations in market prices.

The transition from the historical SPS to the regionalised SPS equal for all farms in the region (without market price variations) does not seem to have brought about any changes in the farming systems of the businesses considered. The results in terms of the use of the land obtained from the comparison of the two policy scenarios (SD1 and SH1) are, in fact, identical. Due to the fact that it is separate from farm production processes, the decoupled payment mechanism has no effect on the benefits gained from said processes, leaving the allocation of factors of production unvaried in the use of the resources available. The farmer shows great sensitivity to price variation signals, modifying his own farming system accordingly, while decoupled aid appears to be entirely "neutral" with respect to corporate production-related decisions.

Table 5. Evolution of the corporate farming system

Region	**BASIC**	**SD1**	**SD2**	**SH1**	**SH2**
	(Ha/animals)	*(Var. %)*			
Emilia-Romagna					
FT 1					
-Cop	13618.1	2.0	37.1	2.0	37.1
-Fodder crops	4792.7	12.6	-64.5	12.6	-64.5
-Other	6044.4	-14.5	-32.4	-14.5	-32.4
- Milk cows	126.1	3.7	19.9	3.7	19.9
-Sheep	0.8	-100.0	-100.0	-100.0	-100.0
FT 4					
-Cop	3018.1	-19.1	-29.1	-19.1	-29.1
-Fodder crops	13357.7	4.6	7.0	4.6	7.0
-Other	115.4	-34.4	-51.4	-34.4	-51.4
- Milk cows	26321.5	-1.2	16.8	-1.2	16.8

-Sheep	245.3	-100.0	-100.0	-100.0	-100.0
Anatoliki-M-T					
FT 1					
-Cop	4087.8	-27.8	27.4	-27.8	27.4
-Fodder crops					
-Other	2298.2	49.7	-47.4	49.7	-47.4
- Milk cows	9.5	7.3	0.2	7.3	0.2
-Sheep	29.1	-16.0	-28.9	-16.0	-28.9
FT 4					
-Cop	124.3	-0.2	0.5	0.1	0.5
-Fodder crops	25.9	2.1	9.5	0.7	9.5
-Other	7.9	-3.2	-38.7	-3.2	-38.7
- Milk cows					
-Sheep	741.5	-5.1	-18.6	-5.1	-18.6
Kassel					
FT 1					
-Cop	2153.5	-8.5	8.2	-8.5	8.2
-Fodder crops	173.6	6.7	-88.3	6.7	-88.3
-Other	144.1	118.7	-15.4	118.7	-15.4
- Milk cows	15.5	-0.4	-31.6	-0.4	-31.6
-Sheep					
FT 4					
-Cop	2013.8	-34.9	-8.1	-34.9	-8.1
-Fodder crops	2919.6	12.1	5.0	12.1	5.0
-Other	17.0	2059.5	97.5	2059.5	97.5
- Milk cows	3160.0	0.1	16.8	0.1	16.8
-Sheep					

Ostra Mellansverige					
FT 1					
-Cop	6221.7	-15.5	17.8	-15.5	17.8
-Fodder crops	1242.7	25.6	-83.6	25.6	-83.6
-Other	213.2	303.5	-32.3	303.5	-32.3

-Milk cows					
-Sheep	13.9	-14.8	-100.0	-14.8	-100.0
FT 4					
-Cop	2353.8	-39.1	33.0	-39.1	33.0
-Fodder crops	6052.7	11.1	-12.3	11.1	-12.3
-Other	61.1	404.4	-50.3	404.4	-50.3
-Milk cows	2269.8	-0.5	17.8	-0.5	17.8
-Sheep	26.8	-29.0	-63.9	-29.0	-63.9

Source: Our processing.

In contrast, the scenarios generate significant effects of an economic nature subsequent to the change in the level of farm subsidies and to the reduction of aid following the application of higher modulation rates. As the results obtained on farm gross margins demonstrate (Tab. 6), the effect of regionalisation added to modulation leaves gross margins per hectare largely unvaried for crop farms, while for animal production farms there is a drop in the gross margin compared to the scenario that envisaged the use of the historical SPS. For animal production farms, the premium on milk produced had a decisive effect on the positive results achieved following the application of the Fischler reform (SD1). The transition to the Health Check situation, in fact, net of market variations (SH1) brings farm gross margins to the levels recorded prior to the reform.

Table 6. Farm gross margin dynamics

Region	**BASIC**	**SD1**	**SD2**	**SH1**	**SH2**
	(€/ha)	*(Var. %)*			
Emilia-Romagna					
FT 1	1,731	-4.4	12.8	-6.3	10.9
FT 4	1,390	9.3	37.4	0.0	28.1
Anatoliki-M-T					
FT 1	767	-0.4	46.1	-1.3	45.2
Ft 4	211	0.1	13.0	-0.9	11.9
Kassel					
FT 1	1,535	-1.1	87.0	-1.3	86.8

FT 4	1,554	18.1	47.4	0.4	29.8
Ostra Mellansverige					
FT1	1,982	0.1	88.7	-0.1	88.5
FT 4	1,453	18.8	52.6	0.4	34.2

Source: Our processing.

The impact on efficiency

The impact of the policies, in addition to modifying productive (use of the land), economic (gross margin) and structural (use of labour) aspects of farming, also has a direct impact on the level of technical efficiency at a farm level. More precisely, the results obtained from the PMP model developed for each individual farm included in the sample have allowed us to assess the level of technical efficiency for each agricultural policy scenario considered. With reference to the mean levels of efficiency per Region and FT (Tab. 7) a fairly uniform behaviour may be observed among farms specialised in the production of cereals and zootechnical farms.

In the case of arable crop farms (FT1), the transition to the decoupled payment generates substantially stable levels of efficiency in all of the regions, with only a slight reduction for Emilia-Romagna. The transition from the historical SPS to the regionalised SPS without variations in price does not change the farming systems and, for this reason, it identifies levels of technical efficiency that are unvaried compared to the initial situation. In presence of variations in price, on the other hand, the farms adapt the organisation of their production and improve their level of technical efficiency to a tangible degree.

In the case of zootechnical farms (FT 4), the transition to the single farm payment scheme at constant prices, both in its historical form and in its regionalised one, would bring about a moderate improvement in the technical efficiency index. In contrast, the variation in prices (among which the increase in the price of milk) brings about a considerable improvement in the level of technical efficiency in all of the regions considered, even although this increase is, however, lower than the one identified in FT1. The different behaviour observed between the two FTs is conditioned by the level of specialisation and by the restrictions existing within the farm which affect the efficient use of the factors of production. While in the FT1 the change of farming system is less restricted, for the zootechnical farms the increase in prices, among which milk, leads to a less efficient allocation of factors of production.

Table 7. Mean level of technical efficiency per Region and OTE

REGIONS	BASIC	SD1	SD2	SH1	SH2
FT 1					
Emilia-Romagna	0.373	0.364	0.473	0.364	0.473
Anatoliki-M-T	0.383	0.397	0.484	0.397	0.484
Kassel	0.258	0.258	0.414	0.258	0.414
Ostra Mellansverige	0.202	0.205	0.325	0.205	0.325
Total farms	***0.358***	***0.361***	***0.462***	***0.361***	***0.462***
FT 4					
Emilia-Romagna	0.385	0.404	0.451	0.404	0.451
Anatoliki-M-T	0.109	0.132	0.166	0.132	0.166
Kassel	0.296	0.314	0.366	0.314	0.366
Ostra Mellansverige	0.254	0.272	0.319	0.272	0.319
Total farms	***0.340***	***0.359***	***0.406***	***0.359***	***0.406***

Source: Our processing.

Overall, comparing all the various farms against one another, the mean level of technical efficiency increases to a very slight degree for the FT 1 farms, passing from the Basic scenario to the two scenarios without variation of market prices (SD1 and SH1), while the increase is more pronounced for the scenarios in which a market price variation is hypothesised (SD2 and SH2). In the FT 4 farms the differences in technical efficiency recorded are in line with those measured for FT 1.

Conclusions

The data obtained with the use of different integrated methodologies have allowed us to check out a series of hypotheses and reach a number of conclusions on the goals proposed by the HC .

The first aspect that emerges from the simulations is that aid distributed in a decoupled manner does not affect either the allocative choices of the production factors or the production strategies of farmers. In this sense the SPS moves in the direction expected by the Commission without causing a distortion of the market. In contrast, farmers prove to be extremely sensitive to price variations, modifying their farming system accordingly when they receive signals from the market. Also in this case, the SPS moves in the direction proposed by the Commission, leaving farmers free to seize the opportunities offered by the market and use them to advantage and the SPS, viewed as a "*safety net*", represents, in actual fact, an element of guarantee against sudden variations in market prices.

This is the context in which the "problem" of the removal of the milk quota restriction should be placed. Undoubtedly, the abolition of this restriction leaves the farms free to seize the opportunities presented by the market even though the change to the regionalised SPS would appear to considerably reduce the corporate gross margin compared to an analogous situation with the historical SPS, thereby weakening the sustainability of these farming enterprises in the event of a sudden drop in prices following market volatility.

A second aspect to be considered is the effect of the regionalised SPS not so much in allocative terms but more as regards redistributive aspects. Much has been said (De Filippis 2008; Arfini 2006) about redistributive effects due to the different levels of compensation between areas of the same region (e.g.: between lowland and mountains) or between regions, but a further redistributive effect also exists between farms with different farming systems and more in general between sectors. In this case (with reference to the analysis carried out) in some particularly intensive regions (e.g. Emilia Romagna) the redistributive effect in favour of farms specialised in arable crops is markedly superior to that of dairy farms. This latter aspect does not change the farming system of the enterprises involved but considerably reduces the economic performance of this category of farm business.

The considerations made up till now on the basis of the results obtained have implications also as regards agro-environmental policies. Some researchers (Frascarelli, 2008) see the environmental function as being the justification for the transition to the regionalised SPS, considering this scheme as the tool for compensating for the cost of "cross-compliance" and for the maintaining agriculture's multifunctional role. In actual fact, this consideration is only partially justified in the goals of the HC because although it is true that farmers will use the SPS to pay for the cost of cross-compliance, it is equally true that the Commission views the SPS as a kind of "*safety net*". To this end, the services generated by cross-compliance are considered as being "public goods" (Sheele, 2008; Henke, 2004), for which – in accordance with art. 12 of the URAA- compensation is not due[4]. It is for this reason that Art. 39 (3) of Reg. 1698/05 states how "*agri-environmental payments only cover the commitments assumed insofar as they exceed the relevant mandatory standards (cross compliance; national legislation)*". At this point it must be considered that the implementation of cross-compliance is undoubtedly higher and more burdensome for zootechnical enterprises compared to enterprises with other farming systems (e.g. cereal growing). For this reason, the redistributive effect among sectors generated by the regionalised SPS reduces the level of the

[4] In this regard, article 12 of the Uruguay Round Agreement on Agriculture (green Box) states: b) The amount of payment shall be limited to the extra cost or loss of income involved in complying with the government programme. To this end, art. 39 (4) of Reg 1698/05 (4) indicates how "the payments shall cover the additional costs and lost income resulting from the commitments assumed".

"safety net" thus rendering the SPS "less attractive" or, in practical terms, leading to the inefficacious application of the regulations relative to cross-compliance reducing the quantity of public goods produced.

Last but not least, if the technical efficiency index can be considered as a reasonable proxy for the level of competition, it appears evident how the factor that really has the power to significantly affect this parameter is represented by the evolution of prices and by the consequent capacity of the entrepreneurs to organise the efficient use of the factors of production with reference to the changing conditions of the market. In this sense, the indications supplied by the model clearly highlight the capacity of the different sectors to allocate the factors in a technically efficient manner, also taking into account the production context in which the farms are placed. In this regard, it appears equally evident how each European Region presents its own level of specificity and efficiency that the decoupled payment only changes to a marginal degree.

References

Anania G. (2008), Il futuro dei pagamenti diretti nell'health Check della Pac: regionalizzaizone condizionalità e disaccoppiamento, in (A cura di) De Filippis F., L'health Check della Pac: una valutazione delle prime proposte della Commissione, Quaderni Gruppo 2013, Edizioni Tellus, pp.29-40.

Arfini F. (2006), Vantaggi e svantaggi della regionalizzazione del pagamento unico: il caso del Veneto, in: Basile E., Cecchi C. (a cura di) Diritti all'alimentazione, agricoltura e sviluppo, Atti del XLI convegno di studi SIDEA, vol. 1, Milano, Franco Angeli, pp. 489-509.

Arfini F., Donati M., Zuppiroli M. (2005), Un'analisi degli effetti della riforma Fischler della Pac sull'agricoltura italiana utilizzando il modello Agrisp, in G. ANANIA, La riforma delle politiche agricole dell'UE ed il negoziato WTO, Franco Angeli, Milano.

Arfini F., Paris Q. (2000). Funzioni di Costo di Frontiera, Auto-selezione, Rischio di Prezzo, PMP e Agenda. Rivista di Economia Agraria, vol. n. 3, LV, n. 2, pp. 211-242.

Borchart K.D. (2008) Speech on Health Check, in Future Challenges for agriculture: A day of scientific dialogue, Brusselles session, EAAE Congress. 28 Agosto 2008, pp. 1-8.

Bouamra-Mechemache Z., Jongeneel R., Requillart V. (2008), Removing EU milk quotas, soft landing versus hard landing, in Proceedings of the XII Congress of the EAAE, People, Food and Environments: Global Trends and European Strategies, Ghent, 26-29 Agosto.

Canali G. (2008), Cambiamento climatico, bioenergia, gestione dell'aqua e biodiversità: i temi ambientali del documento sull'Health Check della Pac, in (A cura di) De Filippis F., L'health Check della Pac: una valutazione delle prime proposte della Commissione, Quaderni Gruppo 2013, Edizioni Tellus, pp.71-82.

Charnes A., Cooper W.W., Rhodes E. (1978), Measuring the efficiency of decision making units, European Journal of Operational Research, n. 46, pp. 185-200.

Commissione Europea (2008), Commission Staff Working Document accompanying the "Health Check" Proposals (available at http://ec.europa.eu/agriculture/healthcheck/ full impact_en.pdf)

Commissione Europea (2008), The Health Check of the CAP reform: Impact Assessment of alternative Policy Option, Maggio.

Commissione Europea, (2008) Explanatory memorandum dell'Health Check,

De Filippis F., (2008), L'Health Check della Pac: una valutazione delle prime proposte della Commissione, Quaderni Gruppo 2013, Edizioni Tellus.

Farrell M.J. (1957), The measurement of productivity efficiency, Journal of the Royal Statistical Society, n. 3, pp. 253-290.

Frascarelli A. (2008), Interventi di mercato, quote, set-aside e gestione dei rischi, in (A cura di) De Filippis F., L'health Check della Pac: una valutazione delle prime proposte della Commissione, Quaderni Gruppo 2013, Edizioni Tellus, pp.53-70

Giacomini C. (2008), Dal criterio storico alla regionalizzazione del Pua, in (A cura di) De Filippis F., L'health Check della Pac: una valutazione delle prime proposte della Commissione, Quaderni Gruppo 2013, Edizioni Tellus, pp.83-88.

Heckelei T. (2002), Calibration and estimation of programming models for policy analysis, Working Paper, University of Bonn.

Henke, R. (2004), Verso Il riconoscimento di una agricoltura multifunzionale, INEA, Esi, Roma.

Paris Q. and Howitt R.E. (1998), An Analysis of Ill-Posed Production Problems Using Maximum Entropy, American Journal of Agricultural Economics, n.80, pp. 124-138.

Scheele M. (2008), Common Agricultural Policy: landscapes goods and environmental services for rural areas, in Future Challenges for agriculture: A day of scientific dialogue, Brusselles session, EAAE Congress. 28 Agosto 2008

Sckokai P, (2008), La rimozione delle quote latte e il futuro della produzione di latte in Italia, Agri Regione Europa, Anno IV, n.13 pp. 5-8.

Witzke H.P., Tonini A. (2008), CAPSIM, Diary reform scenarios with CAPSIM acknowledging quota rent uncertainty, in Proceedings of the XII Congress of the EAAE, People, Food and Environments: Global Trends and European Strategies, Ghent, 26-29 Agosto.

Gocht A., Balcombe K. (2006), Tanking efficiency units in DEA using bootstrapping an applied analysis for Slovenian farm data, Agricultural Economics, n. 35, pp. 223-229.

Kalvelagen E. (2004), Efficiently solving DEA models with GAMS, GAMS documentation, Washington.