AN IMPACT ASSESSMENT OF THE FUTURE CAP REFORM ON THE ITALIAN TOMATO SECTOR

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Abstract

The Health Check (HC) document traces the path for a new revision of the CAP. The communication content can be summarised in the following points: decoupling at regional and not at historical level, a more intensive modulation mechanism differentiated according to the total volume of subsidy received by the farm and a new implementation of the art. 69. The aim of this paper is to assess the effect of the HC on the farms producing fruits and vegetables in Italy, with a particular emphasis on the processed tomato production. The model based on the PMP approach simulates the regionalisation mechanism and the new modulation per brackets. The analysis carried out on a FADN sample of farms located in Emilia-Romagna region highlights as the HC new measures affect the farm economic performances but not the input allocation choice. The flat rate doesn't produce perturbation in the relative convenience of the crops maintaining unchanged the degree of substitution among activities. Only when the CAP mechanism moves from a coupling scenario to a total decoupling one and in the case of a variation in price levels the modifications inside the production plan are evident.

Keywords: Future CAP reforms, Tomato sector, CAP assessment

JEL Code: Q10, Q18

Introduction*

The fruit and vegetable CMO was interested by a wide revision in 2007, when the regulation EC no. 1182/2007 entered into force. The new CAP perspectives of this sector in Italy are characterized by a progressive subsidy decoupling that will be completed in 2011 for the tomato sector and by 2012 for the other processed fruit and vegetables. The Italian Ministry of Agriculture has adopted the option of the transitional period, preserving coupled payments, before to applying the full decoupling as stated by the same regulation. The reform has been particularly relevant for the processed tomato sector, where the subsidies represented about 50% of the entire producer's revenue. Decoupling 50% of the product payments, in the first period, and the 100% at the end of the transitional payments, mean that a large part of the specific crop revenue moves from the product to the producer with the risk of reducing the marginal convenience of the crop. Such risk has become a serious concern for the tomato industry, because the traditional raw material basin could reduce the supply in such a manner that the demand coming from the processing plants could not be completely satisfied. As it is known, the concerns produced an important increase in the prices paid by the industries to the producers, but it was not sufficient to guarantee that all the traditional producers keep the previous production level.

In 2008, the European Commission adopted a series of regulation proposals in order to prepare the actual CAP to the European agricultural support after 2013. The set of documents, called CAP's Health Check (HC), defines new options for Member States concerning the decoupling mechanism, reinforces the role of the modulation for transfer more financial resources from the first to the second pillar and defines a new frame for applying art. 69. In particular, the HC reintroduces the possibility, for the Member States that had adopted the decoupling according historical criteria, to implement single farm payment based on the regionalisation principle or, in other words, on a flat rate equivalents for all the farmers in a certain region.

The expected change in the CAP mechanisms would affect all the agricultural sectors and every single farm payments: the regionalisation will bring less money for the sectors and farmers that nowadays can benefit of a strong financial transfers (tomato sector, milk producers, etc.) and much more money for the sectors that were not historical beneficiaries of CAP subsidies (i.e. fresh vegetables) and farmers located in marginal areas (mountains). The question is if the regionalisation will produce changes in farmers behaviour and in farm economic results.

With particular reference to the fruit and vegetable sector, it is interesting to analyse on how the producers will be affected by the HC, both in term of land allocation and in term of economic results. The objective of this paper is the evaluation of the HC proposals' effects

* The paper is the result of a common work of the authors. Nevertheless, the paragraphs 1, 4 and 6 should be attributed to F. Arfini, paragraph 2 to R. Solazzo, paragraph 3 to G. Petriccione and paragraph 5 to M. Donati.

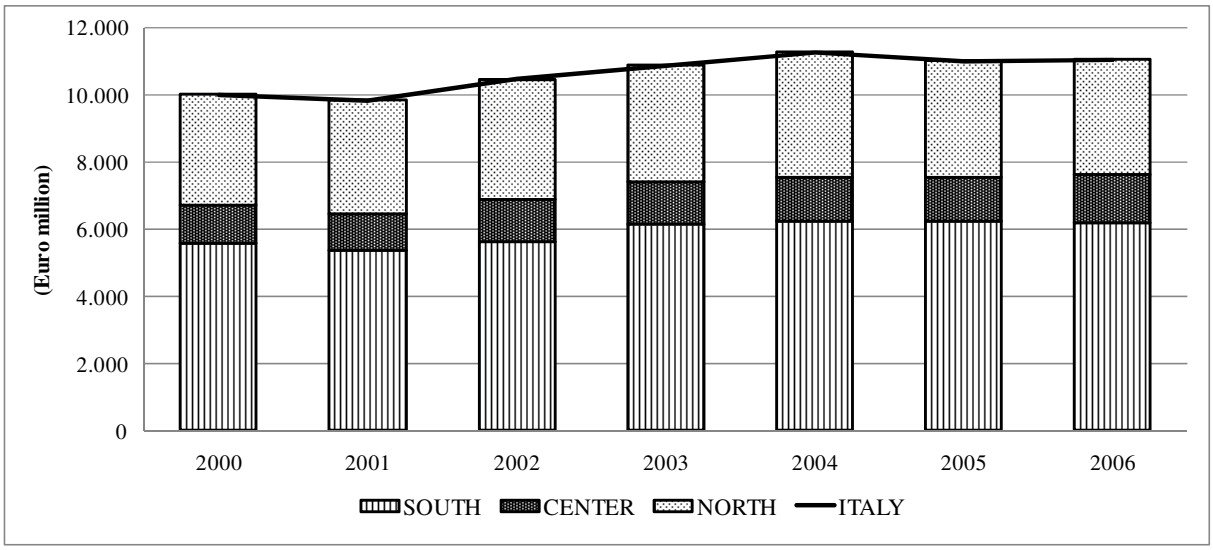
on the fruit and vegetable producers in order to identify the possible reactions with respect to the regionalisation. The assessment will be carried out on a sample of fruit and vegetable farms collected from the Italian FADN. The analysis focuses on the effects of HC on those producers, but the emphasis will be kept on the tomato sector, the most important in term of CAP payments inside the fruit and vegetables interventions. In order to evaluate the impact on the farm behaviour, the analysis will be developed by implementing a simulation model based on the positive mathematical programming (PMP) methodology (Paris and Howitt, 1998).

This work is articulated as follows: the first section focuses an overview of the tomato sector and its evolution with the CAP reforms; the second section presents the main contents of the HC proposal with particular attention towards the changes concerning the fruit and vegetable sector; the third section is dedicated to describe the PMP model; the fourth section concerns the evaluation of some relevant policy scenarios with respect to a group of farms collected from the Italian FADN; and the last section concludes with some remarks.

Towards the Health Check

The production of Italian fruit and vegetable sector amounts to 11.049 million euros in 2006, with a share of 25% of whole agricultural production. Most of that production is concentrated on Southern area with 56% of total sector value. During last years fruit and vegetable sector has strengthened its important role within Italian agriculture, highlighting a positive trend, thanks to an increase, in absolute value, above 10%. The sector weight on agricultural production as well shows an upwards trend with an improvement of three per cent points.

Fig. 1 - Value of fruit and vegetable production



Source: our processing on ISTAT data.

Territorial analysis underlines the strong heterogeneity of Italian fruit and vegetable sector: in Southern area this sector achieves almost 40% of whole relevant agricultural production; in the Centre and in the North this percentage is lower, respectively at 21,4% and at 16,2%. In particular, more than 50% of total fruit and vegetable production in value comes from four regions, three of which are situated in Southern area (Sicilia, Campania and Puglia) and the other one (Emilia-Romagna) in Northern area.

Table 1 - Incidence (%) of fruit and vegetables on agricultural production value for geographic areas

AREA	2000	2001	2002	2003	2004	2005	2006
North	14,8	14,5	15,6	15,2	15,7	16,3	16,2
Center	17,1	16,5	18,1	18,8	17,6	19,8	21,4
South	34,5	32,8	35,0	35,6	35,4	37,4	38,4
Italy	***22,2***	***21,3***	***22,8***	***23,3***	***23,1***	***24,7***	***25,1***

Source: our processing on ISTAT data.

The analysis of production processes outlines strong differences among areas and regions. In all the North grapes production has great importance as well as, in North-eastern regions, apples production: concerning this, in Trentino-Alto Adige 85% of regional fruit and vegetable production is represented by apples production. In Emilia-Romagna, another significant region for fruit and vegetable production, the most important crops regard wine grapes, pears, nectarine and processed tomatoes. As regards Central area, Lazio region is the main kiwi producer with more than one third of national production.

As a whole, vegetables shows a higher incidence than fruit: they reach above 80% in some regions as Puglia and Campania that concentrate almost 30% of total vegetable production, especially tomatoes, potatoes and artichokes.

A share of fruit and vegetable sector, corresponding about 35% of total national production, is represented by the organized system. Thanks to the 1996's CMO reform, in Italy there has been an important organizational process that involved fruit and vegetable production. Nevertheless, its rise, registered especially after Regulation (EC) No. 2699/2000 approval[1], was not been uniform at geographical level. In 2006, in Northern area more than 70% of fruit and vegetable production is organized and the average value of the marketed production exceeds 40 millions euros for each producer organization. In the South organized

[1] As known, this regulation capped the amount of Community financial assistance at 4,1% of the value of the marketed production of each producer organization.

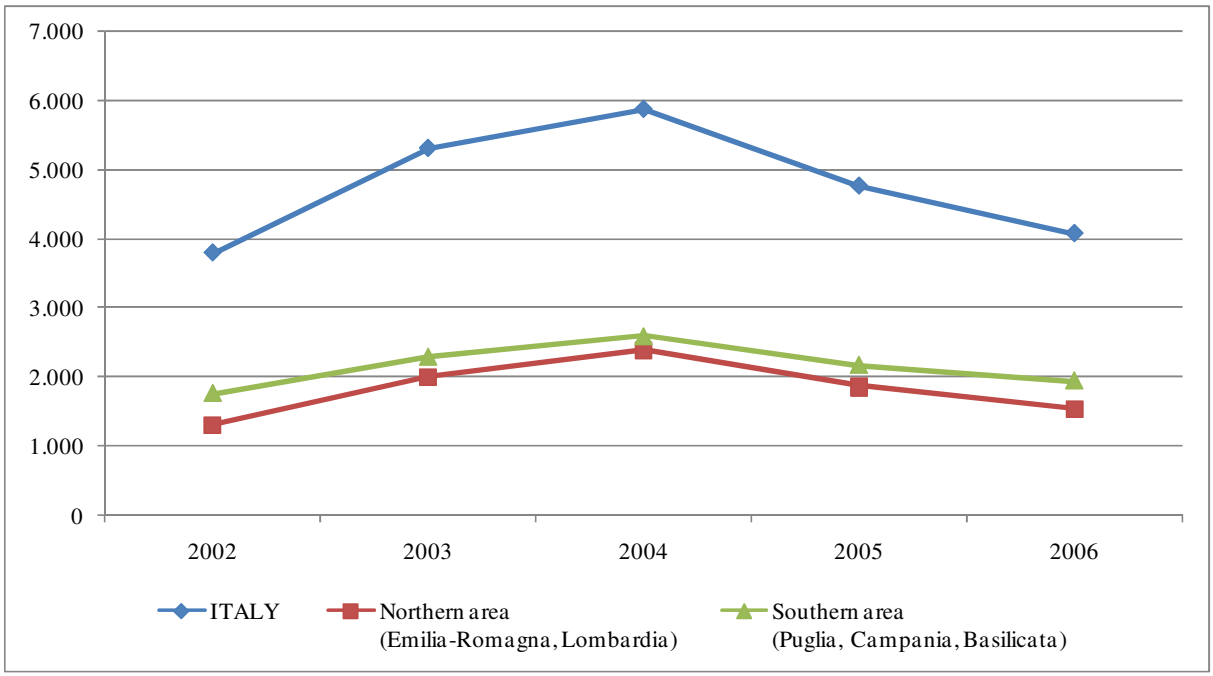
production represents instead about 20% of the whole sector value of the area, while the average value of the marketed production is less than 7 million euros for each producer organization. The low economic size of such organizations represents a real bound for the growth and the strengthening of producer organizations in Southern area. An explanation of these remarkable differences can be found in the deeply roots of co-operative culture that have influenced, especially in North-eastern area, the growth of association system, favouring a different economic dimension of these organizations and the development of suitable competitive strategies (Petriccione, 2008).

Important differences exist non only for territorial dimension but for production processes too. Processed tomato production is almost entirely organized and represents one of the most important agricultural sector in Italy. Its surface covers more than 90.000 hectares and its national production amounts to about 5 millions tons, of which above 50% comes from Southern area. The 80% of Italian processed tomato production is concentrated in two basins: Northern basin is represented by Emilia-Romagna and other production areas production placed in Lombardia; Southern basin is principally constituted by Puglia (Foggia district has a weight equal to 30% of the value of national production), Campania and, less important, by Basilicata. The former is characterized by farms with bigger dimensions and higher mechanized levels than the corresponding national average levels, while the latter is composed prevalently by smaller farms. Furthermore, another important difference between two basins regards industrial process: Northern production area is characterized by the prevalent presence of big co-operatives that self-process tomatoes; instead in the South, production basin is characterized by a large number of private industries, most of which has a very small size.

Campania (in particular Salerno district) represents the main Italian tomato industrial pole: the 90% of processed tomato coming from Puglia is in fact destined to that region, in which industrial facilities process almost 50% of whole national tomato production. Emilia-Romagna represents the other important tomato industrial pole that process almost 30% of total national tomato production, largely coming within the same region.

During last years in Italy processed tomato production has highlighted a trend characterized by a first period (2002-2004) in which the volume registered a considerable increase (+55%), followed by a second period (2004-2006) in which the volume fell (about -31%), as shown by the next figure.

Fig. 2 - Trend in the main production areas for processed tomato, 2002-2006 (.000 tons)



Source: our processing on AGEA data.

The strong increase in tomato production, culminated in the 2004's peak with above 5,8 millions tons, brought about a progressive increase of processed tomato stocks that explains the subsequent decrease in tomato production. This behaviour comes into a cyclic trend, connected with fluctuations in prices and world stocks, where a period in which tomato production increases alternates with another period of heavy contraction.

This is the scenario where the 2007's CMO reform in fruit and vegetables was introduced. In particular, the introduction of decoupled payments for processed tomato – that has integrated Fischler CAP Reform – has caused a strong uncertainty of the market as regards the likelihood of a considerable production decrease and the consequent difficulty of commodities' supplies. This concern largely explain the increase, in one year, above 60% of bargained prices in 2008, that should guarantee the achievement of production objective (equal to 4,6 millions tons) established within the relevant interbranch agreement.

The CMO reform in fruit and vegetables, introduced by Regulation (EC) No. 1182/2007, has integrated, since 1st January 2008, this sector into simple payment scheme, allowing Member States to choose, for a transitional period, the adoption of partially decoupled payments for processed production (tomatoes, pears and peaches, prunes, citrus fruits).

Furthermore, the CMO reform has modified the Article 51 of Regulation (EC) No. 1782/2003, removing the ban from eligible hectares for fruit and vegetable crops, ware potatoes and nurseries, but allowing Member States to choose implementing rules until 2011.

As explained in the following table, Italian implementation choices regarding decoupled payments had been diversified with reference to various processed products, even if all based on historical approach.

Table 2 - Implementation of the Reg. (EC) n. 1182/2007 in Italy

	Starting year of total decoupling application	**Optional transitional period**	**Decoupling percentage in the transitional period**	
Processed tomatoes	2011	YES (3 YEARS)		50%
Pears and peaches	2011	YES (3 YEARS)		0%
Prunes	2013	YES (5 YEARS)	2008-2010	0%
			2011-2012	25%
Citrus fruits	2008	NO		

For processed tomatoes Italy had chosen to maintain transitional coupled payments at 50% of envelope until end 2010. More specifically, during a three years transitional period (2008-2011) a quota of support, corresponding to 1.300 euros/hectare in 2008, is in a coupled form, while the other 50% of ceiling (91.984 millions euros) moves to single farm payment scheme. The latter quota is distributed to those farmers who received historical payments in the referred period 2004-2006.

Furthermore, the granting of the coupled quota of payments is subjected to the condition that it is reserved to farmers who are members of a producer organisation and have stipulated a contract for processing.

Even for processed pears and peaches Italy has chosen to implement a three years transitional scheme (2008-2010), during which maintaining a coupled payment at 100% until end 2010. Since 2011 decoupled entitlements will be distributed among farmers on the basis of the payments received in referred period (2004-2006).

In the case of prunes fully decoupling will be in force since 2013, after a five years transitional period, so divided: in the first phase (2008-2010) the support is maintained fully coupled; in the second one (2011-2012) a decoupled quota at 25% will be introduced.

As regards citrus fruits, Italy has chosen to implement fully decoupled payments since 2008. Nevertheless, the implementation of new decoupling regime for citrus fruits shows some important innovations compared to the other sectors. Firstly, payment entitlements' beneficiaries are all producers of citrus fruits and not only historical ones. Secondly, for the titles' calculation, based on 2006 farm citrus surface, it is provided that per hectare payment is integrated by a correcting coefficient based on regional hectares cultivated citrus fruits.

Finally, as regards agricultural use of the land (Article 51), Italy has chosen that land will not be eligible for ware potatoes and fruit and vegetable crops except for citrus fruits.

The Health Check and the fruit and vegetable sector: a description of the innovations introduced by the European Commission's proposal

The 2003's Fischler Reform of the CAP represents what the European Parliament defines, in a recent Working Document, "the most thorough one to which the CAP has so far been subjected", even if it was originally considered as a mid-term review of the existing subsidy mechanisms in agriculture (European Parliament, 2008). The 2003's CAP Reform included a number of review clauses, which aimed at comparing the adopted measures with the market scenarios and the priorities that will be outlined in the near future. In other terms, the Commission aims at adjusting policy instruments in the view of addressing the needs of an agricultural policy abreast with the times (EC, 2008). For this reason the recent proposals of the European Commission on the Health Check (HC) of the CAP represent an intermediate passage, rather than a radical reform of the CAP: the Commission has proposed adjustments that aim at outlining its future profile with the objective to "promote a sustainable and market oriented agriculture". In this way the EU lays the basis for a deeper reform that will be realized after 2013, alongside the review of the EU budget.

In the proposal, the Commission confirms the 2003's CAP instruments underlining that phasing out coupled support would be the right approach for farm's market orientation and their improved competitiveness and dismantling alike the residual market instruments of the old CAP, that is set-aside, milk quotas, export subsidies and intervention price regimes.

The principal instruments proposed in the CAP Health Check refer to the simplification, the modulation, the revision of the Article 69 and the regionalisation.

The first issue regards the simplification. With the progressive integration of direct payments in the single payment scheme, the Commission considers necessary to shift the different support regimes to a single Common Market Organisation. This is a process that can contribute to reduce the administrative burden and to improve the management of the single farm support.

The modulation is maintained in the HC proposal as the principal instrument addressing the financial strengthening of the second pillar, draining resources from the first

pillar. In consideration of the new issues identified in the HC document as the new challenges to be faced under the rural development (climatic changes, renewable energies, water management and biodiversity protection), the Commission proposes a reinforcement of the compulsory modulation. The HC proposal suggests also the introduction of a rather complex mechanism based on a progressive increase of the modulation rate from 5% to 13% and an additional progressive element under a new system which is based on additional cuts according to payment thresholds.

Another important issue faced in the HC proposal concerns the revision of the Article 69 of the CAP regulation: it becomes the new Article 68, which should allow more flexibility in its use from the Member States, broadening the scope of the former Article 69. From this point of view the Commission's proposal also removes the restriction that linear reductions are taken from and staying in the same sector. At a first glance it seems that there might be some overlapping between the measures provided from the proposed Article 68 and the existing typologies of intervention in the rural development programmes. The result is that the new conditions can determine strong restrictions on the intervention's opportunities (MiPAAF, 2008).

Furthermore, the new Article 68 provides, under certain conditions, a support for some risk management measures, as crop insurance schemes for natural disasters or mutual funds for animal and plant diseases. More specifically, it proposes to grant financial support up to 70% to insurance premiums faced to losses caused by adverse weather conditions. The heterogeneity of the risk and crisis issues calls for heterogeneous measures that should be able to suggest the most suitable solution to help farmers deal with crisis situation (EC, 2008). From this point of view the measures proposed in the HC regulations should show less problems of the overlapping with the measures directly related to risk management for agriculture under the current rural development programmes (MiPAAF, 2008). In line with the direction outlined in the 2005 Communication on risk and crisis management (EC, 2005), the Commission underlines the importance of identifying the best approach to deal with risk and crisis management issues within the CAP that should contribute to the stability of farm income.

For making better use of the potential offered by this instrument, the European Parliament (2008) proposes to create a specific Article, within the HC regulation, allowing the Member States to use up to 5% of their national ceilings in order to finance crop insurance and mutual funds. The European Parliament asserts that the risk and crisis scheme proposed by the Commission is important as preventive instrument, but it is insufficient to face the major systemic crises such as those which occurred during the last years. Furthermore, according to the European Parliament, this is matter relating to the management and organization of markets, so "these instruments should be brought into use within the single CMO". In this view the European Parliament proposes to give a more active role to producers' organisations and/or interbranch organisations as regards the prevention of risks

and crises. This because such organisations could promote a better knowledge of the markets. The European Parliament's proposal goes into the direction undertaken by the recent reform of the fruit and vegetables CMO, that entrusts the measure related to the prevention and management of risks and crises to the producers' organisations.

The issue of the so-called regionalisation is the core of the Health Check proposal. The Commission proposes the regional model based on a mere flat rate of decoupled support as the main form of support. In other terms, the Member States which have implemented the single payment scheme based on the historical approach will be given the opportunity to switch to a regional approach. In doing that, European Commission asserts that maintaining historical model on the basis of the reference period, with its different payments, will become increasingly difficult to understand and to justify in the years ahead. This issue has been the object of a wide debate that has pointed out the discrimination among farmers caused by the current historical payments scheme (Anania, 2008), as well as the difficulty to justify, in front of the society, a public intervention in agriculture connected to production that farmers are not obliged to grow (Giacomini, 2008). The regional payment scheme seems to be a more equitable support to farmers, since the farm payment will not be connected anymore to the historical entitlement rights based on production typologies. It will be related to the actual farmer's title and his role as producer (Frascarelli, 2008) as well as his capacity to develop environmental functions (Giacomini, 2008; Canali, 2008).

In the Commission proposal the regionalisation is an option for Member States, nevertheless it certainly shows CAP future lines about the single farm payment matter.

As regarding fruit and vegetable sector, the CAP Health Check proposal confirm the option introduced by its CMO's reform to deferred integration of the fruit and vegetable sector into the single payment scheme. In other terms, the parcels used for fruit and vegetable production (as well as ware potatoes and nurseries) may not be eligible up to 31 December 2010. The Health Check proposal underlines that "the progressive integration of [this sector] in the single payment scheme makes it necessary to review the definition of the land eligible to benefit from the scheme or for the activation of payment entitlements". However, the Commission's proposal specifies that no review of the partially coupled payments scheme is necessary in the fruit and vegetable sector, because of the only recent introduction of such scheme and only as a transitional measure. On the other hand, the fruit and vegetables CMO reform has been decided and implemented after the 2003 Fischler Reform. For this reason processed fruit and vegetables can still receive, although temporary, a partially coupled support, as seen in the first paragraph.

The regional model definitively disconnects the payments from the farm's history. Farmers achieve further freedom to adjust to market developments, but in some cases they reduce their entitlement rights acquired in the past.

From this point of view it seems priority to ask what kind of possible effects this revision's proposal can have on farmers' behaviour and then on concerned supply chains. The implementation of the historical single farm payment has determined considerable changes in production processes and in farm's profitability. It will probably be as much relevant the consequences deriving from the extension of the regional single farm payment, accompanied by a stronger modulation and a removal of set-aside and milk quotas.

Some analyses about the regionalisation effects point out that the payments' regionalisation process may deeply influence farmers' decisions and, especially, their economic results. These analysis agree on asserting that the higher is the percentage of regionalisation, the wider the payments' redistribution effect will be within the same region. The redistribution will be alike as wider as the referred region will be wider and as the historical production processes will be diversified (Anania, 2008; MiPAAF, 2008; Pupo D'Andrea, 2008). A region characterized by a certain homogeneity of farm production processes will suffer less redistribution effects of the regionalised payment than in the other cases. These expected effects were the main reason for which in the past the most Member States chose a historical approach, like Italy. This choice has been certainly influenced by the adversion of those who received the historical support, but the new EU guidelines brought it up for discussion again.

Furthermore, the redistribution effects of the regionalisation are closely connected to the production processes on which historical payments were calculated. A recent interesting analysis (Pupo D'Andrea, 2008) points out that the regionalisation could penalize those productions that in the past received higher support (milk, olive oil, tobacco, etc. and also processed tomato), while it could reward those one that received less support or didn't get it at all (fruit and vegetables, except processed products, wine, etc.). The result is that the gains or the losses of each administrative region will depend on the historic production processes and their per hectare support received in referred period as regards the middle regional value.

Given all that, the issue is to examine how the measures provided by the Health Check proposal (regional single payment scheme, modulation, removal of set-aside) for fruit and vegetable sector can influence on the farms' competitiveness, that is on their ability to adjust their organization for the purpose to improve economic and productive farm performances. The ability to answer to the changes arisen from the Health Check proposal becomes more difficult for a sector, such as fruit and vegetables, that in short time went from a coupled support to a historical decoupled payments and, now, to a regional single payment scheme.

Methodology for representing HC

The evaluation of the effect of HC on the processed tomato cultivation is carried out using a mathematical programming model based on the positive mathematical programming (PMP) approach. In the original formula put forward by Paris and Arfini (2000), the

methodology of the PMP is based on a three-phase procedure, the main parts of which are summarised below:

1. Estimation of marginal costs for the processes implemented. The aim of this phase is to recover some of the information regarding specific production costs the farmer uses to formulate the farm production plan, through the estimation of marginal costs linked to the production processes of the farm.
2. Estimation of the cost function. In the second phase, the PMP estimates a quadratic cost function able to provide a better representation of production costs, coherent with the economic theory. The method of estimation used in this phase is based on the maximum entropy (Arfini and Paris, 2000).
3. Calibration of the model versus the year of observation. In this phase, the economic-production situation observed is reproduced using only the information on production costs estimated during the previous phase. At this point, the model can simulate the effects of the main changes in agricultural policy.

The model created for the analysis of agricultural policies follows the procedure described integrated with specific constraints and conditions about the new support instruments introduced by the Health Check proposal. More specifically, an important element of innovation with respect the traditional model for CAP evaluation is represented by specific mathematical relations finalised to reproduce the SPS scheme. The relations developed inside the PMP model allow to share the SPS among the eligible land without distortions in the relative convenience of the crops.

The constraints permitting to introduce the decoupling principle inside a PMP model are written below:

$$hm_n \leq hd_n \quad \forall n \tag{1}$$

$$hm_n + he_n \leq \sum_{j=1}^{J} h_{n,j} \quad \forall n \tag{2}$$

where the relation (1) defines that the variable related to the eligible land, hm_n, be not higher than the number of hectares linked to the number of entitlements for the *n*-farm, hd_n. The second constraints (2) establishes that the total amount of the total potentially eligible land ($hm_n + he_n$), where he_n is a variable linked to the eligible land but exceeding the number of the farm entitlements, should not be higher than the entire admissible land $h_{n,j}$. Obviously, only the variable hm_n enters inside the objective function multiplying the unitary value of each entitlement.

In regards to the regionalised SPS, the constraints presented are not modified, but it is the unitary value of each entitlement that changes according to the flat rate defined at regional

level. Furthermore, according to EU Commission proposal, the eligibility is extended to all the products cultivated at farm level (EC, 2008). In other words, the value of hd_n will be equal to $\sum_{j=1}^{J} h_{n,j}$.

Also the new modulation mechanism is represented by using mathematical relations inside the policy evaluation model. In this case, the different brackets foreseen by the HC proposal have been reproduced so that for each level of subsidy is applied a different level of modulation. But more than this last policy mechanism reproduction, an important set of conditions introduced inside the model concerns the permanent crops. As it is known, the mathematical programming models are very useful for estimating possible effects in the short and medium run of the agricultural policies with respect to annual agricultural activities, but it is difficult consider inside the evaluation the permanent crops because they can produce problems of marginal substitution with the annual crops. So, in general, the permanent crops are excluded in such kind of analysis. The problem consists in avoiding that the permanent crops be completely substitutable with annual crops in the short and medium run. To do that it is necessary to consider that the variation of the land use for permanent crops implies adding costs for remove the plants or in the case of new plantings. Following this consideration, the model uses inside the objective function a negative gross margin component linked to the variation of the surface cultivated with permanent crops. This condition can be represented as follows:

$$\sum_{jr=1}^{JR} \left\{ \left| h_{n,jr} - \bar{h}_{n,jr} \right| \gamma_{jr} \right\} \quad \forall n \qquad (3)$$

The difference in absolute value in (3) between the unknown variable about the hectares cultivated to permanent crops and the level observed in the base situation is multiplied by an average cost of permanent crops removal or planting, γ_{jr} . During the process of optimisation, this gross margin's negative component introduces a rigidity component in the process of activation or deactivation of such activities with respect the others. All the model has been developed using the algebraic packaging GAMS and for solving the problem with the relation (3) was used a specific discrete continuous solver, GAMS/DICOPT.

Possible effects of Health Check

Policy scenarios

On the basis of the proposals of the Commission on the HC (EC, 2008), the scenarios developed consider the actual situation in terms of aid provided to the fruit and vegetables and the likely reform that will affect those products starting from 2013. As the data adopted for

this study refers to 2006, the model foresees a specific scenario that reproduces the transitional period that characterizes nowadays the fruit and vegetable sector. Then, in order to fit the decision of the Italian minister, it has been evaluated a scenario where all the subsidies, fruit and vegetables included, are decoupled according to the historical approach. The two mentioned policy scenarios have been integrated with other two, in which the model has reproduced the HC's new measures, that are: the decoupling system based on a flat rate unitary payment for each admissible hectare and a stronger level of modulation applied to all the subsidies received by farmers. The first HC scenario considers the previous new measures without market interferences, for measuring the net effect of the policy; while, in the second HC scenario variations in product market prices are introduced in order to evaluate the adding perturbation of the likely market dynamics on producer decisions.

In order to be more clear, the policy scenarios considered in this paper are listed below:

- "***BASE***" scenario: the scenario reproduces the situation observed in 2006, that is the total decoupling for arable crops, transformed fruit and vegetables excluded.

- Transition scenarios "***S1***": in this case, the CMO reform for fruit and vegetables is applied according to the transition payments decided for the processed tomato and the other processed fruits. More specifically, for processed tomato, the decoupling is adopted only for the 50% of the total subsidy, while the rest is paid to the producer in a coupled form; for the processed fruit, the model foresees a partial decoupling for prunes (75% coupled), and a total coupled payment for pears and peaches. In order to considers the higher purchasing prices that the processing industries have established with producers before the beginning of the first harvesting year with transition payments, the price for tomato has been increased with respect the 2006 basis of 45%.

- CMO fruit and vegetables in force "***S2***": the scenario considers the situation after the transition period expiration, when all the subsidies will be decoupled. The price for the processing tomato is the same used in the previous scenario.

- Health Check scenario "***S3***": 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 "***S4***": like the previous one, in which the variations in prices and variable cost variations are added to scenario S3 (Tab.3).

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

Table 3 - Variation of the prices of the main agricultural products (2006-20013)*

SOFT WHEAT	-10%	SUNFLOWERS	+3,2%
DURUM WHEAT	-10%	SOYA	+3,5%
CORN	-2%	RICE	+4,8%
BARLEY	-10%	TOMATO	+4%
SILAGE	-2%	SUGAR BEET	-4%
OTHER CEREALS	-5%		

* The agricultural product prices not included in the table are assumed constant.

Source: OECD/FAO, 2008.

The agricultural price predictions are those provided by the outlook study developed by the OECD and FAO (2008) that projects the actual prices to 2013. The recent positive variation in purchasing prices for tomato has been accompanied by a raise in costs of production and more specifically in motor fuel, fertilizers and pesticides. For taking in account of this increasing in costs, scenario S4 considers an augmentation in specific variable costs of 15% for every crop.

Farm data

For the purposes of the present paper, the data used in assessing the CAP scenarios concerns a sample collected from the Italian FADN with reference to the Emilia-Romagna region. The region has a particular aptitude in fruit and vegetable productions. As highlighted previously, Emilia-Romagna is the most important Northern Italian region in term of processed tomato production. The farms were selected on the basis of the presence of fruit and vegetable productions inside the individual production plan. The sample has been submitted to a double stratification: the first one, in order to identify the farm specialization and the second for composing three groups according to the GSP size. The farm specialization is identified by measuring the contribution of each family of product (fruit, vegetables and arable crops) on the total GSP. Products with a rate of contribution higher than 50% provide the specialization type to the farm. For the second stratification, the sample of farms was divided according three classes of size: up-to 30.000 euros, 30.000 to 80.000 euros and greater than 80.000 euros. It is important to underline that the simulations have been carried out for each individual farm and not at aggregated level. The stratifications have been useful for estimating the total variable cost function for each typology of farms according to the specialization and the economic size. Once estimating the unique total cost function per group and the differential marginal cost per farm, the simulations have been performed by single farm.

Table 4 - The main characteristics of the FADN sample (2006)

Farm Types	no. of farms	Average UAA	Horticultural Crops (% of UAA)	Processed Tomato (% of UAA)	Fruits (% of UAA)	Average GSP (Euro/Ha)
Fruits	***318***	***16.3***	***4***	***1***	***61***	***5,378***
CL 1	122	5.6	2	0	53	2,873
CL 2	111	11.5	2	0	60	4,357
CL 3	85	38.1	5	1	62	6,310
Horticulture	***67***	***54.2***	***54***	***27***	***1***	***3,012***
CL 1	11	6.5	42	7	4	2,259
CL 2	22	21.0	42	14	5	2,571
CL 3	34	91.2	55	30	1	3,095
Arable crops	***100***	***132.3***	***6***	***3***	***2***	***1,404***
CL 1	32	13.6	8	0	11	1,231
CL 2	28	36.4	13	8	2	1,453
CL 3	40	294.3	5	2	2	1,406

Source: our processing on National FADN data.

Table 4 shows the main information concerning the sample. The sample is composed by 485 farms distributed among the three main farm typologies. Despite of the high number of farms in the "fruits" typology, the average UAA is lower than the average measured in the other typologies. The processed tomato crop is present with a particular evidence inside the second and third classes of the horticultural farms. The first class of this latter farm type is specialized in producing fresh vegetables as demonstrated by the high quota of horticultural crops with respect the UAA (42%). The different average GSP per hectare is relayed on the farm size and the specialization typologies: higher in the bigger classes and inside the fruits specialized farms.

Land use responses

The PMP model can provide many information about the production decisions taken by those farms concerned by the analysis, among which the output levels and land use per product. The variation in the use of the land is an important signal on how the policy engenders reactions on the allocation of the main agricultural constrained factor (the land). In this case, the most important question that the study would respond concerns the decision about the production plan when the HC intervenes in redistributing the subsidy among territories, among farm typologies and individual farms. For reasons of synthesis, our analysis will focus on the changes of the production choices with reference to the farm typologies and with particular emphasis on the dynamics showed by the processed tomato.

If one look at the table 5, it is clear that the policy decisions have a strong impact on the farmer behaviour, in the sense that changes in subsidy mechanism can be affect the marginal profit of each product with respect each others. This is the case of tomato that highlights a sensible variation in its acreage when the transitional payment is introduced (S1).

In S1, the relative convenience of the processed tomato changes, because an important part of its coupled subsidy (50%) has been stabilized inside the farm revenue. In this context, the effort made by industries in increasing the purchasing prices has protected the food chain against the risk of higher production losses. The horticulture farm typology presents the situation previously depicted: a curb in production level in fruit and vegetables CMO transitional phase scenario and a worst productive situation in the total decoupling scenario (S2). The results achieved seem to underline that bigger farms (class of size 2 and 3) are more affected by total decoupling. In other terms, the most professional and specialized farms can benefit of the decoupled payment more than the small farms: the production reduction means less costs and a consistent annuity in the medium run. This is confirmed also by the economic results.

The results that can appear surprising if it is compared with the previous situation is the results obtained in the HC scenarios. If in the previous phases, the policy mechanisms have had a strong role in producing variation for tomato hectares, the HC doesn't produce any productive changes with respects the other scenarios. This output is coherent with the reasons that have pushed farmers to reduce the tomato cultivation when the transition phase has been applied. If the policy changes the crop relative convenience, farmers react changing the production plan, otherwise the production plan remains stable. In the case of HC, the measures proposed by the EU Commission don't affect the relative convenience of the products with respect the historical total decoupling. The flat rate imposed to all the farmers and on all the eligible agricultural surface produces a redistributing effect in term of subsidy but leaves the relative convenience among processes stable. So, the results in S3 is a stability in production levels with respect of S2 for all classes of size and for every farm typology.

The changes in tomato land allocation are more evident in the last scenario, where the HC is associated to market prices hypothesis and variable cost increasing. The combined effect of price and cost variations has produced a strong reduction of the tomato production in all the farm classes specialized in horticulture and in arable crops, while for the farms specialized in fruits the reduction is less important. The price and cost shocks have affected with a real evidence the biggest and most specialized farms highlighting that an increase in costs of production produces negative product profits for an important part of the production. This means that the most specialized farms in tomato production are also the most intensive variable input users. An increase in cost of production of 15% exposes such farms to the risk to not be able to cover specific costs sustained for cultivating the crop.

Table 5 - Changes in tomato land use

Farm Type	Class of Size	Base	S1	S2	S3	S4
		ha	Var. % wrt BASE			
Fruits	**1**	0,0				
	2	0,0				
	3	34,0	2,0	2,0	2,0	-4,2
Horticulture	**1**	4,7	-12,4	-12,4	-12,4	-20,4
	2	65,2	-3,9	-9,1	-9,1	-24,5
	3	928,4	-18,0	-31,9	-31,9	-49,2
Arable crops	**1**	0,0				
	2	82,2	-8,5	-25,9	-25,9	-39,1
	3	293,2	-14,9	-30,5	-30,5	-47,0

Source: our processing using PMP model.

The PMP model used in this framework allows to evaluate the effects of the different farm process, included the permanent processes. Actually, one methodological innovation of this simulation model concerns the possibility to capture the likely dynamics in long run activities, like olive oil, wine yard and fruits. The table 6 shows the results obtained for the fruit activities along the different proposed scenarios. As it is possible understand from the table, the fruit and vegetables CMO transitional payment, historical total decoupling and the flat rate payment have not relevant effects on the land allocated to fruit in the medium run. In the last scenario, considering the increasing in production costs, the land linked to fruits reduces the acreage, but the absolute change remains quite low.

Table 6 - Changes in fruits land use

Farm Type	Class of Size	Base	S1	S2	S3	S4
		ha	Var. % wrt BASE			
Fruits	**1**	212,8	1,1	1,1	1,1	-2,7
	2	540,9	1,2	1,2	1,2	-2,5
	3	1543,7	1,9	1,9	1,9	-3,0
Horticulture	**1**	1,5	0,1	0,1	0,1	-2,5
	2	3,1	-0,2	1,2	1,2	-1,5
	3	4,5	0,0	0,0	0,0	-4,0
Arable crops	**1**	29,1	0,6	0,6	0,6	0,3
	2	19,6	-1,7	-1,7	-1,7	-3,6
	3	169,3	-0,0	-0,0	-0,0	-3,5

Source: our processing using PMP model.

The rather large negative variation in the processed tomato cultivation implies a new organization of the land among the different crops. The question is which are the crops that substitute the land lost by tomato. It is interesting to note that the new production plan takes a configuration deeply characterized by the presence of cereals (see table 7). Not only this work highlights that cereal crops are the main substitutes of the processed tomato (Arfini et al., 2008), but in this case it is clear that inside the specialized farms, like the third class of size of

the horticulture typology, the loss in tomato land is compensated by a strong increase in cereal acreage. This trend is reinforced by the S4 scenario, in which the positive variation in cereal prices (about 10%) leads to a great augmentation of the land invested with cereals.

Table 7 - Changes in cereal land use

Farm Type	Class of Size	Base	S1	S2	S3	S4
		ha	Var. % wrt BASE			
Fruits	**1**	235,3	1,2	1,2	1,2	1,9
	2	322,5	-0,5	-0,5	-0,5	3,1
	3	618,2	-2,0	-2,0	-2,0	-0,8
Horticulture	**1**	19,6	-1,6	-1,6	-1,6	5,2
	2	197,4	-1,4	0,3	0,3	12,4
	3	811,8	20,2	35,8	35,8	57,5
Arable crops	**1**	262,7	0,3	0,3	0,3	-1,4
	2	532,9	5,0	8,5	8,5	-4,0
	3	6178,7	-3,0	-2,5	-2,5	-23,6

Source: our processing using PMP model.

Another point that is useful to add at the discussion around the achieved results is that other agricultural activity, like fodder crops, participate to the process of substitution with the processed tomato. The fodder crops allow farmers to reduce as much as possible the production costs and at the same time they maintaining the decoupled subsidy level. The net results is an improvement of the gross margin.

The main conclusion that it is possible to catch from the discussed results is that the HC doesn't influence the farm production decisions because the flat rate and the modulation don't change the relative convenience of different activities. In other terms, the transition between a situation characterized by total decoupling applied through historical criteria and a new situation where the payments to farmers are calculated according to a common flat rate should not intervene on the production plan choice.

Economic outcomes

The variation inside the production activities are reflected by the changes in the main economic variables, like the levels of gross margin and subsidies. More particularly, the discussion about the economic information can be divided in two steps, one related to the first two scenarios and the second one on the HC results.

The modifications introduced by the CMO reform in fruit and vegetables has induced farms to adopt a strategy oriented to minimize the cost of production. This behaviour has induced a generalized increase in gross margin for every farm typology in scenarios S1 and S2, with a particular evidence inside the horticultural farms, for which the partial and total decoupling of the processed tomato aid has led many farms to reduce the production in order to minimize the costs and keep the farm payment. The greatest increases are identified on the

largest classes of sizes for the horticultural farms. In this case, the amount of decoupled payment with respect the total revenue is much more important than in the other classes. Moreover, it is important to consider that the positive variation in the gross margin levels are due in part to the observed increase in tomato prices (+45%). So, in those farms where the processed tomato production is prevalent, one can observe the highest augmentations.

Other type of comments have to be addressed to the scenarios S3 and S4. The HC operates a strong redistribution of the subsidy among farms and with particular reference to horticultural farms that are subjected to the most relevant reduction in the subsidy level. This produces a substantial resizing of the gross margin. One can say that the positive variations noted in S3 for the horticultural typology is only due to the positive price increase in the processed tomato. The others farm types show an increase in gross margin due to the shift-effect produced by the flat rate. So, farms with a low level of subsidy per hectares receive more, while the farm types with a high level of subsidy per hectare receive less. Only the two largest classes of size in the arable crops specialization present a reduction in the level of subsidies with the consequence of a reduction in the gross margins. Between the horticultural and arable crops farm types, only the smallest classes highlight an increase in the level of subsidy with positive effects on the gross margin. In particular, it is evident that the first class in the horticultural farm type includes many farms with horticulture crops different from processed tomato.

Table 8 - Dynamics in the main economic variables – Gross Margin

Farm Type	Class of Size	Base	S1	S2	S3	S4
		Euro/ha	Var. % wrt BASE			
Fruits	**1**	1151,8	-1,0	-1,0	15,2	-13,0
	2	1765,1	-0,8	-0,8	10,4	-18,0
	3	1728,4	1,7	1,7	11,2	-32,0
Horticulture	**1**	1686,3	3,9	3,9	6,2	-10,4
	2	1600,2	8,9	8,7	4,4	-17,4
	3	1228,7	32,1	33,1	3,7	-29,1
Arable crops	**1**	747,2	-0,5	-0,5	10,9	-10,8
	2	941,9	5,6	5,7	-6,5	-25,5
	3	878,8	0,5	0,5	-8,2	-27,8

Source: our processing using PMP model.

In any case, the great impact on the farm performances should be attributed to market prices and to the variable input markets. The increase of 15% of the variable costs associated to all the crops (see scenario S4) induces a very sensible reduction in the level of gross margin. This result is widely distributed on each farm typology and more specifically on the largest classes. A response to this effect was already suggested: the high intensive use of variable inputs by largest and specialized farms creates a higher fragility in term of economic

equilibrium. This explains how an increase of 15% in the specific variable costs produces a reduction in the gross margin that reaches about -30% in the largest farms.

Table 9 - Dynamics in the main economic variables – Subsidies

Farm Type	Class of Size	Base	S1	S2	S3	S4
		Euro/ha	Var. % wrt BASE			
Fruits	**1**	134.3	-1.0	-1.0	137.5	137.5
	2	113.8	4.6	4.6	177.2	177.2
	3	128.8	1.6	1.4	128.7	128.7
Horticulture	**1**	284.5	-2.2	-2.2	11.4	11.4
	2	389.0	-2.3	-3.7	-21.6	-21.6
	3	671.2	-3.0	-3.6	-57.5	-57.5
Arable crops	**1**	215.6	5.9	5.9	45.3	45.3
	2	406.6	1.6	1.0	-27.2	-27.2
	3	351.8	-1.2	-1.5	-23.2	-23.2

Source: our processing using PMP model.

To the underlined negative performances of the largest farms has participated the stronger levels of modulation that have reduced up-to 22% the subsidy received by the farms. In this respect, the modulation mechanism and the flat rate system represent two CAP instruments that could guarantee the solidarity among farms allowing an important transfer of resources from the big historical beneficiaries to new farmers and to farmers with low supported agricultural activities.

Conclusions

The HC proposals open to a series of questions concerning the future of the CAP interventions and the impact that prospected new measures could produce on the European agriculture in terms of production dynamics and economic results. It is evident that the objective of HC is to trace a linkage between the 2003's CAP and the after 2013's CAP. The reintroduction of the regionalisation and the stronger modulation are two main examples on what will be the future agricultural interventions. How farmers will react to the HC is the issue to analyse.

In this changing framework, the fruit and vegetable sector is still characterized by a partial decoupling system that will become totally decoupled between 2011-2012. In this context, tomato sector is submitted to a process of adaptation that is directly relayed on the amount of subsidies coupled to the production. The high level of coupled subsidies can lead farmers to reduce the production preserving an important quota of the revenue originated by the product. Against this risk, at the beginning of the transitional period, industries have compensated the reduction of the coupled payments by an increase in the production market prices.

The prospected regionalisation adds new issues around the sector perspective. The evaluation proposed in this study adopts a model based on the PMP methodology, in which the new HC mechanisms are reproduced and the permanent crops are considered as part of the farm production plan.

The analysis carried out on a FADN sample of farms located in Emilia-Romagna highlights as the HC new measures affect the farm economic performances but not the input allocation choice. The flat rate doesn't produce perturbations in the relative convenience of the crops maintaining unchanged the degree of substitution among activities. Only when the CAP mechanism moves from a coupling scenario to a total decoupling one and in the case of a variation in price levels the modifications inside the production plan become evident.

Farms specialized in horticultural productions, in particular in processed tomato, are subject to a generalized resizing due to the progressive achievement of total decoupling for the sector. But the regionalisation doesn't induce effects with respect to the total decoupling situation in relation to its character of neutral component in changing the cross crop conveniences. In respect to the economic results, the regionalisation induces a modification in the farm economic results. The spread-effect of the flat rate contribute to transfer financial resources from the strongest historical beneficiaries of subsidies to the marginal farms and to the less historical subsidies receivers, like fruit or fresh vegetable producers. The regionalisation could reinforce the marginal agriculture and contribute to a better distribution of the aids inside a given region. This is a solidarity effect of the regionalisation mechanism that permits to distribute the payment according to objective and actual elements (like the eligible land).

The variations in prices and variable input costs produce strong changes in the land allocation and economic results. This is coherent with the decision of reducing the production in case of decoupling. The assumed increase in prices in the last scenario doesn't permit to cover the greater variable costs. Output and input market prices are the main variables in defining the farm allocation decisions and the role of the CAP will become just a positive component of the farm revenue without interferences on crop profitability.

Even in this CAP evolution frame, the traditional raw material basin could be preserved only if the market allows producers to have favourable expectations in term of activity profitability in the long-run. The food-chain will continue to be affected by the CAP measures until the transitional period will conclude and the total decoupling will be applied; after the transitional period, the intervention mechanism (historical or regionalized) will have a substantial neutral effect on productive decisions leaving to the market the role of production orienting.

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