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

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Objective

Objective:

- To analyze the impact of HC reform in three European Regions: Veneto (I), Belgium (B), Ile-de-France (F);
- To present a generalized PMP model useful for policy evaluation using FADN data;
- To present the strategy on single farms belonging to FT1 in three regions

Outline of the presentation:

- Debate on HC and regionalized SPS;
- Description of the methodology;
- Impact assessment of HC on farm holdings in three European regions;
- Final consideration.

Objectives of Health Check proposal

Health Check objectives is to continue the modernisation process commenced with the "real" reform of the CAP introduced in 2003 (Borchard, 2008);

The aim of the Commission's is to set up a legislative framework (Reg. 73/2009) geared to prepare European agriculture for the real new reform which is to be defined after the review of the EU budget;

Meantime the goals set are founded on the attempt to render European agricultural policy more "**simple**" , "**efficient**" and more focused on coping with the changes that most closely concern European society: **climate change, water management, the development of renewable energy sources and the preservation of biodiversity**.

Health Check and regionalization

One of the aspects that distinguishes 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 value of Single Farm Payment (SFP) can be determined by regionalization, modifying the numbers of entitlements and their value;

Regionalization **will have re-distributional** effects among regions, farm typologies and farms modifying the competitiveness of farm holding;

- ***Which are the consequences in term on farm strategies?***
- ***Which are the consequences in term of efficiency?***

Methological set

For analyzing impact of HC on farm holding two methodologies are integrated:

- **Positive Mathematical Programming**: reproduce the economic characteristics of farm holder included in FADN and represent the impact of new agriculture policy on land allocation and supply;

- **Cluster analysis according to the K-mean technique:** allow to evaluate the dynamic of farms belonging FADN between different homogeneous clusters of FADN farms.

Methological set

Large use of PMP using FADN data but …… strong limitation when information related to variable costs is missing;

The proposed approach can be considered 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;

The model considers the information relative to the total variable costs available in the FADN.

This "innovation" becomes particularly important as it enables us to perform analyses utilizing FADN without other added information.

First phase of generalized PMP

The aim is to estimate specific cultivation costs through the reconstruction of a non linear function of the total variable cost:

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

Objective function

S.t.

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

Relationship between marginal costs derived from a linear function and marginal costs derived from a quadratic cost function

$$\mathbf{c}'\bar{\mathbf{x}} \leq TVC$$
$$\mathbf{u}'\bar{\mathbf{x}} + \frac{1}{2}\bar{\mathbf{x}}'\left(\mathbf{R}'\mathbf{R}\right)\bar{\mathbf{x}} \geq TVC$$

Relation between estimated and observed TVC

$$\mathbf{c} + \boldsymbol{\lambda} + \mathbf{A}'\mathbf{y} \geq \mathbf{p} + \mathbf{A}'\mathbf{s}$$

Economic equilibrium condition

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

Optimality condition

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

Cholesky decomposition

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

Error condition

Second pahse of generalized PMP

The aim of the second is the calibration of the observed production situation through solving farm gross margin maximization problem.

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

Objective function

S.t.

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

Structural constraint

$$A_j x_j - h_j = 0 \qquad \forall j = 1, \ldots, J$$

Balance constraint

Policy scenario

1. ***Baseline 2009***": the scenario reproduces the situation existing before the Fischer-Boel reform;
2. ***Health Check scenario*** "***S_Reg***": payments are calculated on a flat rate basis to each farmer with new rates of modulation on regional bases and modulation of aid at 10%-14%.
3. ***Health Check and market scenario*** "***S_Reg_P***": Health Check scenario with variation in market prices (at 2015) in which the variations in prices are added to scenario S_Reg.
4. ***Health Check and market scenario*** "***S_EUReg_P***": payments are calculated on a flat rate basis to each farmer with new rates of modulation on European bases and modulation of aid at 10%-14% and variation in market prices (at 2015)

FADN Sample

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

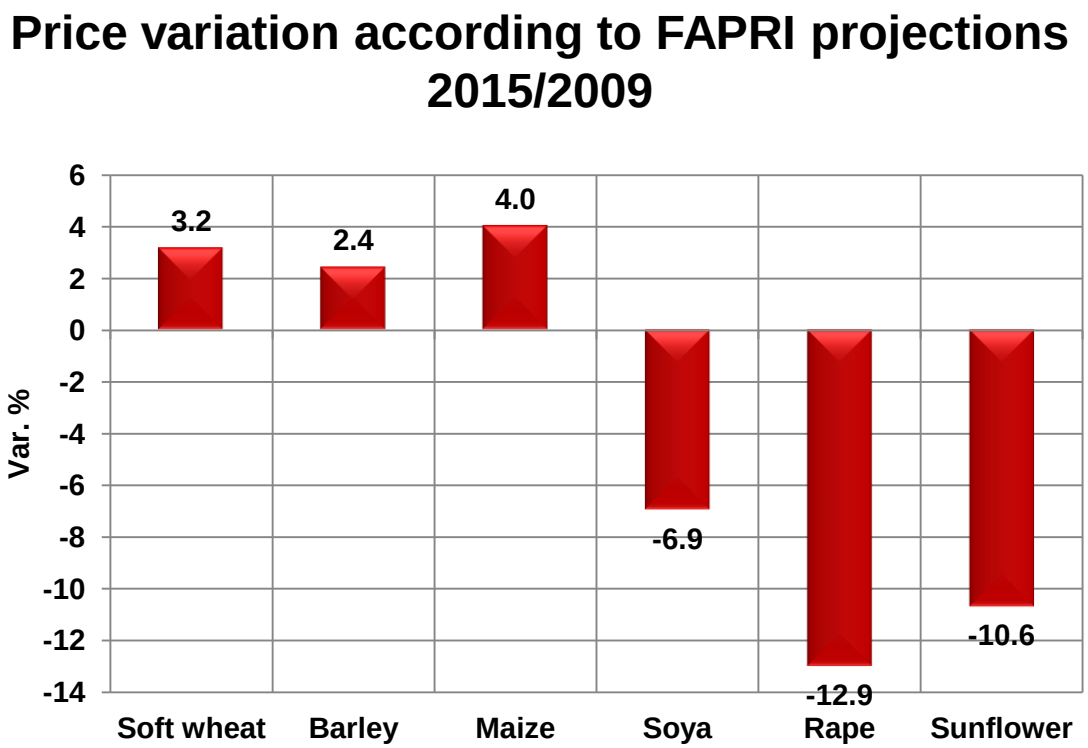
Region	no. of farms	Mean UAA	COP (with rice) Production (% of UAA)	Mean GSP (Euro/Ha)	Mean TVC (Euro/Ha)	Mean Subs. (Euro/Ha)
Veneto	211	41	88	1,973	750	426
Ile-de-France	141	140	94	1,045	473	292
Belgium	93	54	65	2,045	978	356

Calculated entitlement value

Value of entitlements across scenarios
€uro/ha

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

Price projections



Source: Fapri-Ireland 2008, Fapri-USA 2009

Estimated Q Matrices

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

Veneto

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

Ile-de-France

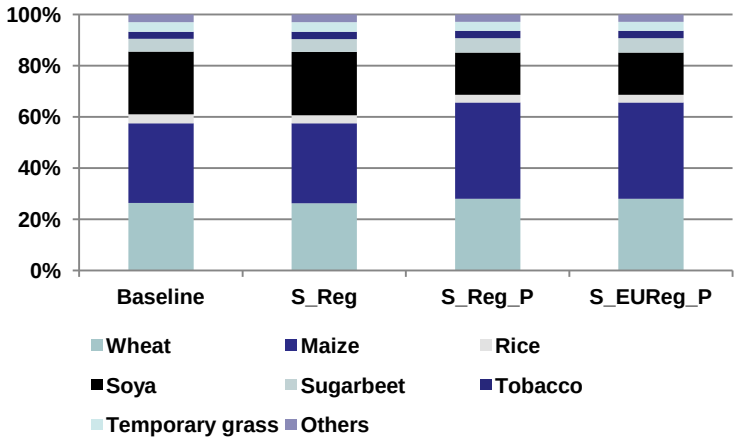
	soft wheat	barley	maize	dry pulse	potato	sugar beet	other indust	vegetables	rape
soft wheat	0.02923	0.06010	-0.00393	-0.00272	0.01606	0.00833	0.02561	0.03687	0.00938
barley		0.16198	-0.00803	-0.00494	0.02815	0.01556	0.05831	0.06923	0.01063
maize			0.00461	0.00851	0.00751	-0.00006	0.00033	0.01075	0.01003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

Belgium

Veneto Region

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

Land allocation



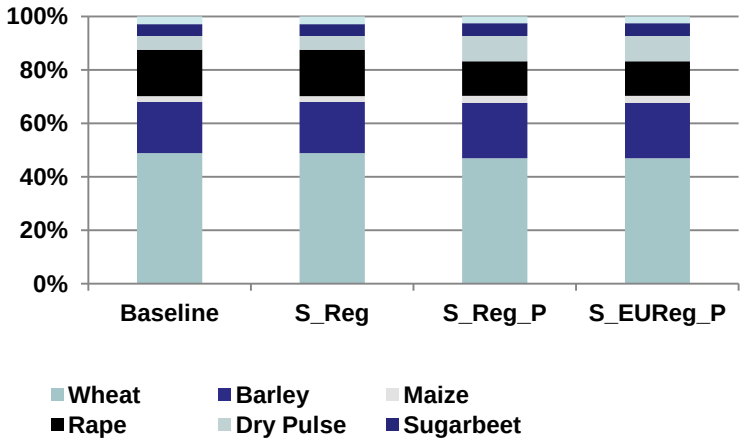
Main economic results

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

Ile-de-France Region

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

Land allocation



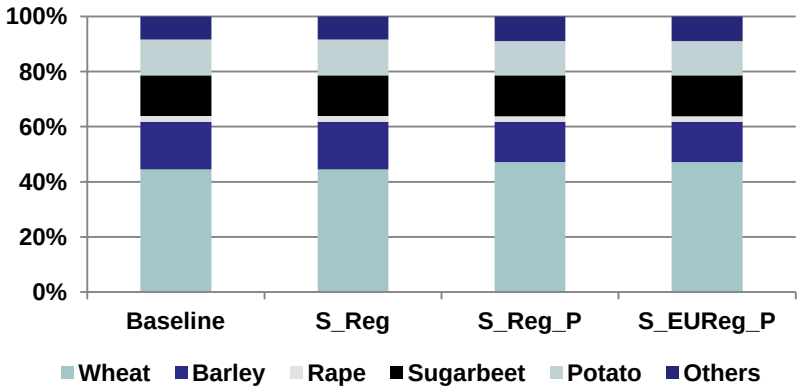
Main economic results

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

Belgium

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

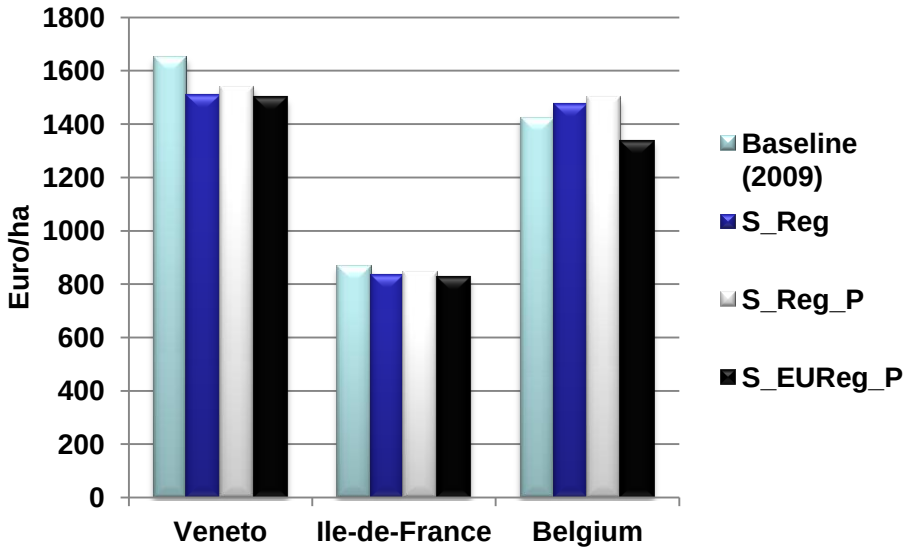
Land allocation

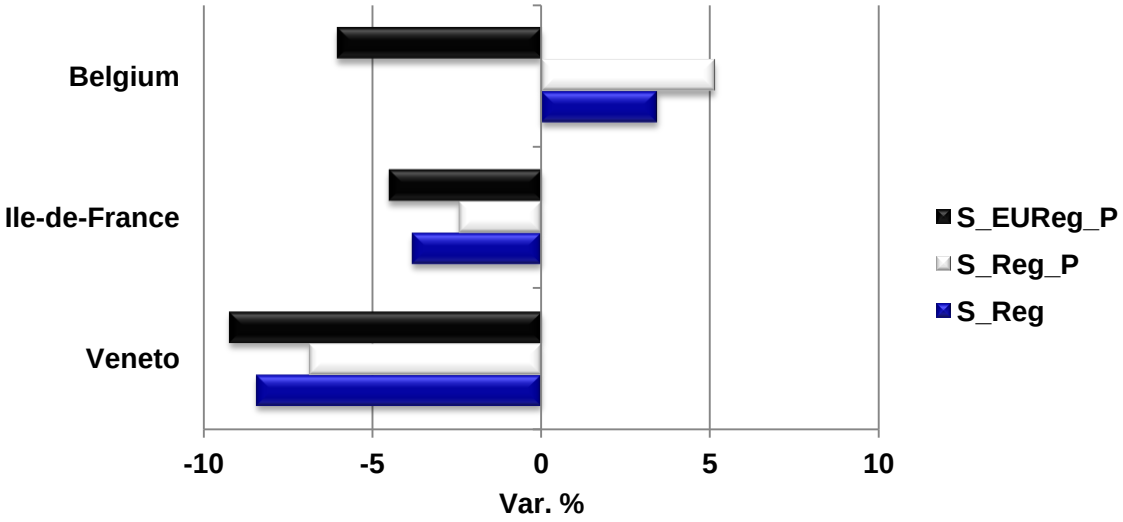


Main economic results

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

Gross Margin Comparison





Veneto – Cluster Analysis

Clusters	GSP (euro/ha)	Variable Costs (euro/ha)	Net Aids (euro/ha)	Class of AAU	Cereal incidence (% on AAU)	
1	1,901	523	408	2	62.4	Small and low intensive farms
2	2,049	745	425	1	99.3	Small and cereal specialized farms
3	1,570	759	434	2	51.2	Small and low efficient farms
4	5,680	3,592	2,713	4	14.3	Large, intensive tobacco farms
5	1,866	625	379	5	62.2	Large and extensive farms
6	1,695	492	426	1	14.6	Small very low intensive farms

Cluster Dynamics

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

Ile-de-France – Cluster Analysis

Clusters	GSP	Variable Costs	Net Aids	Class of AAU	Cereal incidence	
	(euro/ha)				(% on AAU)	
1	970	374	290	4	85.3	Large, cereal oriented farms
2	4,098	2,176	224	5	57.9	Huge, high intensive farms
3	910	391	283	2	73.2	Small, low intensive farms
4	894	414	304	2	92.3	Small, cereal oriented farms
5	942	461	352	3	74.3	Average cereal farms
6	1,040	487	283	5	72.6	Huge cereal farms

Cluster Dynamics

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

Belgium – Cluster Analysis

Clusters	GSP (euro/ha)	Variable Costs (euro/ha)	Net Aids (euro/ha)	Class of AAU	Cereal incidence (% on AAU)	
1	1,259	491	350	3	78.2	Extensive cereal oriented farms
2	1,778	537	295	3	53.7	Low intensive non-cereal farms
3	3,937	2,344	255	4	42.4	Large intensive non-cereal farms
4	1,642	1,021	467	3	64.0	Intensive cereal farms
5	2,027	921	344	5	64.3	Huge intensive farms
6	1,360	720	739	2	91.4	Small, cereal oriented farms

Cluster Dynamics

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

Final remarks

- The proposed methodological approach permits to fully use the FADN information for having useful appraisals on the farm dynamics induced by market evolution and agricultural policy mechanisms.
- These results show a different capability to react to policy measures and to market conditions where efficiency is related to the capacity to adapt to new market scenarios.
- Farm behaviour relies on market conditions: regionalization doesn't introduce modifications in production decision process.
- The decoupling of remaining coupled aids (e.g. rice) influences the production level of the interested crops.
- The results have demonstrated how price variation effect on farm strategies and regionalization may contribute to modify farm gross margin introducing a more equitable CAP instrument as wished by the last reform.