Rivista di Economia Agraria, Anno LXIX, n. 2-3, 2014: 129-140

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Keywords: CAP Reform, livestock, farmers' behaviour, logistic regression
JEL Codes: Q12, Q18

Influence of the Common Agricultural Policy on the livestock number reared. Evidence from selected European regions

Over the past 20-30 years European livestock farming and the spatial distribution of livestock across Europe have been largely shaped by reforms of the European Common Agricultural Policy (CAP). Generally, for the coming years a decrease in livestock numbers is expected in regions that are characterized by high livestock densities. To this regards, most studies examined the influence of CAP changes at a regional level while literature encompassing a broader range of European regions is still scarce. The study aims at assessing the influence of the Common Agricultural Policy (CAP) on farmers' decision about on-farm numbers of livestock reared. To do this, farmers' stated intentions are analysed against the event of a CAP abolishment after 2013.

1. Introduction

Over the past 20-30 years European livestock farming and the spatial distribution of livestock across Europe have been largely shaped by reforms of the European Common Agricultural Policy (CAP) (Hasha, 2002; Hermansen, 2003; European Commission, 2004, 2006).

Since the 80s CAP changes were prompted by different policy concerns which placed farmers' interest and international trading pressures as top priorities. There is a vast literature exploring the economic performance of an agricultural sector in which support policies are in place. Market policy instruments (1982-1992), direct payments coupled to production (1993-2004) and decoupled direct payments with single farm payment scheme SFP (2004-2014) were largely explored (for an updated review see McCormack and O'Donoghue, 2014).

Furthermore, European livestock rearing, especially high density livestock systems, is influenced by environmental themes. Since the McSharry reform and over a period of 10 years (1993-2004) an upper stocking rate limit per farm was introduced along with extensification premia. Finally, the last remarkable reform approved in 2003 and enforced later in 2006 introduced the

DOI: 10.13128/REA-16918
ISSN (print): 0035-6190
ISSN (online): 2281-1559

decoupled payment[1]. These payments were based on a historical reference period and the number of coupled direct payments drawn during that time. In order to receive the payment, farmers have to comply with the cross-compliance rules. Relevant for the livestock sector are the limits to the livestock unit per hectare (LSU) of utilised agricultural area.

Currently, the post-2013 CAP has been approved (European Regulation 1307/2013, 1308/2013, 1305/2013, 1306/2013, 1370/2013). One of the key innovations in the post-2013 CAP reform is the single and uniform Basic Payment Scheme per hectare, at national or regional level, which replaces the Single Payment Scheme. This basic subsidy can be complemented by other different types of payment: a payment for the provision of environmental public goods (the so-called greening component), a payment for installation of young farmers, a payment for areas with natural constraints, a redistributive payment, a coupled support and, a small farm scheme. Complementary, each Member State will rely on an envelopment ranging from 10-12% of total CAP expenditure available as coupled payment which replaces the art. 68. Finally, payments are also included in the Regional Development Plan (RDP) in order to promote environmental protection mandatory standards, and to foster local rural economies according to their specific needs.

A special mention for the Italian case is due, where a unique national basic payment has been adopted. Also called Irish model, with the new payment system it is expected a reduction of at least 30% of previous value while 60% of payment amount is guaranteed for all beneficiaries. In addition, in Italy the envelopment will account for 11% of total budget and, with relevance for livestock sector, a half (210 million EUR/year) addresses to rearing-related issues.

Generally, for the coming years a decrease in livestock numbers is expected in regions that are characterized by high livestock densities (Ciaian and Swinnen, 2006). To this regards, nowadays most studies have examined the influence of CAP changes at a regional level (Matthews, 2011; Copus and Kelly, 1999; Toro-Dunay et al., 2012; Rocamora-Montiel et al., 2014) whereas literature encompassing a broader range of European regions (e.g. European Commission, 2010, Neumann et al., 2011) is still scarce.

In light of these preliminary remarks the aim of this paper is to consider farmers' stated reactions to CAP scenarios and identify the extent to which these intentions would be influenced by the introduction of a CAP change starting in 2014. In particular, the stated responses are analysed in order to stress the influence of CAP liberalization on the farmer's decision of how

[1] Single Farm Payment (SFP) within the EU-15 and Single Area Payment System within new accessed memebrs since 2004.

many numbers of livestock unit keep on-farm, with a specific focus on the different livestock typology (i.e. dairy cattle, fattening cattle, grazing species, pig and poultry). In addition, the paper seeks to identify whether there are any significant variations in the pattern of farmer response associated with key structural and socio-demographic variables.

The hypothesis behind the scenario relies on the fact that CAP liberalization as counter-factual scenario, provides an insight into the influence of the current policy on farmer's decision (Giannoccaro and Berbel, 2014). It helps us to prove whether the current decoupled schemes would affect farmers' decisions on livestock number reared or not. CAP liberalization should imply the abolishment of policy support (monetary) as well as policy regulation affecting the farmer's decision. Indeed, also the current limits imposed on the LSU extent, or on the amount of milk produced under the quota-milk scheme will be removed. In this way, it will also be assessed the extent of cross-compliance influence on the number of animals kept on-farm. Moreover, we expect to some extent that CAP removing would influence farmer's decision differently according to the livestock typology. For instance, this is the case of the dairy specialists currently constrained by the quota-milk capping.

This framework analysis is in the scope of research that focuses on the influence on farmer's behaviour rather that assessing the impacts of a realistic scenario. Moreover, it is worth mentioning the fact that the European Commission carries out the ex-ante evaluation of any CAP reforms considering the 'whit' and 'without' CAP scenario (for the last reform see EC, 2010a).

2. Methodology

2.1 Data collection and survey description

This paper is developed in the scope of the CAP-IRE[2] project that established a scenario hypothesis with two extreme states of the CAP policy by 2020: i) a baseline scenario of the CAP framework in year 2009, that includes the latest *Health Check* agreements, and ii) a scenario assuming a complete abolition of all CAP instruments. The benchmark scenario was defined assuming that prices, employment opportunities and other conditions remain stable at January 2009 level and CAP would continue as it is currently planned especially with Single Farm Scheme, Rural Development Policy and other instruments such as milk quotas and cross-compliance. This first option was called

[2] Assessing the Multiple Impacts of the Common Agricultural Policies on Rural Economies (www.cap-ire.eu).

«Baseline scenario». Secondly, farmers were asked to consider the hypothesis that all CAP payments received (including RDP), and all other CAP instruments (e.g. milk quotas, cross-compliance) with constraints imposed on the LSU would be removed starting in 2014. Except for CAP, all other conditions (prices, labour market, etc) would remain the same as in the first scenario. This second hypothesis was called «NO-CAP scenario».

In 2009 a survey on 2,363 family-run farms across 9 member states of the EU was carried out (detail on the survey has been already provided in Giannoccaro and Berbel, 2014). With respect to previous studies accounting for the same survey, this research focuses exclusively on livestock sector. Indeed, a sample of 1,301 specialized livestock farms is analyzed (Table 1).

The sample reports an average of 22,000 EUR of payment via SFP/SAPS with a farmland size of approximately 55.000 ha. The average farmer's age

Tab. 1. Main features of sample-only farm with livestock (N=1,301)

	Case study	Sample size	Age (year)		Land owned (ha)		SFP/SAPS* (EUR)	
			Mean	S.D.	Mean	S.D.	Mean	S.D.
South	Emilia-Romagna (Italy)	32	54.93	13.72	26.67	47.83	7,848	10,978
South	Macedonia and Thrace (Greece)	154	47.20	5.99	6.67	6.00	11,720	14,004
South	Andalusia (Spain)	27	48.88	12.18	286.79	589.66	39,298	68,153
East	South-East Planning Region (Bulgaria)	149	48.32	11.39	4.21	13.03	6,380	16,298
East	Podlaskie (Poland)	190	35.5	7.49	21.71	14.93	3,035	2,127
Centre-North	North East of Scotland (UK)	147	55.28	11.83	165.93	207.21	38,643	56,063
Centre-North	Noord-Holland (Netherlands)	210	51.67	10.89	30.37	23.14	16,877	18,961
Centre-North	Centre (France)	73	35.73	11.45	58.85	67.33	40,417	33,590
Centre-North	Midi-Pyrénées (France)	120	42.46	10.99	72.48	66.02	19,137	15,617
Centre-North	Lahn-Dill-District (Germany)	91	49.56	10.35	9.20	15.68	8,960	12,110
Centre-North	Ostprignitz-Ruppin (Germany)	108	51.58	10.98	120.69	250.33	94,432	179,780
	TOTAL	1,301	46.86	12.20	54.66	146.28	21,919	59,783

*SFP: Single Farm Payment; SAPS: Single Area Payment System

in the survey is 46.8 years and variability is found with the Polish being the youngest farmers with an average age of 35 years while Italian and Scottish farmers are the oldest with 55 years being the average.

Farm livestock features are reported in Table 2.

The main farm specialization covered by the sample is Dairying livestock and mixed crop & livestock accounting both for 25%. The group of crops and grazing reaches 13% while mixed livestock with poultry covers only 4%.

The question about preferences towards the on-farm animal units was formulated as a close qualitative question, where each household was asked, under each scenario, if they expected to increase, no-change or decrease the (number) units reared at the survey time. In addition, farmers whose responses were not stated (i.e. they did not answer and they did not know what they would do) and 'other' explicit responses were also collected.

The analysis of the policy effects implies two steps: firstly it must be determined who is affected by the policy and secondly the changes due to policy implementation must be assessed.

In light of this, intended behaviour was defined in terms of a dichotomous outcome: (i) farmers who would modify their decision (i.e. those who are influenced by CAP removal; actually they decision on numbers of livestock unit is influenced by the current CAP) were labelled 'Dependent behaviour'. Inside this label, there are two groups, depending on the direction of change either 'change-decreasing' or 'change-increasing' when farmer's choice moves respectively to a lower or upper level of livestock number; and (ii) those farmers whose intended behaviour is not affected by CAP scenarios, therefore farmers would not modify their decision and, they would carry on with the same decision. This category was labelled 'Independent behaviour'. This latter category,

Tab. 2. Farm livestock features

Livestock typology	Frequency	Number of animal reared		
		mean	min	max
Specialist dairying	321	72	3	1,600
Specialist dairying & fattening	202	50	0	500
Specialist sheep & goat	112	193	0	1,200
Mixed, mainly grazing	114	100	0	1,400
Mixed, mainly poultry	51	2,316	0	30,100
Crops & grazing	173	141	0	1,500
Mixed crops & livestock	328	118	0	2,232

Tab. 3. Definition of farmers' behaviours (N=793)

Farmers' behaviours	% of respondents	CAP scenarios	
		Baseline	NO-CAP
Invariant	59.5%	Increase	Increase
		Constant	Constant
		Decrease	Decrease
Change-decreasing	23.6%	Increase	Decrease
		Increase	Constant
		Constant	Decrease
Change-increasing	5.8%	Constant	Increase
		Decrease	Constant
		Decrease	Increase
Undecided	11.29%	Increase	Do not know
		Constant	Do not know
		Decrease	Do not know

Source: own elaboration

likely includes already market-oriented farms, much more efficient, capable to adapt to a CAP payment abolishment. Again, farms receiving a very small CAP payment or farms with livestock typologies that are not constrained by some CAP scheme, such as the milk quotas.

Table 3 shows the survey results of farmers' stated preferences with reference to the number of livestock under each CAP scenarios.

Results show that farmers who are influenced by CAP removal are 30%: they would modify their decision in a way of increasing, 'change-increasing' (6%), or lowering, namely 'change-decreasing' (24%). The percentage of farmers whose intended behaviour is not affected by CAP scenarios, called 'invariant' reaches 60%.

2.2 Econometric modeling of farmer's response

The economic theory underlying stated preferences assumes that the most preferred option yields the highest utility for the respondent. According to the questionnaire here there is a single decision among more unordered alternatives. Assuming that farmer's utility is a linear function that contains the set

of the individual explanatory variables (x) and β their coefficients, it is possible to define the probability for the *i*-th farmer to choose among the alternatives given, namely (1) keep invariant behavior, (2) change-decreasing or (3) change increasing. The method to determine statistical relevant factors was a multinomial logistic regression formula (see Giannoccaro and Berbel, (2013) for further details). The positive/negative sign of β coefficient, when significant, can be interpreted as the increment/decrement of the probability of a farm being in the specific group. Note that a non significant coefficient implies that the regressors do not affect the utility or the probability of being in a certain group.

The variables considered as determinants are all of those derived from the questionnaire and are fully available in Viaggi et al. (2009) in which the stated reaction to the CAP scenarios was also collected. The full list of variables used, and the way each variable was measured, is available in Giannoccaro and Berbel, (2013).

3. Results

According to the econometric model (Table 4), major likelihood of decrease in number of animal reared would be related to farm structural features such as size of land owned and farm with rented land. We introduced a metric variable for farmland size taking into account the tenure of land. We refer to the land owned by the farmer at the time of interview. At the same time, the renting-in activity is rather common among specialist in livestock. The model findings points out that the larger the land, the higher is the likelihood of having a decreasing behaviour. Similarly, the land rent-in variables set as a dummy variable implies that those farms renting-in land would have higher probability of sizing the unit numbers.

Mostly relevant, the change is not spatially neutral indeed across hilly and mountainous areas the reduction strategy would be more likely with respect to flat zone. To the same extent, differences have been found across the EU regions, with the new entered members showing the biggest change. In fact, comparing the farmers' behaviour of the latest entered members (in the sample: Poland and Bulgaria) to the EU-15 (grouped as Centre-North and South) findings reports a minor likelihood of being in the class of change-decreasing for EU-15 cases study. Many studies (Thomson and Psaltopoulos 2007; Slangen et al. 2004; Gorton et al. 2008; Neumann et al. 2011; Giannoccaro and Berbel 2013) have already stressed the dependency of farmers' decision belong to last entered members on the CAP payment. Although the total amount of payment received is lower than that of EU-15 farmers, the relevance with respect to the total income is pretty higher (Gorton et al. 2008).

Tab. 4. Logistic regression models: 'Changing behaviour' category [(a)]

	Factors	β	S.E.	Z	Sig.
Changing-decreasing	Constant	-1.51	.6486	-2.34	.019**
	Farmer's age	-.001	.0109	-0.15	.884
	Land owned (ha)	.005	.001	2.28	.023**
	Land rent IN	.831	.320	2.59	.010**
	Specialist				
	dairying	.547	.4515	1.21	.225
	dairying&fattening	.595	.4013	1.48	.138
	sheeps&goats	.372	.5956	.63	.531
	mixed, graizing	.344	.5048	.68	.495
	mixed, granivores	-.734	.7779	-.94	.345
	crops &grazing	-.213	.4346	-.49	.623
	mixed, crops&livestock (reference)				
	Region				
	Centre-North	-1.49	.3171	-4.71	.000***
	South	-2.09	.5402	-3.87	.000***
	East (reference)				
	Altitude				
	Hill	.732	.2601	2.82	.005**
	Mountain	1.124	.4119	2.73	.006**
	Plain (reference)				
	Organic production	.721	.4103	1.76	.079*
	SFP/SAPS per ha	.000	.000	1.05	.294
Changing-increasing	Constant	-6.62	1.720	-3.85	.000***
	Farmer's age	-.041	.0177	-2.34	.019**
	Land owned (ha)	.004	.0035	1.26	.208
	Land rent IN	1.85	.7911	2.35	.019**
	Specialist				
	dairying	2.143	.921	2.31	.020**
	dairying&fattening	-.4347	1.26	-.34	.731
	sheeps&goats	1.221	.983	1.24	.214
	mixed, graizing	-23.94	260	-.00	1.00
	mixed, granivores	-16.12	121	-.00	1.00

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	Factors	β	S.E.	Z	Sig.
	crops &grazing	1.641	.871	1.88	.060*
	mixed, crops&livestock (reference)				
	Region				
Changing-increasing	Centre-North	3.52	1.072	3.29	.001***
	South	-26.04	1325	-.00	1.00
	East (reference)				
	Altitude				
	Hill	.501	.6149	.82	.415
	Mountain	.981	.9548	1.03	.304
	Plain (reference)				
	Organic production	-.128	.7230	-.18	.858
	SFP/SAPS per ha	.000	.0004	1.14	.225

Source: own elaboration; (a) Reference class: Invariant.
Rate of -2 Log likelihood= 350.885; Pseudo R2= .2297
* Statistically significant at 90% level; ** at 95%; *** at 99%

Finally, livestock rearing under organic production systems would have also more likelihood of adopting the decreasing strategy. Without compensatory payments for the major cost that organic livestock implies, this type of production process, more environmentally sustainable, turns to be economically unsustainable.

On the other hand, the increasing behaviour has been found for farms with renting (in) land. Among the livestock typology, as expected, dairying is the specialist with major probability, while across EU regions the Northern members would have the biggest likelihood. Finally, also farmer's age has been found being significant, with inverse relationship with increasing intention. The older the farmers the lower is the likelihood of raising the livestock number reared.

While for renting-in the rationale of farmer's stated reactions might be the same, namely rant-in land provides a more flexible size of livestock activities that can be promptly adjusted downwards or upwards depending on the economic efficiency of each farm, the fact that the amount of payment is not significant is relevant. The SFP/SAPS refers to the total amount received per ha and it differs across EU members as well as among the livestock typologies.

Generally, these results are in line with other studies in which the influence of CAP support on the number of livestock unit has been investigated.

For instance Neumann et al. (2011) analyzing the impact of different CAP and market scenario found a reduction trend in animals reared in the new EU member countries according to the CAP shift in paradigm from a higher degree of governmental regulation to low regulation levels and dominance of market forces.

4. Conclusions

In this study farmers' intended behaviour towards numbers of livestock reared were analyzed under the hypothesis of a plenty CAP liberalization since 2014. As underlined in Barnes et al (2014), like all surveys of future intent, the responses may have beeen some built in bias which is reflective of present agricultural conditions that could influence the responses.

In general, removal of the CAP would not induce strong changes in farmers decisions (60% are 'invariant', 11% 'undecided'), and results show that 30% of farmers would modify their decisions (6% 'change increasing', 24% 'change decreasing'). Basically, results have found that farm structural variables, such as size of land, rented land and organic rearing, would influence the decreasing in numbers of animal reared. In addition the increasing behaviour would be influenced by other features, such as renting (in) land and diary livestock typology. This might be related to the quota-milk abolishment that would lead to increase the on-farm animal reared. However, heterogeneous behaviour between the New Member States and the others (EU-15) has been found, as new members are more likelihood to decrease the number of livestock unit without CAP support.

Although the CAP liberalization is not going to happen, from the analysis made, some implications for near future might be drawn. For instance, since 2015 the total removal of the current limits of milk quotas would imply a slight increase in the number of livestock units among the dairying specialists. Moreover, according to our findings, those farms which support higher production costs such as organic farms or farms located on hilly and mountainous areas are much more depending on the CAP payments. For the Italian case, a reduction in the amount of payment is expected as a consequence of the unique national basic payment while coupled payments for the livestock sector will amount about to 210 million EUR/year. In this contest, coupled payments will address to these livestock sectors expecting much more impacts from the new national basic scheme.

Finally, the survey used for this study did not allow us to separate the effects of monetary effects and environmental constraints on farmer's decision. This point could be taken into account for future development of the research.

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