A C T A U N I V E R S I T A T I S L O D Z I E N S I S
FOLIA OECONOMICA 2 (319), 2016
http://dx.doi.org/10.18778/0208-6018.319.07

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THE IMPACT OF THE SUPPORT INSTRUMENTS OF THE COMMON AGRICULTURAL POLICY ON ECONOMIC AND FINANCIAL STABILITY OF FARMS IN EU COUNTRIES

Abstract. EU subsidies influence the economic and financial situation of farms through several complex channels, although their economic and financial impact may be observed with a delay. The aim of this study was to assess the impact of selected support instruments of the Common Agricultural Policy, CAP (including direct payments and subsidies from Pillar 2) on economic and financial stability (respectively, the level of net farm income and debt/asset ratio) of farms in EU countries at regional level. The research goals included: (1) to present differences in the level and the structure of instruments of CAP support (excluding investment subsidies) at the level of member states; (2) to determine significance, strength and direction of the relationship between amounts of subsidies received and selected indicators of economic and financial stability of farms. The Farm Accountancy Data Network (FADN) database provided secondary data for the study. The dynamics of changes was analysed for years 2007 and 2012. At the country level, the share of subsidies related to rural development programs gradually increased during the years 2007–2012. A weighted regression approach with correction of heteroscedasticity (a total of four models) was employed separately for the 2007 and 2012 (based on data from the FADN regions). Although subsidies (excluding for investment) under the CAP influenced quite strongly the level of agricultural income, the impact of subsidies on the financial stability was ambiguous. This may lead to the refinement of regional approach in relation to the selection of support instruments and the determination of the amounts of support provided under the CAP.

Keywords: agricultural finance; farm; financial stability; debt/assets; income; Common Agricultural Policy

JEL: Q14, Q12, Q16, H20.

1. INTRODUCTION

There is a growing body of literature on rationales for policy support instruments that may be directed at various sectors of the economy (Karagiannis 2001: 17–47; Kling 2012; Carden, Horowitz 2013; Marsden 2010; Grahl, Teague 2013; Campbell, Klaes 2005)[1]. Economists have identified and explored

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[1] For example, Carden and Horowitz (2013) enumerated „externalities, public goods, asymmetric information, and market power" as factors that may influence actions taken by state or regional governments.

the roots of theory of economic interventions in action, taken by governments after the Great Recession. This was accompanied by the basis of Keynesian economics and its successors (Neo-Keynesian, New Keynesian and post-Keynesian economics).

Agriculture is a significant part of the primary sector of the economy, which requires close attention, given economic and social functions of rural areas. There exists an extensive body of literature (De Gorter, Swinnen 2002; Sumner 2007; Sumner 2008, Goodwin, Mishra, Ortalo-Magné 2011) on rationales for agricultural subsidies[2]. It should be noted that a significant part of policy objectives of governments or supranational institutions (for example, the European Union) focuses on providing financial aid (in the form of subsidies) for "more sensitive" parts of economy. Nevertheless, the debate on agriculture subsidies should include the fact that „in developing countries, agricultural policy issues revolve around basic concerns like food security, poverty alleviation, rural development, and stabilization of export revenues", whereas „(…) in developed countries, food self-sufficiency may continue to be important but increasing attention is being paid to food safety and environmentally sustainable farming" (World Trade Organization 2006: 120). This means that, in particular, complex interactions of the agricultural sector with the environment (for example, the problem of provision of public goods), as well as the sensitive issues of income inequality may provide stimulus for policy makers who design and use the instruments targeted at the support of agriculture[3]. Furthermore, from the perspective of U.S. agricultural policy, Sumner (2007) enumerated and discussed rationales for agricultural subsidies, including „chronic low farm prices and farm income" associated with „high variability" in these two categories", and „the need to ensure a reasonably cheap food supply"

As Sumner (2008) rightly pointed out, „the impact of the subsidies depends on their form". The main form of agricultural subsidy, namely direct payments, may affect the economic and financial situation of agricultural holdings, for example, through changes in investment activity (Soliwoda 2014). This abovementioned form of agricultural subsidy – as the element of the so-called „safety net" for agriculture, may stabilize farm income (Kellermann 2009; Moser et al. 2014). In general, EU subsidies, such as agricultural subsidies, influence the economic and financial situation of farms through several complex channels. (Lagerkvist

[2] As experts of World Trade Organization (2006) stressed, there is no clear commonly accepted definition of „subsidy". It should be noted that the term of „subsidy" seems to be widely used in economics and applied areas (such as public and international trade policies). Schrank (2003) discussed that there is a variety of definitions of „subsidies": from a very narrow approach underlining a financial dimension of aid to a relatively broad one, stressing the impact of public action on financial results of entities.

[3] As Triest (2007: 10) reasonably stated,"subsidies can be viewed as distorting the benefit-cost calculus implicit in market decision-making, leading to the economically inefficient outcome".

2005; Goodwin, Mishra, Ortalo-Magné 2011; Rizov, Pokrivak, Caian 2013; Minviel, Latruffe 2014), although the effect of the absorption of some instruments may be observed with a delay[4].

Regional approach has become more important in the agricultural policy of the European Union (the Common Agricultural Policy, CAP) that is oriented to, inter alia, supporting farm incomes, increasing productivity and the stabilisation of agri-food markets (European Commission 2013). The ongoing CAP 2014–2020 has been equipped with „better targeted instruments of the first pillar complemented by regionally tailor-made and voluntary measures of the second pillar" (European Commission 2013: 5). This refers to the distribution of direct payments and the architecture of rural development programmes (RDPs). Additionally, as Hill (2012: 158) underlined, „the regions that are lagging behind should be assisted to share in the EU's collective prosperity". Given the perspective of CAP 2014–2020, Góral (2014: 110–111) convincingly argued that „the regionalization of agricultural policy is becoming a necessity due to an increase in EU spending to reduce the impact of the current global economic crisis (2008+)". Additionally, she indicated that „targeting", is a very complex issue for the CAP instruments, because one should answer two fundamental questions: who and how should be supported. Similarly, Montini (2011: 9) indicated that „within a future CAP, more focused on the support of the delivery of public goods, there is clearly scope to explore the relevance of a more territorially based approach". This justifies the need for putting an emphasis on a regional approach in empirical studies on the impact of CAP subsidies on the economic and financial condition of agricultural holdings.

The aim of the paper is to assess the impact of the selected support instruments of the Common Agricultural Policy, CAP (including direct payments and subsidies from Pillar 2) on economic and financial stability of farms in EU countries at regional level. The research objectives include: (1) to present differences in terms of amounts of CAP instruments (total subsidies) received at state level; (2) to determine the significance, strength and direction of the relationship between the amount of subsidies received and selected indicators of economic and financial stability of farms.

The remainder of this paper is organised as follows: in the next section we present and discuss an evolution of regional approach in the Common Agricultural Policy; the third section presents data and methodology; in the fourth section we describe and discuss the main results. The last section draws some concluding remarks.

[4] For example, results from a meta-regression analysis of Miniviel and Latruffe (2014: 1) revealed an interesting fact that the impact of agricultural subsidies was „negatively associated with farm technical efficiency". In addition, Zhu, Karagiannis and Oude Lansink (2008) formulated similar conclusions in respect to Greek olive farms.

2. REGIONAL APPROACH IN THE COMMON AGRICULTURAL POLICY: EVOLUTION AND PERSPECTIVES

Figure 1 presents the main milestones and stages in the history of the Common Agricultural Policy (CAP). This policy, as one of the oldest policies of the European Union (formally in existence since 1962), aimed at increasing productivity in the agri-food chain (European Commission… 2015c). In the crisis years: throughout 1970s and 1980s European policymakers had to deal with the issue of „structural adjustments". The year of 1992 should be treated as a milestone, because „the CAP shifted from market support to producer support" (European Commission 2014b: 5). Agenda 2000 implemented the second pillar of the Common Agricultural Policy (rural development programmes) that may be tailored to national and regional policies. It should be emphasised that the CAP Health Check in 2008 implemented some significant changes, strengthening the mechanism of decoupling (a lack of linkage between the production volume and payments received). However, as Cantore, Kennan and Page (2011: 4) observe, after the CAP Reform in 2003, „some Member States chose to maintain some 'coupled'– i.e. production-linked – payments". The Health Check was focused on „helping farmers to respond better to signals from the market and to face new challenges" (European Commission 2009).

The last CAP Reform (started in 2010, agreement reached in 2013) with a new vision for CAP 2014–2020 is based on two pillars. Nevertheless, a holistic approach and balance between various instruments led to a new architecture of provision of safety nets for farmers (European Commission 2013). Since „balanced territorial development" was set as one of policy objectives for the CAP, post-2013, „better targeting of the available CAP budget" has been emphasised. Given the distribution of direct payments, internal convergence within the Member States has been implemented. This means that national and regional differences should be taken into considerations. As Boulanger and Philippidis (2015) emphasised, „the 2013 CAP reform seeks to further strengthen the relation between agricultural production and environmental responsibility by explicitly linking up to 30% of the direct payments envelope to greening practices".

Table 1 presents common areas that may be realised under two reformed Pillars and indicates whether a regional approach has been included. Only measures under the Second Pillar were designed with a special focus on potential regional effects. It should be noted that some instruments may be designed with emphasis on regional differences. However, this is still a task for national policy makers.

STAGES						
Food security						
	Competitiveness					
		Sustainability Cohesion				
			Policy Efficiency			
The Early Years (60s)	**The Crisis Years (70s/80s)**	**The 1992 Reform**	**Agenda 2000**	**CAP Reform 2003**	**CAP Health Check 2008**	**CAP Reform Post–2013**
• Price support • Productivity improvement • Market stabilisation	• Overproduction • Exploding expediture • International frictions • Supply controls	• Price costs and compensatory payments • Surplus reduction • Income and budget stabilisation	• Deepening the reform proces • Rural development	• Market orientation • Decoupling • Cross compliance • Consumer concerns • Environment • Enlargement	• Reinforcing 2003 Reform • Dairy quotas	• Greening • Targeting • Redistribution • End of production constraints • Food chain • Research & Innovation

Figure 1. Evolution of the Common Agricultural Policy

Source: based on European Commission… (2015c).

Table 1

Actions/measures under both Pillars, CAP 2014–2020

Pillar I	Regional approach*	Targeted action	Pillar II	Regional approach*
Green payment	+/–	Environment	Agri-environment-climate Organic, Natura 2000	++
Top-up payment	+/–	Young farmer	Business development grants Higher investment aid	+
Top-up payment	+/–	Areas with natural constraints	Area payments	+/–
Alternative simplified scheme	+/–	Small farmer	Business development grants	+
Improved legal framework	0	Producer cooperation	Aid for setting up producer groups; cooperation and short supply chain	+/–

Note: *authors's assessment, 0 – neutral, +/– – dependent on national regulations, +/++ a regional approach was adopted.

Source: own elaboration based on European Commission… (2013).

3. DATA AND METHODOLOGY

The dataset for the empirical part of studies came from The Farm Accountancy Data Network (FADN) that was intended to be a special tool for evaluating farm incomes, and, consequently, their impact on the Common Agricultural Policy. The FADN is regarded as a source of microeconomic data that is harmonised at the EU level. It should be noted that farms are selected to take part in the annual survey on the basis of sampling plans established at the level of each EU region. "The methodology of the FADN is oriented to provide representative data along three dimensions: region, economic size and farming type" (European Commission… 2015a). It should be noted that the annual sample includes approx. 80 000 entities that represent a population of about 5 000 000 farms in the EU. The information collected, for each sample farm, concerns approximately 1 000 variables, both physical and structural data, and economic and financial data (European Commission… 2015a).

Table 2 enumerates and provides brief definitions of variables used in further analyses and econometric models. It should be noted that some variables are based on "fundamental" FADN categories (for example, "farm net income" or "total utilised agricultural area"). "Farm net income" is the most significant indicator of economic stability for farm households (farms), whereas debt-to-assets-ratio indicates the financial stability of economic entities. The category of farm net income (euro/farm) describes overall results of farm managers. The fact that farm net income may be generated indicates economic viability of agricultural holdings. However, debt-to-asset ratio indicates the financial stability and may be treated as one of the measures for borrowing capacity of the firm.

Table 2

Description of variables used in analyses and models

Abbreviation (FADN)	Description	Unit
SYS002	Farms Represented: sum of weighting coefficients of individual holdings in the sample	–
SE025	Total Utilised Agricultural Area: Total utilised agricultural area of holding	hectares
SE430	Farm Net Income / FWU: Family Farm Income (SE420) expressed per family labour unit, FWU (SE015), takes into account differences in the family labour force to be remunerated per holding.	euro/ FWU
SE420	Family Net Income (Family Farm Income): Remuneration to fixed factors of production of the family (work, land and capital) and remuneration to the entrepreneur's risks (loss/profit) in the accounting year.	euro
–	Debt-to-Assets Ratio: as total liabilities (SE485)/total assets (SE436) of farm, expressed as %	%

SE605/SE025	Total subsidies (excl. investment)/total utilised agricultural area: Subsidies on current operations linked to production (not investments):	Euro/ha
SE605/SE131	Total subsidies (excl. investment)/total output: as above/ Total of output of crops and crop products, livestock and livestock products and of other output.	%
SE624/SE605	Total support for rural development /total subsidies excl. investment: (environmental subsidies+ LFA subsidies + other Rural Development payments including RD national payments) / total subsidies (excl. Investment)	%

Source: based on European Commission… (2014a).

First, we described an overall economic situation of farms (by member states), stressing differences concerning measures related to subsidies. Since one of our objectives was to investigate the impact of support instruments (namely, total subsidies excluding aid for investment processes), we built four models: two of them were based on data from 2007 (the first year of CAP 2007–2013) and two included data from 2012[5]. Models were based on weighted least squares (WLS) regression (variable "SYSO2" as source of weights). Regional data came from the FADN public database. This type of regression analysis may be used when the problem of known heteroscedasticity (e.g., grouped data with known group sizes) occurs (see: Welfe 2008). A similar econometric approach was adopted by Poczta, Średzińska, Mrówczyńska-Kamińska (2009: 17–30).

4. RESULTS AND DISCUSSION

4.1.Economic situation of farms vs. CAP subsidies: analysis at Member State level

Table 3 provides a brief description of economic situation of farms (aggregated at Member State level), with a particular focus on total utilised arable area, the level of farm net income, farm net income per family working unit (FWU) and debt-to-asset ratio. An in-depth analysis of the differences between the 2012 and 2007 may indicate the extent to which the CAP plans have been realized within the period 2007–2013. With the exception of some countries (e.g. Slovakia), a total area of average farm increased. In the Nordic countries labour productivity (measured as net farm income/ FWU) decreased insignificantly. The changes in debt-to-asset-ratio may indicate that farms in Sweden and Denmark dealt with an increasing financial risk.

[5] Data from 2013 were not available at the moment of preparation of this paper.

Table 3

Key economic features of average farms – EU-27 Member States in 2007 and 2012

Year	2007					2012					2012/ 2007	2012– 2007
Sp.	SYS02 (A)*	SE025 (B)	SE420 (C)	SE430 (D)	SE485/ SE436 (E)	SYS02 (A)	SE025 (B)	SE420 (C)	SE430 (D)	SE485/ SE436 (E)	SE430	SE485/ SE436
BE	33320.00	43.19	57685.00	37253.29	26.44	30400.00	49.14	64248.00	38723.76	28.76	1.04	2.32
BG	146770.00	21.39	4563.00	1942.72	15.49	115640.0	35.71	8669.00	3650.33	15.93	1.88	0.44
CY	12740.00	9.83	7423.00	8087.35	1.41	10300.00	9.04	9573.00	9592.31	5.26	1.19	3.85
CZ	15710.00	222.53	36342.00	16779.51	22.47	14850.00	227.86	50501.00	19035.44	24.62	1.13	2.14
DK	28950.00	91.63	2611.00	2862.59	56.47	28760.00	95.26	62308.00	75409.50	59.58	26.34	3.10
DE	200470.00	78.41	43529.00	28974.89	17.61	192450.0	85.57	47984.00	33067.55	19.81	1.14	2.20
GR	389120.00	7.56	14726.00	13339.43	0.44	326820.0	9.29	11500.00	12160.10	0.37	0.91	–0.07
ES	554810.00	36.27	28601.00	25451.96	2.26	587510.0	38.65	21079.00	19911.65	3.01	0.78	0.75
EE	7880.00	109.25	22847.00	12159.31	27.96	8100.00	125.87	25693.00	16567.70	29.08	1.36	1.12
FR	302200.00	84.73	43354.00	29772.12	37.19	304190.0	85.36	47403.00	33115.34	38.72	1.11	1.52
HU	95380.00	54.42	13018.00	12572.80	28.77	105320.0	46.26	18817.00	21586.51	16.85	1.72	–11.92
IE	104820.00	45.89	21411.00	20010.51	1.99	78950.00	50.27	22534.00	19868.73	2.62	0.99	0.63
IT	849090.00	14.77	24948.00	24039.73	1.14	804670.0	15.34	22469.00	23435.00	0.86	0.97	–0.28
LT	51300.00	43.93	16078.00	9585.62	16.05	53410.00	48.49	17131.00	11321.11	14.15	1.18	–1.90

LU	1590.00	76.53	50284.00	35552.84	17.33	1600.00	85.95	40780.00	27191.44	22.64	0.76	5.31
LV	20650.00	70.47	15854.00	9088.06	32.32	21940.00	68.93	13161.00	8262.31	31.91	0.91	–0.41
ML	2640.00	3.12	17232.00	11966.01	3.65	3070.00	2.62	8560.00	6940.10	4.26	0.58	0.61
NL	51290.00	33.96	46475.00	32342.42	37.42	52190.00	35.65	66508.00	46215.88	35.87	1.43	–1.55
AT	90560.00	30.98	30007.00	20968.78	9.27	93270.00	31.46	27826.00	21147.08	10.69	1.01	1.42
PL	735100.00	18.33	9979.00	6414.72	10.82	728160.0	18.84	10681.00	6710.55	6.10	1.05	–4.73
PT	99880.00	25.21	10315.00	7394.98	3.80	110650.0	24.19	12839.00	10041.27	3.54	1.36	–0.26
RO	1289250.00	8.20	3028.00	1749.63	6.38	1042390.	10.05	5853.00	4090.05	1.86	2.34	–4.52
FI	42080.00	51.39	25990.00	22043.14	26.22	39870.00	54.73	21966.00	21692.43	26.37	0.98	0.16
SE	29770.00	90.67	24703.00	21050.49	30.30	27890.00	101.27	16492.00	14710.56	31.22	0.70	0.93
SK	3700.00	584.02	7769.00	19477.26	8.43	4160.00	521.50	–9967.00	13813.05	13.77	0.71	5.34
SI	39940.00	10.84	7197.00	4247.90	1.99	40740.00	11.57	5417.00	3866.06	2.44	0.91	0.45
GB	95870.00	154.55	50565.00	39094.37	10.28	92180.00	161.13	51742.00	39554.12	9.89	1.01	–0.38

Note: traditional abbreviation for names of EU countries are presented; (A) – Farms represented, (B) – Total Utilised Agricultural Area (hectares), (C) Farm Net Income (euro), (D) – Farm Net Income / FWU (euro/FWU), (E) – Debt-to-Assets Ratio (%);change 2012–2007 as difference of percentage points; Sp. – specification.

Source: author's computation based on FADN (2015).

As shown in table 4, farms in New Member States benefited from, increasing amounts of subsidies (per one hectare of utilised arable area and in relation to total output as "subsidy rate"). Moreover, the change in structure of CAP subsidies may indicate that actions and instruments under the Second Pillar may be better tailored to more complex problems referring to rural economies. Nevertheless, there is a group of states (including Poland) where the share of total support for rural development in total subsidies was lower than 20%.

Table 4

Selected measures referring to CAP subsidies – EU-27 Member States in 2007 and 2012

Year	2007			2012			Change 2012/ 2007	Change 2012– 2007	Change 2012– 2007
Specification	SE625/ SE025 (A)	SE625/ SE131 (B)	SE624/ SE625 (C)	SE625/ SE025 (A)	SE625/ SE131 (B)	SE624/ SE625 (C)	SE065/ SE025 (A)	SE065/ SE131 (B)	SE624/ SE625 (C)
BE	534.48	11.57	8.87	514.53	9.54	12.28	0.96	–2.03	3.41
BG	80.74	9.51	0es.00	191.37	16.64	14.33	2.37	7.13	14.33
CY	414.85	10.74	10.57	537.28	12.29	33.37	1.30	1.55	22.81
CZ	275.90	22.10	24.03	363.58	24.45	23.88	1.32	2.35	–0.15
DK	397.70	11.34	3.35	383.50	7.80	2.57	0.96	–3.54	–0.79
DE	406.12	15.82	13.00	408.78	13.49	13.20	1.01	–2.33	0.20
GR	857.28	28.73	14.94	710.44	28.08	9.35	0.83	–0.65	–5.59
ES	195.23	13.45	5.21	243.54	18.91	9.95	1.25	5.46	4.74
EE	149.14	21.70	32.87	195.71	22.41	35.44	1.31	0.71	2.57
FR	354.89	18.66	8.98	361.11	15.21	9.92	1.02	–3.45	0.94
HU	238.20	19.29	13.90	328.10	21.58	19.01	1.38	2.30	5.11
IE	440.81	47.84	31.98	426.62	33.20	26.17	0.97	–14.63	–5.81
IT	356.47	10.22	12.67	419.56	11.66	16.42	1.18	1.44	3.75
LT	161.80	21.88	26.01	183.09	20.93	22.51	1.13	–0.95	–3.51
LU	517.82	25.40	43.95	608.73	26.88	40.60	1.18	1.48	–3.35
LV	184.67	27.04	32.03	190.38	23.29	30.94	1.03	–3.75	–1.10
ML	2800.00	21.37	29.54	1101.53	7.58	29.24	0.39	–13.79	–0.30
NL	489.87	4.62	9.32	580.73	4.29	14.64	1.19	–0.34	5.32
AT	595.16	27.62	48.80	580.71	24.55	51.80	0.98	–3.07	3.01
PL	219.75	14.62	25.30	298.57	18.08	16.69	1.36	3.46	–8.60

PT	225.74	22.00	27.73	280.86	22.84	25.61	1.24	0.84	–2.12
RO	257.80	17.33	0.00	193.63	15.27	10.38	0.75	–2.07	10.38
FI	893.87	60.72	45.26	921.41	48.10	49.45	1.03	–12.62	4.19
SE	380.03	24.06	31.70	385.11	19.24	34.25	1.01	–4.82	2.55
SK	239.18	26.62	39.61	271.72	27.21	28.51	1.14	0.60	–11.10
SI	558.39	25.92	43.95	626.19	27.24	44.86	1.12	1.32	0.91
GB	297.20	22.00	22.64	262.87	16.15	20.79	0.88	–5.85	–1.85

Note: (A) total subsidies (excl. investment)/total utilised agricultural area (euro/ha); (B) total subsidies (excl. investment)/total output (%); (C) total support for rural development /total subsidies excl. investment (%).

Source: author's computation based on FADN (2015).

4.2. Regression models

Table 5 presents the basic descriptive statistics for variables used for econometric models. Given a scope of this paper, much attention should be given to the significance, strength and direction of the dependence between total subsidies and farm net income (proxy for economic stability) and debt-to-asset ratio (proxy for financial stability). The "raw" dataset included 142 FADN regions from each of EU-27 Member States (including Bulgaria and Romania). It should be added that a very similar approach was exploited by Špička and Machek (2015: 1–13). However, the lack of some data for selected observations resulted in the need for exclusion of certain regions. Outliers were eliminated using interquartile range (IQR), mainly the observations that were higher than Q3+1,5IQR and lower than Q1-1,5IQR, given all variables analysed.

The samples seem to vary. This may be explained by the fact that small family-owned agricultural holdings dominate in some FADN regions, particularly in some parts of New Member States (Poland, Romania, Bulgaria), whereas large farms (benefiting from economy of scale) are typical of Czech Republic, Slovakia, Eastern Germany or Netherlands. Particularly farms from FADN regions in France (for example, Picardie, Basse-Normadie, Bretagne), Denmark and Germany (Brandenburg, Mecklenburg-Vorpommern) had to bear with the high financial risk (depicted by debt-to-assets-ratio).

The highest level of total subsidies was associated with the largest size of farms (in terms of total utilised arable areas). It should be noted that in regions of Eastern Germany (e.g. Brandenburg, Sachsen-Anhalt, Mecklenburg-Vorpommern), Czech Republic and Slovakia large-sized farms dominated. These entities could particularly benefit from direct payments that were, gradually, decoupled from farmers' production decision.

Table 5

Descriptive statistics for variables used in the models

Specification: variable, (unit abbreviation used)	Mean	Std. Dev.	Min.	Max.	CV [%]
2007 (N=127)[A]					
Farm Net Income (euro), FNI	25940.40	16213.60	457.00	72889.00	62.5
Debt-to-Assets (%), DtA	15.30	14.62	0.01	56.47	95.6
Total Subsidies (excl. investment) (euro), TS	18005.90	19329.00	191.00	139685.00	107.3
2012 (N=121)[A]					
Farm Net Income (euro), FNI	26975.90	17388.70	3657.00	75385.00	64.5
Debt-to-Assets (%), DtA	15.42	15.50	0.04	59.58	100.5
Total Subsidies (excl. investment) (euro), TS	19028.60	16259.80	927.00	72608.00	85.4

Note: [A]the initial number of observations was 136, whereas for 2012 – 134.

Source: author's computations.

Table 6 presents descriptions of variables used in econometric models, whereas, as key, table 7 contains results of estimation (incl. coefficients, standard errors, t-ratios and p-values) for each of four models built.

Analytical forms of econometric models are as follows:

model (1): $FNI = 9999.20 + 0.81\ TS + \xi$, $R^2 = 43.2\%$,
(1711.28) (0.12)

model (2): $DtA = 0.0361371 + 0.000006\ TS + \xi$, $R^2 = 34.8\%$,
(0.010027) (0.0000007)

model (3): $FNI = 8180.80 + 1.04\ TS + \xi$, $R^2 = 51.1\%$,
(1324.95) (0.09)

model (4): $DtA = 0.0050 + 0.000008\ TS + \xi$, $R^2 = 53.3\%$,
(0.070) (0.0000009)

model (4)[WI]: $DtA = 0.000008\ TS + \xi$, $R^2 = 53.2\%$,
(0.0000007)

where:

ξ – random error

We presented only four models (model (4) WI as a modified version of (4)). Based on estimations of all models, it should be emphasised that total subsides (excluding aids for investment) stimulated positively both farm net income and debt-to-asset ratio. In particular, as Model 2 indicated, an increasing level of total subsidies encouraged farm managers to use external sources of financing. This means that beneficiaries of CAP support were willing to bear higher level of financial risk (expressed by debt-to-assets-ratio). Additionally, financial institutions often treated the high level of subsidies as some kind of financial guarantee during the process of evaluation of financial standing of farms. Computed values of coefficients of determination (R^2) or adjusted R^2 indicate a relatively moderate goodness of fit (>30% in all models). It should be noted that the random errors in small samples (particularly, referring to financial data) are not normally distributed. Moreover, the visual analysis of distribution of residuals indicates that the distribution was close to normal.

Our results seem to be consistent with results from empirical studies of Poczta, Średzińska and Mrówczyńska-Kamińska (2009) who identified determinants of farm income for various types of agricultural production. Similarly, Kulawik (Ed.) (2012: 87), proposed a conceptual model based on the results of our empirical studies, which confirmed the positive impact of payment of EU subsidies on profitability. A different point of view was represented by Czech economists, Trnková and Malá (2012: 415–424) who emphasised that large agricultural enterprises cannot succeed to significantly increase their profits.

Table 6

Variables in econometric models

Specification	Model (1)	Model (2)	Model (3)	Model (4)	Model (4)^{WI}
Dependent variable	Farm net income (FNI)	Debt-to-assets-ratio (DtA)	Farm net income (FNI)	Debt-to-assets-ratio (DtA)	Debt-to-assets-ratio (DtA)
Independent variable	Total subsidies excl. investment (TS)	Total subsidies excl. investment (TS)	Total subsidies excl. investment (TS)	Total subsidies excl. investment (TS)	Total subsidies excl. investment (TS)
Year	2007	2007	2012	2012	2012

Note: ^{WI} without intercept.

Source: author's computations.

Table 7

Estimation results of models

Specification	Coefficient	Std. Error	t-ratio	p-value
Model (1)				
Intercept	9999.20	1711.28	5.8431	<0.0001 ***
TS	0.81	0.12	6.7369	<0.0001 ***
Model (2)				
Intercept	0.0361371	0.010027	3.6040	0.00050 ***
TS	0.000006	0.0000007	5.8969	<0.00001 ***
Model (3)				
Intercept	8180.80	1324.95	6.174	<0.0001 ***
TS	1.04	0.12	8.510	<0.0001 ***
Model (4)				
Intercept	0.0050	0.070	6.1744	<0.00001 ***
TS	0.000008	0.0000009	–0.6637	<0.00001 ***
Model (4) [WI]				
Intercept	0.000008	0.0000007	10.8252	<0.00001 ***

Note: described as in the previous table.; */**/ *** statistical significance level.

Source: author's computations.

5. CONCLUDING REMARKS

From a theoretical point of view, regional approach is one of the most important challenges for the CAP. Particularly, Rural Development Programmes within the second pillar of CAP are being constructed, as intended, with „national actors" of agricultural policy and even representatives of agricultural organisations. The current perspective of the Common Agricultural Policy (CAP 2014–2020) includes differences at the regional level at even greater extent, as the significant rationale for designing "better tailored instruments". This corresponds with the concept of integral sustainability, including the economic, environmental and social dimensions.

In practice, only large countries that have a federal political system can expose differentiation resulting from the use of varied equipment and the influence of varied natural factors, as well as the specifics of social conditions. Belgium may be treated as an exception, which stems from the history of this country. As Dworak and Grzelak (2015: 16) rightly stated (in relation to Poland), „modification of some CAP instruments related to ecology may also decrease the compet-

itiveness of many farms". However, in the case of Poland, regional differences resulted from historical determinants. Consequently, taking socio-demographic processes (e.g. migration from rural areas, accelerated ageing) into consideration should lead to more detailed analyses.

The impact of the CAP instruments on economic and financial stability was significant and relatively strong. Particularly, direct payments as element of safety nets may stabilize the level of farm incomes. On the other hand, an increasing level of total subsidies may strengthen a willingness to bear higher financial risk. Therefore, the impact of the CAP subsidies on economic viability of farms seems to be subtle. It should be noted that the effects of substitutability and complementarity between the instruments of the first and second pillar, as well as market (financial) instruments (for example, crop or livestock insurance products) may exist. Given the perspective of new CAP (2020+), the pressure of international bodies (for example, WTO) on decreasing the dependence of EU agriculture on financial support instruments will affect the shape of future policies. This means a proposal of implementing remuneration for provision of public goods cannot be ignored.

Further in-depth studies, including an approach of geographically weighted regression (with GIS data) or more advanced spatial models may shed light on dynamics of processes of structural adjustments, given the complex mechanism of how the CAP instruments react. This may be very helpful in decision-making processes related to allocation of financial resources at regional/national level.

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ODDZIAŁYWANIE INSTRUMENTÓW WSPARCIA WSPÓLNEJ POLITYKI ROLNEJ NA STABILNOŚĆ EKONOMICZNĄ I FINANSOWĄ GOSPODARSTW ROLNICZYCH KRAJÓW UE

Streszczenie. Dotacje UE oddziałują przez kilka złożonych kanałów na sytuację ekonomiczno-finansową gospodarstw rolniczych, choć ich efekty ekonomiczne i finansowe pojawiają się z opóźnieniem. Celem opracowania była próba oceny oddziaływania wybranych instrumentów wsparcia Wspólnej Polityki Rolnej, WPR (włączając płatności bezpośrednie i dotacje w ramach II filaru) na stabilność ekonomiczną i finansową gospodarstw rolniczych krajów UE na poziomie regionalnym. Jako cele szczegółowe przyjęto: (1) przedstawienie zróżnicowania wysokości uzyskanych dotacji (wyłączając inwestycyjne) według krajów UE, (2) określenie istotności, siły i kierunku zależności między wysokością uzyskiwanych subsydiów na wybrane wskaźniki stabilności ekonomicznej i finansowej gospodarstw rolniczych. Źródłem danych była baza Farm Accountancy

Data Network (FADN). Dynamikę zmian analizowano dla lat 2007 i 2012. Wykorzystano podejście regresji ważonej z korektą heteroskedastyczności (łącznie, cztery modele) dla danych jednorocznych (2007 i 2012 (na podstawie danych z regionów FADN). Choć subsydia (wyłączając inwestycyjne) w ramach WPR oddziaływały istotnie na poziomie dochodów rolniczych, ich wpływ na stabilność finansową jest raczej niejednoznaczny. Wyniki mogą uzasadniać potrzebę rozważnego stosowania podejścia regionalnego w odniesieniu do doboru instrumentów oraz kształtowania wysokości wsparcia kierowanego w ramach WPR.

Słowa kluczowe: finanse rolnictwa; gospodarstwo rolnicze; stabilność finansowa; dług/aktywa; dochody; Wspólna Polityka Rolna