

# EVALUATION OF THE IMPACT OF THE CAP MEASURES TOWARDS THE GENERAL OBJECTIVE "VIABLE FOOD PRODUCTION"

*European Evaluation Helpdesk*

*Good Practice Workshop "How to assess direct payments in the new CAP"  
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# CONTEXT OF THE EVALUATION

- One of the three long-term objectives of the 2014-2020 CAP is to **ensure a viable food production by increasing the competitiveness of agricultural sectors and the profitability of agricultural production** (art. 110(2) of the Horizontal Regulation (EU) No 1306/2013)
  - DG AGRI commissioned to the EEIG the **evaluation of the contribution of the CAP measures towards the objective of viable food production (VFP)**, which was **carried out in 2017-2018**, with a duration of 16 months.
- The 2013 CAP reform substantially modified the structure of direct payments:
- More restricted budgetary framework
  - Better targeting of support and a more equitable distribution of payments
  - More freedom to MS to opt for a combination of different types of direct payments
- For rural development policy 2014-2020, compared to the 2007-2013 programming period, constraints to budget allocation became less strict, whereas monitoring and evaluation acquired greater importance.

# OBJECTIVE OF THE EVALUATION

- **To assess the impact of the CAP measures towards the objective of ensuring a viable food production (VFP) focusing on:**
  - ❑ Effects of CAP measures on **farm income level and stability**
    - Effects of the 2013 CAP reform on the distribution of direct income support
    - Effects of direct payments in targeting the appropriate recipients
    - The role of the new targeting elements on farm income: redistributive payment, active farmer clause, young farmer payment
  - ❑ Effects of CAP measures on the **competitiveness of the agricultural sector** and downstream sectors
    - Effects of the voluntary coupled support (VCS) on the competitiveness of supported sectors and of processing industry
  - ❑ The role of CAP measures on job maintenance and/or creation in the farm sector
  - ❑ Effects of CAP measures on **market stability**
    - Effects of market measures on the stabilisation of domestic market prices
    - Effects of market measures on farmers production decisions
- Answers to 14 Evaluation Questions covering all evaluation criteria and providing, to the extent possible, quantitative evidence / estimation of the impacts, complemented by robust qualitative assessment.
- **Geographical scope** → EU28
- **Period of analysis** → from 2015 (2014 for market measures under the CMO).

# CAP MEASURES UNDER ANALYSIS

- The measures under analysis are set out in the four main regulations of December 2013, governing the CAP for the period 2014-2020:
  - ❑ direct payments provided for in Regulation (EU) no. 1307/2013
  - ❑ market measures provided for in Regulation (EU) no. 1308/2013
  - ❑ rural development measures provided for in Regulation (EU) no. 1305/2013
  - ❑ the provisions of the Horizontal Regulation (EU) no. 1306/2013

## Income

- Decoupled payments
- Voluntary Coupled Support
- RDP annual payments

## Competitiveness

- RDP measures: support to investments, support to knowledge and advisory services, support to cooperation
- Voluntary Coupled Support (sector targeted, processing industry)

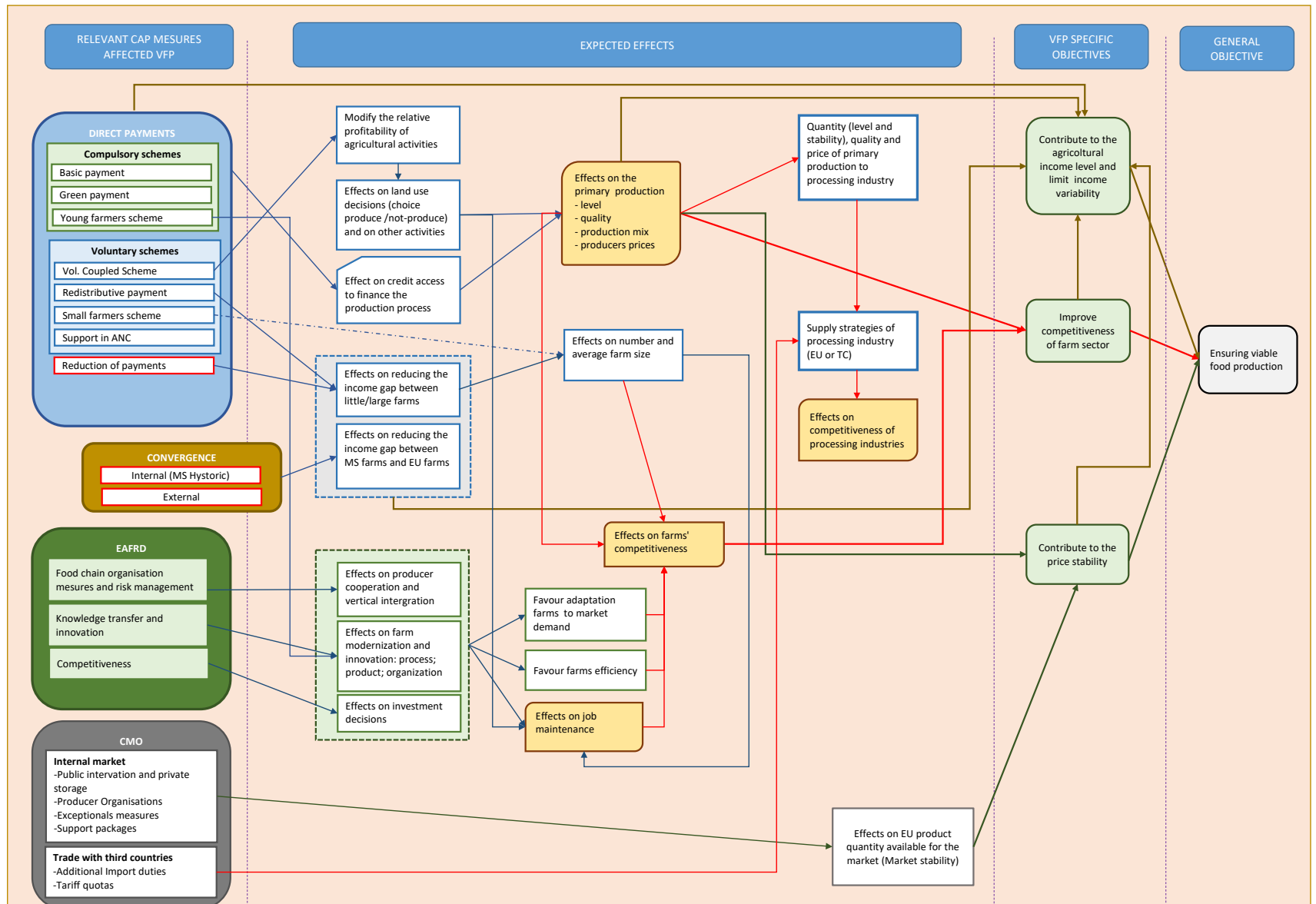
## Market stability

- Internal market measures under CMO: safety net tools and exceptional measures, public intervention

# OVERALL EVALUATION APPROACH

- The **approach is based on theoretical analysis** examining the linkages between CAP measures and the objective to ensure viable food production and related specific objectives.
- Considering the complexity and wide range of topics under evaluation, the evaluation approach **combines empirical analysis**, via quantitative methods and modelling, **with qualitative analysis** based on information collected from stakeholders and agents operating in the farm sector and along supply chains in ten Case study Member States.
- **Quantitative analysis was developed at two different levels:** regional analysis based on EU regional statistics (NUTS 1 level) and analysis at farm level based on individual farm data provided by the Farm Accountancy Data Network (FADN), distinguishing eight agricultural sectors and farm economic sizes.

## Intervention logic of the CAP measures related to the general objective Viable food production



# APPLIED METHODS

The VFP evaluation combines different tools of analysis:

- ❑ **Statistical analysis of secondary data** from various sources: DG AGRI, EU Regulations, data on EAGF and EAFRD payments (CATS database provided by DG AGRI), EUROSTAT (Economic Accounts for Agriculture, Agricultural labour input statistics, price indices), COMEXT, COMTRADE, Agriview, FAO, National Payment Agencies, and other sources (e.g., RDP Annual implementation Reports, processing industry data, sector organisations)
- ❑ **Statistical analysis of FADN data** for a constant sample of farms in 2013 and 2015
- ❑ **Econometric models** developed on individual FADN data (2015) to estimate the net income effects of decoupled direct payments, coupled direct payments, EAFRD annual payments
- ❑ **Qualitative analysis** of information collected from public authorities and stakeholders in the framework of ten national Case studies: CK, DE, DK, ES, FR, GR, HU, IT, LT, PL.

# DATA AVAILABILITY

- **Limited data availability** for the years following the implementation of the 2014-2020 CAP represents a limit for the evaluation exercise:
  - ❑ Short period of analysis of the effects of 2014-2020 CAP measures: the first year of implementation of the new direct payments scheme is 2015; concerning EAFRD support, 2014-2020 RDPs were approved by the European Commission between Dec 2014 and Nov 2015.
  - ❑ Consequently, the evaluation could rely only on two years from EUROSTAT data (2015 and 2016), and only on one year from FADN and CATS data (i.e., 2015 last available year).
  
- **How were data limitations resolved?**
  - ❑ Prospective analysis simulating the full implementation of the new direct payments system in 2019: based on FADN individual farm data, baseline 2015
  - ❑ Econometric modelling
  - ❑ Information and data collected for 10 national case studies to gain further insight.



# FOCUS: Estimating the net effects of CAP measures on farm income

- The analysis used **econometric models developed at micro level on individual farm data (FADN, 2015)** aimed at estimating the **net effects** of:
  - decoupled direct payments,
  - coupled direct payments,
  - EAFRD annual payments

on **farm income level**.



## FACTORS INFLUENCING THE RESULTS

- The evaluation was carried out just two years after the start of the 2014-2020 CAP: the availability of data to study the effects of the new policy is limited, one/two years depending on the data source.
- The launch of the 2014-2020 CAP coincided with other events having an influence on producer's choices and making the net effects of the 2013 reform less evident:
  - decrease of main agricultural commodities world prices (2013-2015)
  - introduction of Russian ban in 2014
  - end of milk quota system in 2015

# DATA and GEOGRAPHICAL AGGREGATION

- Models developed on individual FADN data (complemented by EUROSTAT data for each single EU Member state) in the first year of the reform (2015)
  
- Three levels of geographical aggregation:
  - farms of all EU28,
  - farms located in Member States applying SAPS
  - farms located in Member States implementing the BPS.

# EFFECTS of DIRECT PAYMENTS on FARM INCOME LEVEL (Y)

TAP  $\leftarrow$ ----- $\rightarrow$  Y/L

**TAP** Total Annual Payments per unit of labour (TAP is sum of CDP, DDP and RDPa)

**Y/L** Farm Net Value Added per unit of labour

$$Y_i = \alpha_0 + \alpha_1 TAP_i + \alpha_2 K/L_i + \dots + \alpha_n X_{n,i} + \varepsilon_i \quad (1)$$

CDP  $\leftarrow$ ----- $\rightarrow$  Y/L  
 DDP  $\leftarrow$ ----- $\rightarrow$  Y/L  
 RDPa  $\leftarrow$ ----- $\rightarrow$  Y/L

**CDP** Coupled Direct Payments per unit of labor

**DDP** Decoupled Direct Payments per unit of labor

**RDPa** Rural Development Payments – annual – per unit of labor

$$Y_i = \beta_0 + \beta_1 CDP_i + \beta_2 DDP_i + \beta_3 RDP_{a,i} + \beta_i K/L_i + \dots + \beta_n X_{n,i} + \theta_i \quad (1bis)$$

Where:

- subscript i refers to the generic i-th farm
- Y farm income, i.e., farm net value added per annual work unit (FNVA/AWU)
- TAP total amount of annual payments deriving from first and second pillar as sum of: CDP +DDP +RDPa
- K/L available capital per unit of labour;
- Xn control variables
- $\varepsilon$  and  $\theta$  are error terms
- $\alpha$  and  $\beta$  are parameters to be estimated. Some assess the impact of an additional unit of support on farm income, keeping all other variables constant.

Monetary data expressed in PPS (EUROSTAT PPP index for 2015) to account for the large differences in cost of living observed in the EU MS.

## Explanatory variables considered in the models

Code	Description	Unit of Measurement	Source
TAP	Total Annual Payments (CDP+DDP+RDPa)	PPS/AWU	FADN
CDP	Coupled Direct Payments (VCS)	PPS/AWU	FADN
DDP	Decoupled Direct Payments (DP-VCS)	PPS/AWU	FADN
RDPa	RDP Annual Payments	PPS/AWU	FADN
RDPo	RDP farm support other than RDPa	PPS/AWU	FADN
K/L	Capital over Labour input	PPS/AWU	FADN
SIZE	Farm Size	SO	FADN
SIZE_SQ	Farm Size Squared	SO <sup>2</sup>	FADN
TF2	Horticulture	Dummy (0; 1)	FADN
TF3	Wine	Dummy (0; 1)	FADN
TF4	Other permanent crops	Dummy (0; 1)	FADN
TF5	Milk	Dummy (0; 1)	FADN
TF6	Other grazing livestock	Dummy (0; 1)	FADN
TF7	Granivores	Dummy (0; 1)	FADN
TF8	Mixed	Dummy (0; 1)	FADN
ALT2	Altimetry dummy 2	Dummy (0; 1)	FADN
ALT3	Altimetry dummy 3	Dummy (0; 1)	FADN
ALT4	Altimetry dummy 4	Dummy (0; 1)	FADN
COST	(Interm. Cons. and Depreciation)/Tot. Assets	%	FADN
FAWU	Relative amount of family based labour	%	FADN
UAA	Utilised Agricultural Area	ha	FADN
ORGANIC	Organic farms	Dummy (0; 1)	FADN
GDP_PC	Gross Domestic Product pro-capite	Euro/Person	Eurostat
UNEM	Unemployment rate	%	Eurostat
AGR/GDP	Relative importance of the farm sector	%	Eurostat
HICP	Harmonized Index of Consumer Prices	%	Eurostat
Price_Out	Price index for farm products	P Index	Eurostat
Price_Input	Price index for farm inputs	P Index	Eurostat

# RESULTS

## Regression model 1 and 1bis

	EU-28	MS with SAPS	MS with BPS
Intercept	-119416,809 ***	-123813,544 ***	-80661,918 ***
TAP	0,171 ***	0,493 ***	0,171 ***
K/L	0,016 ***	0,038 ***	0,015 ***
SIZE	0,025 ***	0,011 ***	0,029 ***
SIZE_SQ	-0,000000005 ***	-0,000000001 ***	-0,000000001 ***
TF2	1397,673 **	4121,667 ***	2502,785 ***
TF3	3783,569 ***	137,805	5704,644 ***
TF4	1275,132 ***	273,741	3140,146 ***
TF5	1299,741 ***	-478,360	3993,665 ***
TF6	-2672,369 ***	-2178,529 ***	-1230,688 **
TF7	3337,877 ***	1232,235	5285,955 ***
TF8	-2410,518 ***	-2605,718	551,210
ALT2	-118,150	891,573 **	230,447
ALT3	-536,316	-1555,278	-430,206
ALT4	-11655,378 ***	-195,508	-13505,982 ***
COST	248,333	-787,303 ***	2001,528 ***
FAWU	502,683 ***	1936,323 ***	-353,483
UAA	13,612 ***	14,771 ***	24,347 ***
ORGANIC	4443,138 ***	-206,886	6041,946 ***
GDP_PC	-0,370 ***	-1,366 ***	-0,159 ***
UNEM	633,416 ***	442,864 *	1040,869 ***
AGR/GDP	-17807,514 **	-2006,338 ***	7393,944
HICP	12927,092 ***	10739,008 ***	15664,776 ***
Price_Out	803,912 ***	484,217 ***	806,353 ***
Price_Input	498,766 ***	979,317 ***	-12,160
R <sup>2</sup>	0,539	0,427	0,57
Adj R <sup>2</sup>	0,539	0,426	0,569
Res. Std. Err.	214.274,90	153.833,90	229.896,70
F Statistic	2.967,23 ***	577,8 ***	2.322,68 ***

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

	EU-28	MS with SAPS	MS with BPS
Intercept	-68401,801 ***	-56010,213 ***	-45680,855 ***
CDP	0,697 ***	0,817 ***	0,710 ***
DDP	1,147 ***	1,242 ***	1,089 ***
RDPa	0,159 ***	-0,063 ***	0,161 ***
K/L	0,007 ***	0,011 ***	0,008 ***
SIZE	0,027 ***	0,015 ***	0,029 ***
SIZE_SQ	-0,000000005 ***	-0,000000001 ***	-0,000000001 ***
TF2	8346,983 ***	6007,378 ***	9825,237 ***
TF3	12775,577 ***	5539,789 ***	14013,328 ***
TF4	7506,647 ***	2132,910 ***	9298,433 ***
TF5	4001,345 ***	313,698	6734,813 ***
TF6	-441,836	-1486,290 ***	801,235
TF7	8863,921 ***	4410,447 ***	11294,153 ***
TF8	413,778	-1941,446 ***	2491,370 ***
ALT2	946,120 ***	656,523 **	1247,359 ***
ALT3	955,493 **	-683,186	966,244 *
ALT4	-8264,568 ***	692,835	-10407,858 ***
COST	-357,327 *	-1002,501 ***	1196,642 ***
FAWU	1921,595 ***	1701,057 ***	1472,530 ***
UAA	-5,104 ***	7,139 ***	-1,627
ORGANIC	4485,595 ***	349,034	6152,900 ***
GDP_PC	-0,257 ***	-1,086 ***	-0,008
UNEM	373,151 ***	225,745	997,087 ***
AGR/GDP	27811,083 ***	925,980	42668,855 **
HICP	8411,715 ***	5925,704 ***	13922,151 ***
Price_Out	597,045 ***	221,625 ***	682,214 ***
Price_Input	98,518 *	526,701 ***	-372,358 ***
R <sup>2</sup>	0,587	0,526	
Adj R <sup>2</sup>	0,586	0,525	
Res. Std. Err.	203.025,40	139.854,10	
F Statistic	3.317,29 ***	795,863 ***	

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

Source: elaborations based on 2015 EU-FADN DG AGRI C-3.

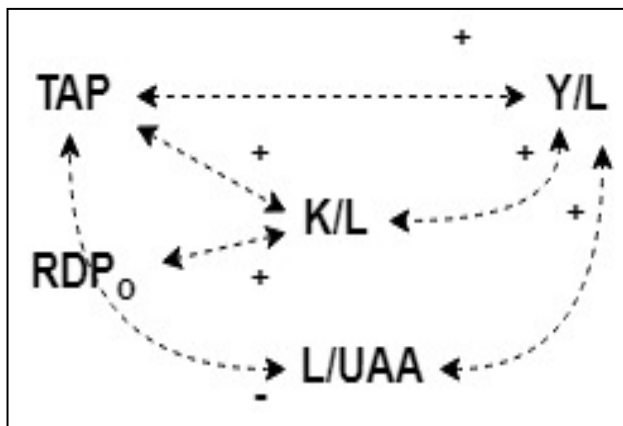
## KEY FINDINGS of the econometric models



- ❑ CAP support provided by annual payments (total) has a **net positive impact on farm income**
- ❑ both coupled and decoupled direct payments contribute to support farm income, but the estimated coefficients of decoupled payments are greater than those of coupled payments → **DDP have a higher transfer efficiency of policy support than CDP**
- ❑ Differences between SAPS and BPS countries: transfer efficiency of CDP and DDP higher, but RDPa slightly negative → **transfer efficiency of policy support differs according to SAPS and BPS**

# LIMITS OF THE ANALYSIS

- Collinearity among regressors (e.g. among different policy measures)
- Even if considering a large set of explanatory variables, still a simplified approach (omitted variable bias?)
- Cross-section (lack of data)
- Endogeneity: CAP affects at the same time income but also factor use (e.g., K and L)
- Dynamicity of the income generation process ( $Y_t$  and  $Y_{t-1}$ )



**TAP** Total Annual Payments

**Y/L** Farm Net Value Added per unit of labour

**RDP<sub>0</sub>** Support granted to farms not as annual payments  
(i.e. mainly support to farm investments)

**K/L** Amount of capital per unit of labour

**L/UAA** Amount of labour per unit of land

“+” Indicates positive correlation



# POSSIBLE IMPROVEMENTS

From cross-section to **panel data**

$$Y_i = \alpha_0 + \alpha_1 T A P_{i,t} + \alpha_2 \frac{K_{i,t}}{L_{i,t}} \dots + \alpha_n X_{n i,t} + \eta_i + \tau_t + \varepsilon_{i,t} \quad (2)$$

$$Y_i = \beta_0 + \beta_1 C D P_{i,t} + \beta_2 D D P_{i,t} + \beta_3 R D P a_{i,t} + \beta_4 \frac{K_{i,t}}{L_{i,t}} \dots + \beta_n X_{n i,t} + \eta_i + \tau_t + \xi_{i,t} \quad (2 \text{ bis})$$

## Endogeneity:

Possible approaches

- Seemingly Unrelated Regression (SUR)
- Two Stage Least Square (2SLS)

## Endogeneity and dynamicity:

Generalized Method of Moments with lag IV in System (SYS-GMM) – (Blundell and Bond, 1998)

## GMM-Sys - RESULTS

	Total Sample	Small Farms	Medium Farms	Large Farms
$FNI_{t-1}$	0.183*** [0.032]	0.076** [0.035]	0.065** [0.021]	0.191*** [0.048]
$FNI_{t-2}$	0.033*** [0.013]	0.013 [0.008]	0.005* [0.002]	0.025 [0.020]

	Short-Run			
	Total	Small	Medium	Large
<i>CDP</i>	0.261	-0.089	1.194	0.193
<i>DDP</i>	0.725***	0.781**	0.531**	0.668***
<i>RDP<sub>aes</sub></i>	0.403**	0.159	0.087	0.478
<i>RDP<sub>inv</sub></i>	0.369***	0.014	0.424***	0.514***
<i>RDP<sub>other</sub></i>	1.235***	0.848**	1.266***	1.558***
	Long-Run			
	Total	Small	Medium	Large
<i>CDP</i>	0.333	-0.097	1.284	0.246
<i>DDP</i>	0.924***	0.858**	0.571**	0.852***
<i>RDP<sub>aes</sub></i>	0.514**	0.175	0.093	0.610*
<i>RDP<sub>inv</sub></i>	0.470***	0.015	0.456***	0.655***
<i>RDP<sub>other</sub></i>	1.575***	0.931**	1.362***	1.987***

Significance codes for p-values: \*\*\*  $\leq 0.01$ ; \*\*  $\leq 0.05$ ; \*  $\leq 0.10$

Autoregressive effect →  
always significant  
Large > Small

### Income Transfer Efficiency (ITE)

- *DDP* have the higher ITE
- *CDP* have no significant effect
- *RDP<sub>inv</sub>* and *RDP<sub>aes</sub>* have a statistically significant ITE
- *DDP* are significant in all types of farms.
- *RDP<sub>aes</sub>*, *RDP<sub>inv</sub>*, *RDP<sub>other</sub>* increase ITE based on farm size.

**Take-away message:** ITE greatly differs between groups and measures

**Policy implication:** Policy-makers must consider the ITE taking into account both the characteristics of the farm and the different measures

# THANK YOU

The evaluation report is available here: [https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef/products-and-markets/impact-cap-measures-general-objective-viable-food-production\\_en](https://agriculture.ec.europa.eu/common-agricultural-policy/cap-overview/cmef/products-and-markets/impact-cap-measures-general-objective-viable-food-production_en)

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# Generalized Method of Moments - System (GMM-Sys - Blundell and Bond, 1988)

GMM-SYS used:

- GMM as estimator
- First-difference to eliminate time invariant variables bias (individual fixed effect)
- Time-effects (annual intercept): eliminate the annual effect common to all farms
- Dependent variables at time t-1 to account for the dynamicity of income variations
- Instrumental Variables in level and first difference (System) to reduce multiple endogeneity issues
- Robust errors to reduce collinearity problems

Other issues:

- Comparison in total sample and with three different level of income (Low, Medium and High)
- Short run and Long Run Effect accounting for the dynamic nature of the model

## The Role of the Common Agricultural Policy in Enhancing Farm Income: A Dynamic Panel Analysis Accounting for Farm Size in Italy

Luigi Biagini<sup>id</sup>, Federico Antonioli<sup>id</sup> and Simone Severini<sup>id</sup>

(Original submitted May 2019, revision received April 2020, accepted April 2020.)

$$FNI_t = \alpha_1 FNI_{i,t-1} + \alpha_2 FNI_{i,t-2} + \sum_{k=1}^5 \beta_k G_{k,i,t} + \sum_{k=1}^5 \gamma_k G_{k,i,t-1} + \sum_{j=1}^7 \delta_j X_{j,i,t} + \sum_{j=1}^7 \zeta_j X_{j,i,t-1} + \tau_t^* + \eta_i^* + \varepsilon_{i,t}'' \quad (1)$$

where  $\alpha_1$  and  $\alpha_2$  are the autoregressive coefficients for the lagged values of the dependent variable<sup>10</sup> and  $G$  refers to the considered policy variables.  $X$  represents other explanatory variables related to farm characteristics, including the value of farm assets (*Land Value* and *Non Land Value*), the ratio between rented and total land, the amount of family labour, and output and input prices as explained below.  $\tau_t^*$  is the year-specific intercept,  $\eta_i^*$  is the time-invariant farm-specific fixed effect, and  $\varepsilon_{i,t}''$  is the idiosyncratic error term.<sup>11</sup>