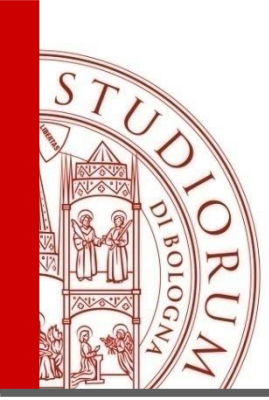

DIPARTIMENTO DI SCIENZE AGRARIE

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A farm level model to evaluate the impact of the Common Agricultural Policy on EU farmers' investment decisions

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Outline

- Background and objectives
- Literature
- Scenarios
- Modelling approach
- Selection of farms (pilot farm)
- Pilot model results
- Conclusion and planning

Background

- Investment behaviour in conventional and emerging farming systems under different policy scenarios, 2006 (UNIBO)

http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1557

- Farm investment behaviour under the CAP reform process, 2009 (UNIBO)

http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4239

- Survey and data analysis on EU farmers expected investment decisions and their determinants 2012 (GfK)

Rq: results of the survey will be discussed at DG Agri on the 8th of october 2013

Objectives

1. To provide a formalisation of farm investment decision making

2. To assess the impact of different agricultural policy and economic scenarios on farmers' investment behaviour and income

Literature review

1. Policy impact on investment is a relatively less exploited topic in the context of policy analysis (especially ex ante analysis)

2. Direct Payment can affect investment in two ways: releasing financial resources (particularly efficient in case of restricted credit access) and/or favouring better credit conditions (e.g. reducing interest rate)

3. Investment subsidies in 2° Pillar also affect investments through two channels: granting capitals or subsidizing credit interest rates, as pointed out by Cahill (2004).

4. The literature focused **on two main topics, treated separately:**

- **the effects of decoupling (controversial)**
- **the effects of enhanced RD programmes in eastern European and developing countries (positive impact)**

Literature review (relevant papers since 2010)

1. Increased number of studies directly addressing the policy impact on investment
2. Few ex-ante analysis of the post-2013 CAP reform
3. Other issues:
   - methods
   - credit and financial constraint
   - contract enforcement
   - farm structural aspects and land market
   - relation household and farm investments

Modelling approach

Dynamic NPV maximising farm(-household) model usig integer programming (asset choice) (Viaggi et al., 2011)

Main decision variables:

- Asset choice, including land
- Labour allocation
- Crop (activity) mix (not primary focus)
- Liquidity/credit
- External investment

- Data sources:
  - Investment survey 2013
  - Secondary data (FADN and IPTS models)

- Complementarity between (1) mathematical programming models (predictions of decisions in scenarios not observable today) and (2) econometric models **(understand the drivers of the intentions to invest as stated by the farmers in the survey).** Here, we focus on (1).

Scenarios

Scenario variables	S0 - Baseline (Pre-2013 CAP)	S1 - Post 2013 CAP	S2- Post 2013 DP but no RD investment support	S3 - Increase in RD investment support, abolition of DP	S4- no DP no RD investment support
Time horizon	**2014-2020 (but model is run until 2030)**				
DP	current SFP	Basic payment calculated as expected with regionalisation	Basic payment calculated as expected with regionalisation	NO	NO
Cross compliance	NO	NO	NO	NO	NO
Greening	NO	NO	NO	NO	NO
RD investment measure support (measure 121)	Current support rate, success rate and budget allocated to 121	Support rate as in art. 17 Reg, (EU) No 1305/2013 (40%); regional success rate modified with respect to S0 according to the changes in the budget allocated to RD in 2014-2020 at national level	budget allocated to investment subsidy = 0	Increased investment subsidy 2x compared to S1. Increased support rate=maximum allowed support rate in as in art. 17 Reg, (EU) No 1305/2013= 75% Increased probability of being funded, proportionally to the increased budget allocated to RD=all the CAP budget of 2014-2020 programming period (DP abolished)	NO
Young farmers	YES, current support rate for measure 121	higher DP and higher support rate for young famers as in CAP post 2013	higher DP for young farmers	higher support rate, as in most remote regions according to in art. 17 Reg, (EU) No 1305/2013	NO

Scenario variables
Policy variable

Direct Payments :

- SFP (unit **process** payment*eligible crop up to n. of entitlements-> no entitlement trade)
- Basic Payment (unit **regional** payment*eligible crop up to n. of entitlements-> no entitlement trade)

Coupled payments

- Unit **production** payment*eligible activity (canvary across scenarios)

Investment subsidies:

- **Public support rate*** **Probability of being funded** (success rate, allocated budget)*Investment costs

The model – policy equations and scenarios

$$F_t^p = \Psi_{t,sce}^{bl} + \Psi_{t,sce}^{reg} + \Psi_t^c + \Psi_{t,sce}^{I}$$

Decoupled Direct Payment

$$\Psi_{t,sce}^{bl} = SFP \frac{\sum_i x_{i,t}\, n_{i,sce}^u}{n}$$

$$\Psi_{t,sce}^{reg} = BPS \frac{\sum_i x_{i,t}\, n_{i,sce}^u}{n}$$

SFP 2013, as declared by farmers

$$BPS = \psi_{t,sce}^{reg} * \sum_i x_{i,t}$$

Region area coincides with countries,
Unit value, as estimated in the literature

The model – policy equations and scenarios

$$F_t^p = \Psi_{t,sce}^{bl} + \Psi_{t,sce}^{reg} + \Psi_t^c + \Psi_{t,sce}^I$$

Coupled Payments

$$\Psi_t^c = \sum_i x_{i,t} * \psi_{i,t}^c$$

Eligible crops and unit value: fixed at the baseline level (2013)

MS will indicate eligible crops and unit value according to 2013 reform , then bth terms will change according to scenario

RD investment subsidies

$$\Psi_{t,sce}^I = scf^r{}_{sce} * pb^r{}_{sce} * \sum_m \sum_\tau I_{m,t,\tau}^+ k_{m,\tau}^+$$

- **TC?** Advisory cost and administrative costs (taxes) can be included in the expenditure
- **Selection of eligible assets?** All considered physical assets are eligible
- **Use constraint=property constraint?** Investment supported by subsidies can not be sold before 5 years
- **Timing?** The subsidies are granted in the same year of the application

Pilot model
The farm

SMALL ARABE FARM, EMILIA-ROMAGNA

SIZE:	12 ha (UAA available), 218 ha of activities?
CROPPING PATTERN:	maize, soft wheat, hard wheat, sugar beet
MACHINERY/BUILDINGS:	Tractor1,Tractor2,Drilling1, Drilling2, Combined harvester, Transportation trailers, Balers, Irrigation, Machinery building
HOUSEHOLD:	48 years old male farmer, 100% on farm 5 adults in the family (successor already working on farm) 2000 € total external revenues of the family
POLICY SUPPORT:	no SFP declared (average of the region attributed) RDP (121) in 2010 (€10500)

Pilot scenario variables and parameters

Scenario variable	Baseline (S_0)	S_1	S_2	S_3	S_4
Direct Payments (to be adjusted for the owned entitlements and for eligible land uses)	SFP	BPS	BPS	None	None
Public support rate in RD investment subsidies	37.5%*	40%	None	75%	None
Probability of being funded through RD investment subsidies	0.35**	0.25	None	0.5	None
Prices (output and input) and yield	Kept constant at the baseline level (assuming no relevant technological change)				

*average support rate In Emilia-Romagna region in RDPs 2007-2013
**average success rate for applicants to measure 121 until year 2011 in Emilia-Romagna region

Pilot model results compared to baseline….

Scenario	Cash Flow Investment	Cash Flow Disinvestment	Cash Flow Policy support	Total Farm Cash Flow
S1	-21%	-4%	-22%	-3%
S2	-61%	-16%	-54%	-12%
S3	21%	14%	53%	12%
S4	-61%	-14%	-100%	-20%

Preliminary simulation results: cash flow categories are given as increment rate with respect to the baseline level S_0

Pilot model
Investments in physical assets

	Scenario				
Physical assets	S0	S1	S2	S3	S4
Balers	3	3	1	4	1
Combined_harvester	3	3	1	4	1
Machinery_building	2	2	1	2	1
Tractor	3	3	1	4	1
Transportation_trailers	3	3	1	4	1
Total amount of physical assets	14	14	5	18	5

Preliminary simulation results: the number of units of each type of investment is given for each scenario, including the baseline scenario S_0

Pilot model
Investments in land

Scenario	Avg land available	Avg land owned	Avg land rent in	Avg land rent out
S0	35.58	4.31	31.27	0.00
S1	29.58	4.12	25.46	0.00
S2	18.89	2.58	16.31	0.00
S3	37.97	5.95	32.02	0.00
S4	17.78	5.49	12.29	0.00
Total	**27.96**	**4.49**	**23.47**	**0.00**

Average size of the agricultural land available, owned, rented in and rented out in the pilot farm, in different scenario.

Conclusions

- preliminary results are available only for a pilot farm, not general finding on the policy impact on different farming systems can be drawn
- the model captures the different implementations of policy support schemes represented in different scenarios, demonstrate by consistency to what expected in terms of policy and investment cash flow
- the enhancement of the investment support through RD subsidies (S3) positively impacts farm investment behaviour, while the increment rate of investment in physical assets do not vary significantly with respect to the baseline level (CAP before 2013) in other policy scenarios
- The abolition of DP and of RD investment subsidies negatively affects farm income (-20% with respect to the baseline) and has a detrimental effect on investments (-61%).
- A negative impact on investments is recorded also when RD investment subsidies are abolished

Next steps

- **Model calibration and validation** through survey data

  (integration of mixed sources: survey data and model predictions)

- **Implementation of more policy details:** diversify use constraint for machinery and buildings, introduce homogeneous area payments

(policy implementation "details" have proven to be relevant in affecting farmers' decisions, especially in the case of RD investment support)

- Diversify **coupled payments** across scenarios

  (coupled payments are considered to have a major impact on farm investment behaviour and can now be increased)

- **Sensitivity analysis on interest rate** on credit received under the framework of investment support

  (credit facilitation appears to be the key factor in investment support)

- Simulation run under the hypothesis of **variable market prices** (according to FADN prices outlook 2013-2023)

Farm selection general criteria

1. for each country one region is selected for each specialisation and (at least) two farms are chosen within each region.

2. regions holding the highest national share of agricultural production of a given specialization are selected within each country.

3. within each region, farm are selected according to size: one smaller and one larger farm than the median of the region (Eurostat data).

N.B.
However, in some case choosing the extremes of the regional sample results to be more meaningful, as the number of farms is very limited and, usually, the smallest farm of the sample correspond to the average of the region (Eurostat data).

Pilot model results

Scenario	Avg x(i,t)
S0_	
Hard_wheat	35.0
Maize	10.0
S1_	
Hard_wheat	30.7
Maize	10.0
S2_	
Hard_wheat	19.4
Maize	10.0
S3	
Hard_wheat	37.4
Maize	10.0
S4_	
Hard_wheat	19.4
Maize	10.0

Activities practised by the pilot farm and average crop extension in different scenario

Farm selection arable

Code	Region	Legal Status	Age farmer	Total land available
FR054	23 Centre	Individual	35	61
FR130	23 Centre	Individual	40	176
CZ064	5 Střední Cechy	Individual	44	98
CZ011	5 Střední Cechy	LTD	39	1270
GE064	8 Niedersachsen	Individual	59	65
GE074	8 Niedersachsen	Individual	41	500
SP037	14 Castilla y León	Individual	53	37
SP038	14 Castilla y León	Individual	56	415
IT049	30 Emilia-Romagna	Individual	48	12
IT046	30 Emilia-Romagna	Individual	42	70
PL039	38 Dolnoslaskie	Individual	35	280
PL042	38 Dolnoslaskie	Individual	66	560

Model input data

Model input	**Gfk database Question code***	**Secondary data source**
UAA_(total, owned, rented-in, rented-out)	S3.1, S3.2, S3.3, S3.4	
Minimum consumption	A10	FADN? EUROSTAT
Age of the farmer	A13.1	
Number of adults in the household	A14.1	
Arable crops – type, area grown, yield, price	B1.0_1-12 B1.1_1-12 B1.2_1-12 B1.3_1-12	FADN,
Dairy animals – type, number of animals, litres of milk per animal, price of milk	B3.0_1-2 B3.1_1-2 B3.2_1-2 B3.3_1-2	FADN,
Arable crops and dairy animals variable costs		IPTS (other models outcome)
% of professional time dedicated to the farm	C1.1	
Average annual off-farm income	C1.2	
Total income earned annually by all other members of your household	C1.3	

Model input data

Model input	Gfk database Question code*	Secondary data source
Number of permanent workers working on the farm	C2.1	FADN
Annual total cost of labour of all permanent and temporary workers working on the farm	C2.2, C3.1	FADN EUROSTAT
Contractor - activity (purchased service), annual cost per activity	C5.1_1-6 C5.3_1-6	
Investment land - land area, year- and purchase value per ha	D1.1_1-7 D1.2_1-7 D1.3_1-7	FADN
Investment building - purchase/built year - building cost – renovation year	D2.0 1-9 D2.1 1-9 D2.2 1-9 D2.3 1-9	FADN
Investment machinery/equipment - purchase year – purchase value – replacement year	D3.0 1-9 D3.1 1-11 D3.2 1-11 D3.3 1-11	

Model input data

Model input	Gfk database Question code*	Secondary data source
amount of CAP direct payments received in 2012	E1.1	FADN
rural development payment received (measure, amount, year)	E1.2 E1.0_1-10 E1.3_1-10 E1.4_1-10	FADN
applied for an investment subsidy number of applications year of applications, amount, source of funding, type of investment, answer to application	E2.1 E2.2 E3.1_1-8 E3.2_1-8 E3.3_1-8 E3.4_1-8 E3.5_1-8	FADN
Credits/loan taken out Credits number Year of beginning, year of ending, Amount taken	E4.1, E4.2 E5.1_1-10 E5.2_1-10 E5.3_1-10 E5.1_1-10	FADN

Model calibration data

Model input	**Gfk database** **Question code***	**Secondary data source**
intention on modifying farming activities	F1.1-5	
investments planned type of investment, expected amount, expected year. expected cost, financing	F2 F4.1-6 F5-7.1_1-3/5 F5-7.2_1-3/5 F5-7.3_1-3/5 F5-7.4-5/8_1-5	