



## **Determinants of innovation by agri-food firms in rural Spain: an MCA PLS-SEM analysis**

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**Table S1.** Variables and descriptive statistics.<sup>1</sup>

Variable	Definition	Type	Recoded	MCA	Descriptive statistics								
					n	Mean	Std. Dev	Min	p25	Median	p75	Max	
<b>Innovation</b>													
<u>Innovation in product / services</u>													
innprod	Innovation in products	dummy 0 - 1		1	INNOPROD	283	0.61	0.49	0.0	0.0	1.0	1.0	1.0
innobien	Innovation in goods	dummy 0 - 1		1	INNOPROD	283	0.54	0.50	0.0	0.0	1.0	1.0	1.0
innoserv	Innovation in services	dummy 0 - 1		1	INNOPROD	283	0.21	0.41	0.0	0.0	0.0	0.0	1.0
<u>Innovation in processes</u>													
innproc	Innovation in processes	dummy 0 - 1		2	INNOPROC	283	0.69	0.46	0.0	0.0	1.0	1.0	1.0
innfabri	Innovation in productive methods	dummy 0 - 1		2	INNOPROC	283	0.59	0.49	0.0	0.0	1.0	1.0	1.0
innlogis	Innovation in logistics	dummy 0 - 1		2	INNOPROC	283	0.15	0.36	0.0	0.0	0.0	0.0	1.0
innapoyo	Innovation in support to processes	dummy 0 - 1		2	INNOPROC	283	0.27	0.45	0.0	0.0	0.0	1.0	1.0
<u>Innovation in organization</u>													
inorgn1	Innov. organization: management systems	dummy 0 - 1		3	INNORG	283	0.30	0.46	0.0	0.0	0.0	1.0	1.0
inorgn2	Innov. organization: work	dummy 0 - 1		3	INNORG	283	0.32	0.47	0.0	0.0	0.0	1.0	1.0
inorgn3	Innov. organization: external relationships	dummy 0 - 1		3	INNORG	283	0.18	0.39	0.0	0.0	0.0	0.0	1.0
<u>Innovation in marketing</u>													
incomn1	Innov. marketing: product design	dummy 0 - 1		4	INNOMARKT	283	0.33	0.47	0.0	0.0	0.0	1.0	1.0
incomn2	Innov. marketing: distribution channels	dummy 0 - 1		4	INNOMARKT	283	0.18	0.39	0.0	0.0	0.0	0.0	1.0
incomn3	Innov. marketing: market targeting	dummy 0 - 1		4	INNOMARKT	283	0.19	0.40	0.0	0.0	0.0	0.0	1.0
incomn4	Innov. marketing: price strategy	dummy 0 - 1		4	INNOMARKT	283	0.09	0.28	0.0	0.0	0.0	0.0	1.0

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**Organisation (internal):**Managers

## • CEO support / expectations

innexpense	Ratio of total innovation expenses to revenues	numerical	ranked by quartiles	5	CEO	283	1.63	0.79	1.0	1.0	1.0	2.0	4.0
rdempl	Ratio of employees in R & D to employees	numerical	ranked by quartiles	5	CEO	283	1.86	0.96	1.0	1.0	2.0	2.0	4.0

Firm

## • Firm size (employees / capital base)

revenues	Sales revenues	numerical	ranked by quartiles	6	SIZE	283	3.18	0.96	1.0	3.0	3.0	4.0	4.0
employees	Number of employees	numerical	ranked by quartiles	6	SIZE	283	2.75	1.06	1.0	2.0	3.0	4.0	4.0
age	Log (# years since the company was launched)	numerical	ranked by quartiles	6	SIZE	283	2.94	1.10	1.0	2.0	3.0	4.0	4.0

## • Availability of financial resources

face1	Relevant factors: No internal financing	categ. 1 ← 4	recoded 1 → 4	8	RESOURCES	283	3.13	0.93	1.0	2.5	3.0	4.0	4.0
face2	Relevant factors: No external financing	categ. 1 ← 4	recoded 1 → 4	8	RESOURCES	283	3.04	0.97	1.0	2.0	3.0	4.0	4.0
inver	Gross investment in physical goods	numerical	ranked by quartiles	8	RESOURCES	283	2.81	1.15	1.0	2.0	3.0	4.0	4.0
face3	Relevant factors: High innovation costs	categ. 1 ← 4	recoded 1 → 4	8	RESOURCES	283	2.93	1.02	1.0	2.0	3.0	4.0	4.0

**Technology (external):**

## • Expected benefit

objet1	Objective: Wider range of goods / services	categ. 1 ← 4	recoded 1 → 4	10	GROWTH	283	3.12	1.04	1.0	2.5	3.0	4.0	4.0
objet2	Objective: Substitute products / processes	categ. 1 ← 4	recoded 1 → 4	10	GROWTH	283	2.58	1.13	1.0	2.0	3.0	4.0	4.0
objet4	Objective: Higher market share	categ. 1 ← 4	recoded 1 → 4	10	GROWTH	283	2.96	0.99	1.0	2.0	3.0	4.0	4.0
gradcom1	Innomarkt - Objective: Higher market share	categ. 1 ← 4	recoded 1 → 4	10	GROWTH	94	3.52	0.65	2.0	3.0	4.0	4.0	4.0
objet3	Objective: New markets	categ. 1 ← 4	recoded 1 → 4	11	NEW MARKETS	283	3.05	1.05	1.0	2.5	3.0	4.0	4.0
gradcom2	Innomarkt - Objective: New customer segments	categ. 1 ← 4	recoded 1 → 4	11	NEW MARKETS	94	3.40	0.87	1.0	3.0	4.0	4.0	4.0
gradcom3	Innomarkt - Objective: New markets	categ. 1 ← 4	recoded 1 → 4	11	NEW MARKETS	94	3.30	0.90	1.0	3.0	4.0	4.0	4.0
objet5	Objective: Greater quality of goods / services	categ. 1 ← 4	recoded 1 → 4	12	QUALITY	283	3.40	0.88	1.0	3.0	4.0	4.0	4.0

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objet6	Objective: More flexibility in production / services	categ. 1 ← 4	recoded 1 → 4	12	QUALITY	283	2.82	1.08	1.0	2.0	3.0	4.0	4.0
objet7	Objective: Greater capacity in production / services	categ. 1 ← 4	recoded 1 → 4	12	QUALITY	283	2.87	1.04	1.0	2.0	3.0	4.0	4.0
objet8	Objective: Lower labor costs per unit produced	categ. 1 ← 4	recoded 1 → 4	13	COST REDUCT	283	2.53	1.02	1.0	2.0	3.0	3.0	4.0
objet9	Objective: Fewer materials per unit produced	categ. 1 ← 4	recoded 1 → 4	13	COST REDUCT	283	2.31	0.99	1.0	2.0	2.0	3.0	4.0
objet10	Objective: Less energy per unit produced	categ. 1 ← 4	recoded 1 → 4	13	COST REDUCT	283	2.47	1.03	1.0	2.0	2.0	3.0	4.0
gradorg4	Objective: Lower unit costs	categ. 1 ← 4	recoded 1 → 4	13	COST REDUCT	103	3.24	0.81	1.0	3.0	3.0	4.0	4.0
objet11	Objective: Reduced environmental impact	categ. 1 ← 4	recoded 1 → 4	14	COMPLIANCE	283	2.77	1.12	1.0	2.0	3.0	4.0	4.0
objet12	Objective: Better health / security	categ. 1 ← 4	recoded 1 → 4	14	COMPLIANCE	283	2.54	1.07	1.0	2.0	3.0	3.0	4.0
objet13	Objective: Regulatory compliance	categ. 1 ← 4	recoded 1 → 4	14	COMPLIANCE	283	2.69	1.12	1.0	2.0	3.0	4.0	4.0
objet14	Objective: Increasing total employment	categ. 1 ← 4	recoded 1 → 4	15	EMPLOYMENT	283	2.13	0.91	1.0	1.0	2.0	3.0	4.0
objet15	Objective: Increasing qualified employment	categ. 1 ← 4	recoded 1 → 4	15	EMPLOYMENT	283	2.23	0.95	1.0	1.0	2.0	3.0	4.0
objet16	Objective: Maintaning employment	categ. 1 ← 4	recoded 1 → 4	15	EMPLOYMENT	283	2.73	1.12	1.0	2.0	3.0	4.0	4.0
gradorg1	Innorg - objective: Reduced time of response	categ. 1 ← 4	recoded 1 → 4	16	TIME INFO	103	3.35	0.68	1.0	3.0	3.0	4.0	4.0
gradorg2	Innorg - objective: Ability to develop new products	categ. 1 ← 4	recoded 1 → 4	16	TIME INFO	103	3.37	0.71	2.0	3.0	4.0	4.0	4.0
gradorg5	Innorg - objective: Better information exchange	categ. 1 ← 4	recoded 1 → 4	16	TIME INFO	103	3.21	0.85	1.0	3.0	3.0	4.0	4.0
• Complexity													
faci2	Relevant factors: No information about technology	categ. 1 ← 4	recoded 1 → 4	17	COMPLEX	283	2.34	0.79	1.0	2.0	2.0	3.0	4.0
faci3	Relevant factors: No information about markets	categ. 1 ← 4	recoded 1 → 4	17	COMPLEX	283	2.35	0.85	1.0	2.0	2.0	3.0	4.0
<b>Environmental (external):</b>													
• Competitive pressure & value chain													
otrofac1	Relevant factors: Market dominated by competitors	categ. 1 ← 4	recoded 1 → 4	19	COMPETITION	283	2.46	0.94	1.0	2.0	3.0	3.0	4.0
fuelle4	Information source: competitors	categ. 1 ← 4	recoded 1 → 4	19	COMPETITION	283	2.35	0.98	1.0	2.0	2.0	3.0	4.0
faci4	Relevant factors: No partners for innov. cooperation	categ. 1 ← 4		21	COMPETITION	283	2.56	0.94	1.0	2.0	3.0	3.0	4.0
fuelle2	Information source: suppliers	categ. 1 ← 4	recoded 1 → 4	20	COMPETITION	283	2.76	1.07	1.0	2.0	3.0	4.0	4.0
fuelle3	Information source: customers	categ. 1 ← 4	recoded 1 → 4	20	COMPETITION	283	2.63	1.02	1.0	2.0	3.0	3.0	4.0
otrofac2	Relevant factors: Uncertain demand	categ. 1 ← 4		20	COMPETITION	283	2.29	0.96	1.0	2.0	2.0	3.0	4.0
otrofac4	Relevant factors: No demand for innovative goods	categ. 1 ← 4		20	COMPETITION	283	3.36	0.72	1.0	3.0	3.0	4.0	4.0

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• Social influence

parque	Located in a science or technology campus	dummy 0 - 1		21	SOCIAL	283	0.01	0.10	0.0	0.0	0.0	0.0	1.0
fuelle5	Information source: consulting	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.48	1.10	1.0	2.0	2.0	3.0	4.0
fuelle6	Information source: universities	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.39	1.10	1.0	1.0	2.0	3.0	4.0
fuelle7	Information source: public agencies	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.14	1.01	1.0	1.0	2.0	3.0	4.0
fuelle8	Information source: technology centers	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.37	1.12	1.0	1.0	2.0	3.0	4.0
fuelle9	Information source: conferences	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.46	0.99	1.0	2.0	3.0	3.0	4.0
fuelle10	Information source: academic journals	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.28	0.96	1.0	1.0	2.0	3.0	4.0
fuelle11	Information source: professional associations	categ. 1 ← 4	recoded 1 → 4	21	SOCIAL	283	2.24	0.97	1.0	1.0	2.0	3.0	4.0

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<sup>1</sup> All categorical variables coded in PITEC database as 1=high; 2=intermediate; 3=low; 4=not relevant were recoded inversely except where noted.

**Table S2.** Cronbach alpha.

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<b>MCA indicator</b>	<b>G&amp;K gamma</b>	<b>Dimension</b>	<b>Variance explained</b>
<b>Innovation</b>			
1 INNOPROD	0.74	1	67.1%
2 INNOPROC	0.70	1	53.1%
3 INNORG	0.74	1	66.3%
4 INNOMARKT	0.78	1	62.7%
<b>Internal</b>			
5 CEO	0.81	1	28.6%
6 SIZE	0.74	1	23.3%
7 RESOURCES	0.70	1	20.0%
<b>Technology</b>			
8 GROWTH	0.69	1	20.6%
9 NEW MARKETS	0.75	1	21.9%
10 QUALITY	0.71	1	22.5%
11 COST REDUCT	0.75	1	25.7%
12 COMPLIANCE	0.85	2	23.6%
13 EMPLOYMENT	0.83	2	21.5%
14 TIME INFO	0.72	1	24.9%
15 COMPLEX	0.83	1	30.5%
<b>Environmental</b>			
16 COMPETITION	0.60	1	11.9%
17 SOCIAL	0.83	1	18.1%

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