Consumer's choices and a willingness to pay for Auvergne cheeses under PDO label. An empirical analysis.

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context

- In 2011, 970 products registered under PDO or PGI (465 PGI and 505 PDO) by the European Commission
- 45 PDO cheeses, with 5 in the former region of Auvergne
- Since 2000, Tonnage of French PDO cheeses is stable (190,000 tons, with a turnover of about 1.4 billion euros)
- Unfortunately, Auvergne PDO cheeses do not have the same stability at the French national level (Baisse des volumes commercialisés de 46 075 à 40 555 tonnes (-12%))
- Regional strategy (3 levers) [code of practise, Marketing Effort, Compulsory voluntary contribution]
- But...

context

- Auvergne PDO cheeses face many difficulties in terms of price and volumes sold compared to PDO and no-PDO
- These difficulties, which can be qualified as the “curse of the Auvergne PDO cheeses”
- Despite these efforts the Auvergne PDO cheeses still has mitigate results
- It seems that a consumer forsakes these Auvergne PDO cheeses for other PDO or no-PDO cheeses from other regions
- What are the determinants of choice of consumption and what is the willingness to pay of consumers ?

- Krystallis and Ness (2005) "olive oil from Greece". Age, the education and the income
- Scarpa and Del Giudice (2004) "extra virgin olive oil from Italy". Appearance, price, geographical origin
- Van der Lans, Van Ittersum et al. (2001) "extra virgin olive oil". Price, the color and the appearance"

- Bonnet and Simioni (2001) "Camembert cheeses from France"
- Cavicchi, Bailetti et al. (2010) "Cheese Pecorino di Fossa from Italy"
- Hassan, Monier-Dilhan et al. (2011) "21 cheeses from France"
- Gracia and de-Magistris (2016). "cheese from Spain". Female, older, a university-level education

- Kantar Worldpanel (2008-2010), about 20 000 French households
- We merge data
- 58 199 acts of purchases of Auvergne PDO cheeses
- Following Bonnet and Simioni (2001)

Variable	Obs	Mean	Std. Dev.	Min	Max
price	58199	10.25	2.51	6.59	23.08
CDI	58199	0.37	0.48	0	1
CDD	58199	0.07	0.26	0	1
Without Activity	58199	0.55	0.49	0	1
Primary_Education	58199	0.09	0.29	0	1
Secondary_Education	58199	0.56	0.49	0	1
Superior_Education	58199	0.31	0.46	0	1
NoEducation	58199	0.01	0.13	0	1
Single	58199	0.21	0.40	0	1
Married	58199	0.47	0.49	0	1
Couple	58199	0.30	0.46	0	1
age	58199	56.10	14.56	15	93
income	58199	2741.75	1326.33	300	7000
gender	58199	0.91	0.28	0	1
nberind	58199	2.42	1.19	1	9
Auvergne	58199	0.09	0.29	0	1
MDD	58199	0.28	0.45	0	1
Supermarket	58199	0.31	0.46	0	1
Hypermarket	58199	0.38	0.48	0	1
Creamer	58199	0.10	0.30	0	1
Hard_discount	58199	0.19	0.39	0	1
OtherMarket	58199	0.01	0.02	0	1
Mat_Grasse	58199	56.78	7.69	45	80
sale_promo	58199	0.09	0.28	0	1

- random utility model (RUM)
- Mixed logit Model (MXL)
  1. Does not take into account the Independence of Irrelevant Alternatives (IIA) assumption
  2. Authorize a distribution of preferences among the population rather than identifying only the average preference
- Nested logit Model(NL)
  1. Does not take into account the Independence of Irrelevant Alternatives (IIA) assumption
  2. It allow us to group the modalities into several nests

- Model 1 : Mixed logit equation

$$Choice_{Mixed} = \alpha_i + \beta_{price} Price + \beta_{nit} X + \beta_{nit} Z + \varepsilon_{nit}$$

- We deduce WTP

$$WTP^{k} = -\frac{\beta^{k}}{\beta^{price}}$$

- Model 2 : Nested logit equation

$$Choice_{Nested} = \alpha_i + \beta_{price} Price + \beta_{nit} X + \beta_{nit} Z + \varepsilon_{nit}$$

- X : income, age, nberind, CDI, CDD, gender, Single, Couple, Primary-Educ, Secondary-Educ, Superior-Educ

- Z : Supermarket, Hypermarket, Hard-Discount, Creamer, MDD, sale-promo, Mat-Grasse, Auvergne

Mixed logit results

VARIABLES	MXL Cantal [1]	MXL St Nectaire [2]	MXL Bleu Auvergne [3]	MXL Fourme Ambert [4]	MXL Salers [5]
Product Variables					
Price	-0.774***	-0.909***	-0.790***	-0.778***	-0.806***
	(0.005)	(0.008)	(0.006)	(0.005)	(0.005)
MDD (mean)	0.370***	-0.380*	0.750***	0.063	-16.601
	(0.136)	(0.199)	(0.126)	(0.127)	(763.854)
MDD (SD)	0.002	0.058	0.001	0.001	0.635
	(0.128)	(0.228)	(0.123)	(0.109)	(663.137)
Supermarket (mean)	-0.014	-2.623***	0.565**	0.589**	-2.741***
	(0.207)	(0.234)	(0.235)	(0.238)	(0.461)
Supermarket (SD)	0.191	0.160	0.001	0.138	0.031
	(0.107)	(0.188)	(0.094)	(0.089)	(0.269)
Hypermarket (mean)	0.015	-2.116***	0.245	0.409*	-1.965***
	(0.204)	(0.228)	(0.235)	(0.237)	(0.458)
Hypermarket (SD)	0.056	0.647***	0.005	0.001	0.014
	(0.114)	(0.158)	(0.133)	(0.130)	(0.252)
Creamer (mean)	-0.132	-1.227***	0.092	0.151	-0.113
	(0.214)	(0.227)	(0.244)	(0.248)	(0.452)
Creamer (SD)	0.779***	1.109***	0.228	0.304	0.644**
	(0.129)	(0.212)	(0.214)	(0.265)	(0.268)
Mat_Grasse (mean)	-0.146***	0.065***	0.106***	0.123***	-0.459***
	(0.006)	(0.006)	(0.004)	(0.006)	(0.028)
Mat_Grasse (SD)	0.001	0.012***	0.001	0.001	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
sale_promo (mean)	1.851***	-16.841	0.396**	-0.964***	-15.084
	(0.222)	(425.036)	(0.187)	(0.188)	(1027.795)
sale_promo (SD)	0.060	0.032	0.034	0.014	0.465
	(0.175)	(523.169)	(0.185)	(0.146)	(989.951)
Auvergne (mean)	-0.686***	1.544***	-0.123	-0.537***	0.202
	(0.124)	(0.165)	(0.131)	(0.130)	(0.342)
Auvergne (SD)	0.061	0.425***	0.045	0.167	0.041

Mixed logit results (*continued)*

	MXL	MXL	MXL	MXL	MXL
VARIABLES	Cantal	St Nectaire	Bleu Auvergne	Fourme Ambert	Salers
	[1]	[2]	[3]	[4]	[5]
Household Variables					
CDI (mean)	0.060	-0.305	0.113	-0.174	-0.110
	(0.108)	(0.195)	(0.126)	(0.128)	(0.284)
CDI (SD)	0.052	0.075	0.050	0.114	0.034
	(0.100)	(0.208)	(0.151)	(0.133)	(0.241)
CDD (mean)	-0.090	-0.491	0.250	-0.031	0.484
	(0.179)	(0.286)	(0.205)	(0.207)	(0.446)
CDD (SD)	0.052	0.127	0.331	0.036	0.143
	(0.222)	(0.769)	(0.206)	(0.253)	(0.550)
Primary_Educ (mean)	0.122	-1.061**	0.531	-0.087	1.383
	(0.271)	**(0.532)**	(0.339)	**(0.322)**	(0.984)
Primary_Educ (SD)	0.030	0.343	0.438***	0.096	0.448
	(0.193)	(0.307)	(0.162)	(0.217)	(0.470)
Secondary_Educ (mean)	0.101	-1.231***	0.354	0.129	0.190
	(0.242)	**(0.518)**	(0.307)	(0.291)	(0.629)
Secondary_Educ (SD)	0.050	0.148	0.018	0.005	0.079
	(0.093)	(0.191)	(0.145)	(0.102)	(0.195)
Superior_Educ (mean)	-0.114	-1.014**	-0.401	-0.051	-0.377
	(0.255)	**(0.490)**	(0.320)	(0.306)	(0.651)
Superior_Educ (SD)	0.039	0.214	0.111	0.007	0.170
	(0.120)	(0.248)	(0.131)	(0.135)	(0.280)
Couple (mean)	0.080	-0.142	0.133	-0.082	-0.067
	(0.169)	(0.261)	(0.189)	(0.189)	(0.444)
Couple (SD)	0.010	0.049	0.045	0.032	0.050
	(0.114)	(0.156)	(0.120)	(0.120)	(0.271)
Single (mean)	-0.087	-0.365	0.201	-0.153	0.414
	(0.268)	(0.517)	(0.279)	(0.298)	(0.644)
Single (SD)	0.024	0.124	0.022	0.009	0.111
	(0.157)	(0.241)	(0.144)	(0.153)	(0.333)

Mixed logit results (*continued*)

	MXL	MXL	MXL	MXL	MXL
VARIABLES	Cantal	St Nectaire	Bleu Auvergne	Fourme Ambert	Salers
	[1]	[2]	[3]	[4]	[5]
Household Variables					
Gender (mean)	0.023	-0.166	0.114	-0.047	1.53
	(0.191)	(0.173)	(0.211)	(0.217)	(0.366)
Gender (SD)	0.208	0.133	0.025	0.075	0.027
	(0.087)	(0.126)	(0.103)	(0.095)	(0.207)
Lincome (mean)	-0.260**	0.048	-0.049	-0.018	0.484*
	(0.101)	(0.154)	(0.112)	(0.111)	**(0.278)**
Lincome (SD)	0.001	0.097***	0.007	0.010	0.016
	(0.009)	(0.015)	(0.010)	(0.009)	(0.021)
Age (mean)	-0.001	-0.008	-0.004	-0.008*	0.019*
	(0.004)	(0.006)	(0.004)	**(0.004)**	**(0.117)**
Age (SD)	0.002*	0.008***	0.001	0.001	0.003
	(0.001)	(0.002)	(0.001)	(0.001)	(0.003)
Nberind (mean)	0.154**	-0.206**	0.049	-0.050	0.202
	(0.071)	**(0.105)**	(0.075)	(0.084)	(0.342)
Nberind (SD)	0.020	0.045	0.013	0.003	0.041
	(0.038)	(0.046)	(0.032)	(0.033)	(0.215)
Constant	11.425***	2.305***	8.277***	6.634***	22.222***
	(1.050)	(1.862)	(2.795)	(2.260)	(2.775)
Observations	324035	324035	324035	324035	324035
Log likelihood	-7250.26***	-5373.46***	-5887.80**	-7666.15**	-8090.19**

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

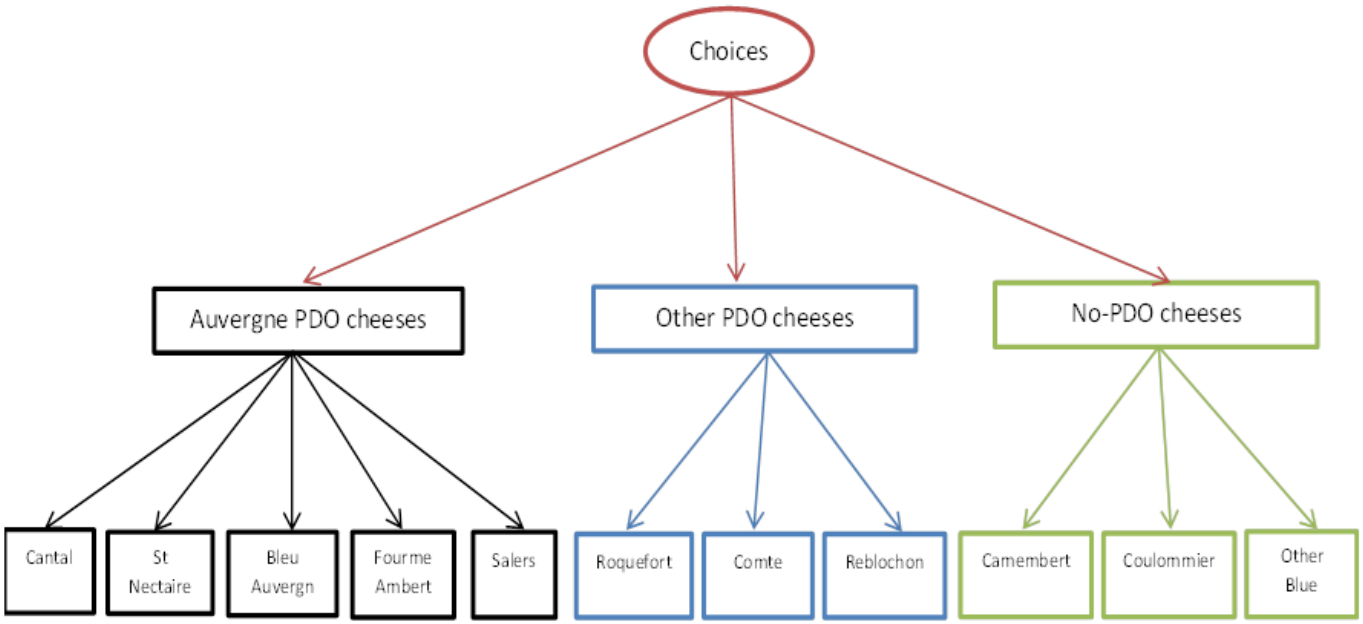
Willingness to Pay

Variables	Cantal in €/kg	St Nectaire in €/kg	Bleu Auvergne in €/kg	Fourme Ambert in €/kg	Salers in €/kg
MDD	**-0.268***	**0.993***	**0.229***	**0.525***	-0.848
Supermarket	-0.112	**-1.561***	**0.810***	**0.741***	**-3.261***
Hypermarket	-0.041	**-1.442***	**0.513***	**0.588***	**-1.904***
Creamer	-0.119	**-0.574***	0.110	-0.908	0.011
Mat_Grasse	**-0.175***	**0.143***	**0.127***	**0.140***	**-0.580***
sale_promo	**2.341***	1.971	**0.696***	**0.879***	-1.344
Auvergne	**0.783***	**1.892***	**0.642***	**0.586***	**0.914***
Total	**+2.681** €/kg	**-0.549** €/kg	**+3.01** €/kg	**+3.459** €/kg	**-4.831** €/kg

Comparaison

Variables	Average PRICE in €/kg	Average WTP in €/kg	Expected average PRICE in €/kg
CANTAL	**9.627**	**+2.681**	**12.308**
SAINT NECTAIRE	**12.235**	**-0.549**	**11.686**
BLEU AUVERGNE	**9.009**	**+3.01**	**12.019**
FOURME AMBERT	**9.435**	**+3.459**	**12.894**
SALERS	**17.423**	**-4.831**	**12.592**

Nesting structure for the choice of cheese (1 743 896 observations)



Nested logit results

VARIABLES	NL PDO Auvergne Cheese	NL Other PDO cheese
	[1]	[2]
Product Variables		
Price *(fixed)*	**-2.020*** **	**-2.020*** **
	(0.057)	**(0.057)**
Supermarket	**-6.632*** **	**4.548*** **
	(1.325)	**(1.544)**
Hypermarket	**-7.506*** **	**4.832*** **
	(1.320)	**(1.548)**
Creamer	**-4.146*** **	**4.595*** **
	(1.367)	**(1.621)**
Hard_discount	**-8.218*** **	**2.660***
	(1.345)	**(1.584)**
MDD	**-1.310*** **	**0.727*** **
	(0.284)	**(0.184)**
Sale_promo	**-4.022*** **	**-0.207*** **
	(0.327)	**(0.197)**
Mat_Grasse	**0.204*** **	-0.022
	(0.015)	(0.010)
Auvergne	**3.322*** **	0.651
	(0.533)	(0.623)

Nested logit results (*continued*)

VARIABLES	NL PDO Auvergne Cheese [1]	NL Other PDO cheese [2]
Households Variables		
CDI	-0.378	0.543***
	(0.290)	**(0.210)**
CDD	0.473	-0.589*
	(0.467)	**(0.349)**
Couple	0.175	-0.383
	(0.389)	(0.282)
Single	0.140	0.028
	(0.563)	(0.453)
Gender	0.302	0.928**
	(0.452)	**(0.387)**
lincome	-0.376**	0.277
	(0.194)	(0.179)
age	-0.003	-0.031***
	(0.010)	**(0.008)**
Nberind	-0.288**	-0.122
	(0.145)	(0.107)
Observations	1,743,896	
Log likelihood	-3851.50***	
Likelihood Ratio Statistic	1458.02***	
Number of cases	158,536	
Number of Alternatives	11	
Wald test	1344.51***	
τPDO_Auvergne	2.475	
τOther_PDO	2.410	
τNO_PDO	1.320	
Utility (PDO Auvergne)	0.404	
Utility (PDO Other PDO)	0.414	
Utility (no-PDO)	0.757	

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1