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Quality Labels and Export Performance: Evidence from the French Cheese Industry

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Selected Paper prepared for presentation at the International Agricultural Trade Research Consortium's (IATRC's) 2016 Annual Meeting: Climate Change and International Agricultural Trade in the Aftermath of COP21, December 11-13, 2016, Scottsdale, AZ.

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Quality labels and export performance: Evidence from the French cheese industry

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Motivation

- **Protected Designations of Origin (PDO)**, an European label certifying :
 - the characteristics of the product
 - that it was produced, processed and prepared in a defined region
 - the use of a recognized know-how
- **Protection** of the name of the product on the European market
- Hot topic in trade agreements' **negotiations** (TTIP)



Motivation

- This **European quality policy** aims to :
 - Fitting consumer concerns about the attributes of food products (quality and geographical characteristics)
 - Sustaining competitiveness within the agri-food chains

⇒ **Do PDO really impact the competitiveness of firms ?**

Literature on European geographical labels

- **Consumer's side** : perception of labelled products

- Consumers' willingness to pay (*Menapace et al. 2011*)
- Price elasticities (*Hassan et al. 2011*)
- Price premium (*Deselnicu 2013*)

⇒ The premium varies substantially according to products and markets

- **Producer's side** :

- Determinants of adoption of PDO (*Bouamra-Mechemache & Chaaban 2010a*)
- Comparison with private certifications (*Bouamra-Mechemache & Chaaban 2010b*)
- Impact of PDO on survival of firms (*Bontemps et al. 2013*)

⇒ Again, important heterogeneity among sectors

⇒ No analysis of the impact of PDO on **export competitiveness**

This paper

- Analyzes the role of official labels (PDO) on **export performance** in the French cheese industry
 - At the extensive (probability of export) margin
 - At the intensive (quantity) margin
 - On unit values
- Uses an **original and exhaustive dataset** of firms and products concerned by PDO in the French cheese industry
 - multi-product exporters may provide both labelled products and non labelled products
 - merged with custom data
- Shows :
 - A **positive impact** of PDO at the extensive and intensive margin
 - A positive effect mainly driven by the **European destinations**
 - A **spillover effect** of PDO authorization for non-PDO products within authorized firms

Literature on trade and quality

- Impact of **trade costs on quality mix** :

- Country-level data (*Schott 2004, 2006, Hummels and Klenow 2005, Baldwin and Harrigan 2011*)
- Firm level data (*Bastos and Silva 2010, Martin 2012*)

- **Firm-level heterogeneity in quality** :

- Firms with higher quality goods have better export performance
- Unit values as proxy for quality (*Manova and Zhang 2012, Johnson 2012*)
- Expert ranking as measure of quality (*Crozet et al. 2012*)
- R&D and innovation as proxy for quality in the food sector (*Curzi and Olper 2012*)

⇒ This paper : an alternative measure of quality

21 French cheeses with PDO certification

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FRANCHE-COMTÉ / ALSACE-LORRAINE

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- Livarot
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Charentes-Poitou

- Chabichou du Poitou
- Beurre Charentes-Poitou

Rhône-Alpes

- Piardon
- Fourme de Montbrison
- Brie de Valromey Saas-et-Grasse
- Rigotte de Comté

Savoie

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- Abondance
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Data

INAO dataset : authorized **plants** for a given **PDO product** in 2012

① Correspondence **products** \Rightarrow **NC8 codes**

- A PDO product may correspond to several NC8
- A NC8 may correspond both to PDO and non-PDO product \Rightarrow All exports of a authorized firm of a NC8 code concerned by a PDO are considered labelled.

② Correspondence **plant** (SIRET) \Rightarrow **firms** (SIREN)

③ Merge with **French customs dataset** :

- **Export** of French firms in value and quality, by destination market and 8-digit (NC8) product
- PDO authorized firms are **multi-products** firms: they export both labelled and non-labelled products

④ Merge with **FARE Dataset** (INSEE) :

- **Accounting data** of French firms (value added, workers, turnover)

Stylized facts

Table : Descriptive statistics on authorized and non authorized firms

	Type of firm	Nber of firms	Mean	Sd	Median	Min	Max
productivity (1000 €/employee)	<i>Authorized</i>	29	1,489	5,264	355.6	145.9	28,759.1
	<i>Non-authorized</i>	191	582	1,949	292.8	0	26,131.4
Number of Employees	<i>Authorized</i>	29	244	428	87	10	1,744
	<i>Non-authorized</i>	191	211	383	52	1	2,620
Number of products	<i>Authorized</i>	29	7.59	6.31	6	1	24
	<i>Non-authorized</i>	191	3.33	4.23	2	1	29
Number of destinations	<i>Authorized</i>	29	15.8	18	9	1	73
	<i>Non-authorized</i>	191	5.9	12.4	2	1	101
Total export value (1000 €)	<i>Authorized</i>	29	23,705.8	54,030	2,078.5	0.43	238,541
	<i>Non-authorized</i>	191	6,575.2	30,304.6	92.8	0.173	372,192

Notes: Authors' computation using INSEE and INAO datasets.

Authorized firms account for 5% of firms and 22% of exports in value

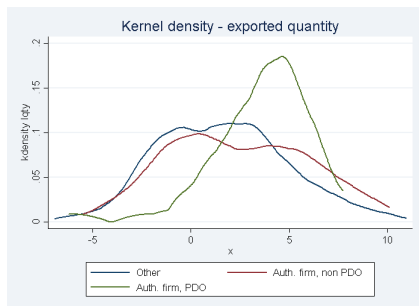
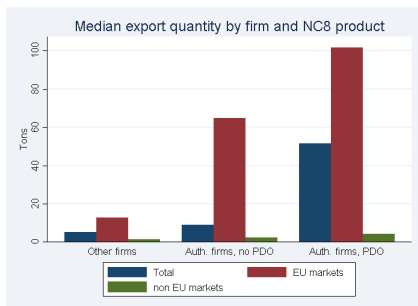
Stylized facts

PDO products = 5% of French total cheese exports

non-PDO products of authorized firms = 17% of French total cheese exports

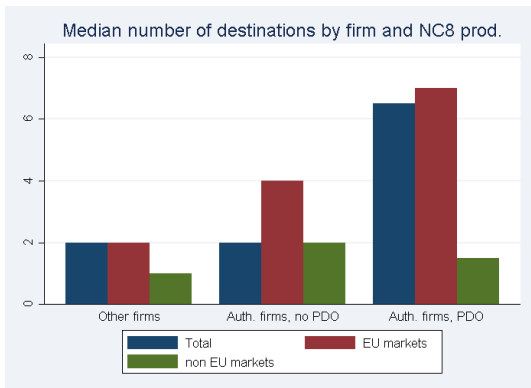
Non authorized firms = 78% of French total cheese exports

Export quantity by firm and NC8 category of good (2012)



Notes: Authors' computation using French Customs and INAO datasets.

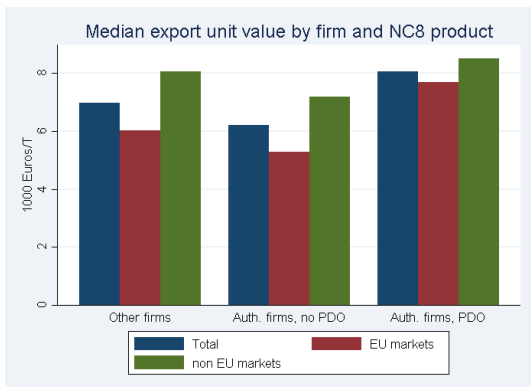
Stylized facts



Notes: Authors' computation using French Customs and INAO datasets.

⇒ suggest a positive role of labelling in firms export performance, both at the extensive and intensive margin

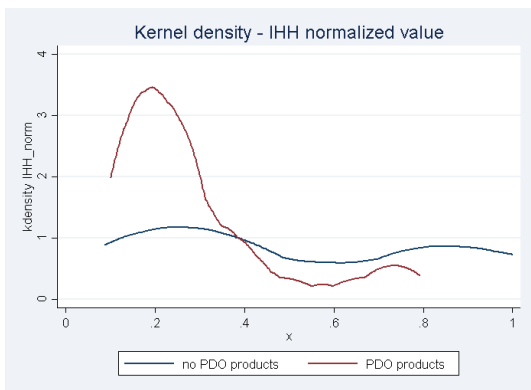
Stylized facts



Notes: Authors' computation using French Customs and INAO datasets.

⇒ A price premium only on European markets

Stylized facts



Notes: Authors' computation using French Customs and INAO datasets.

⇒ PDO products exhibits a smaller firm's concentration than non-PDO products

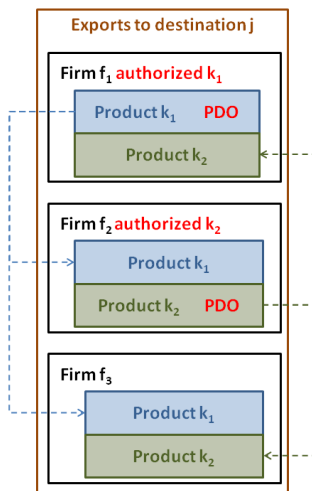
Direct effect of PDO : empirical strategy

- Does PDO labelling entail better performances for French exporters?

Direct Effect:

PDO versus non PDO flows
for a given destination j
and a given product k_1

(Across firm comparison)



Direct effect of PDO : empirical strategy

- Empirical model :

$$\begin{cases} X_{fjk} \\ \ln Q_{fjk} \\ \ln uv_{fjk} \end{cases} = \gamma_0 + \gamma_1 PDO_{fkt} + \gamma_2 Z_f + \Gamma Y_{fkj} + \epsilon_{fjk} \quad (1)$$

- three dependant variables:
 - **Extensive margin** ($X_{fjk}=0$ or 1 if $Q_{fjk} > 0$)
 - **Intensive margin** ($\ln Q_{fjk}$: log quantity exported by firm f of product k to j)
 - **Unit value** uv_{fjk} of product k exported to country j by firm f
- Key variables: PDO_{fkt} , dummy indicating whether firm f benefits from PDO labelling for k
- Z_f firm controls (size and productivity)
- Y_{kj} product NC8-destination fixed effects

Results : direct effect of PDO on the extensive margin X_{fjk}

	(1)	(2)	(3)	(4)
PDO _{fjk}	0.026*** (0.003)		0.031*** (0.005)	
PDO _{fjk} × EU _j		0.118*** (0.006)		0.172*** (0.011)
PDO _{fjk} × non-EU _j		0.005* (0.003)		0.014*** (0.005)
PDO _{fjk} × IHH _k			-0.024 (0.019)	
PDO _{fjk} × IHH _k × EU _j				-0.176*** (0.030)
PDO _{fjk} × IHH _k × non-EU _j				-0.030** (0.013)
Cheese industry _f	0.019*** (0.002)	0.019*** (0.002)	0.019*** (0.002)	0.020*** (0.002)
Productivity _f	0.014*** (0.000)	0.014*** (0.000)	0.014*** (0.000)	0.014*** (0.000)
1st class of nber of Employees _f	Ref.	Ref.	Ref.	Ref.
2nd class of nber of Employees _f	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
3rd class of nber of Employees _f	0.009*** (0.001)	0.009*** (0.001)	0.009*** (0.001)	0.009*** (0.001)
4th class of nber of Employees _f	0.043*** (0.001)	0.043*** (0.001)	0.043*** (0.001)	0.043*** (0.001)
Fixed effects	kj	kj	kj	kj
Nber Obs.	121,119	121,119	121,119	121,119
r2	0.18	0.18	0.18	0.18

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : direct effect of PDO on the intensive margin $\ln Q_{fjk}$

	(1)	(2)	(3)	(4)
PDO _{fjk}	0.173 (0.169)		0.881** (0.356)	
PDO _{fjk} × EU _j		0.113 (0.206)		0.947** (0.433)
PDO _{fjk} × non-EU _j		0.297 (0.295)		0.101 (0.496)
PDO _{fjk} × IHH _k			-2.772** (1.229)	
PDO _{fjk} × IHH _k × EU _j				-3.034** (1.379)
PDO _{fjk} × IHH _k × non-EU _j				0.843 (1.722)
Cheese industry _f	2.146*** (0.261)	2.146*** (0.261)	2.146*** (0.261)	2.220*** (0.261)
Productivity _f	0.500*** (0.035)	0.500*** (0.035)	0.494*** (0.035)	0.498*** (0.035)
1st class of nber of Employees _f	Ref.	Ref.	Ref.	Ref.
2nd class of nber of Employees _f	0.272 (0.187)	0.279 (0.187)	0.272 (0.187)	0.273 (0.187)
3rd class of nber of Employees _f	0.815*** (0.130)	0.821*** (0.130)	0.827*** (0.130)	0.830*** (0.130)
4th class of nber of Employees _f	1.692*** (0.129)	1.696*** (0.130)	1.698*** (0.129)	1.700*** (0.129)
Fixed effects	kj	kj	kj	kj
Nber Obs.	4,651	4,651	4,651	4,636
r2	0.55	0.55	0.55	0.55

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : direct effect of PDO on the trade unit value $\ln uv_{fjk}$

	(1)	(2)	(3)	(4)
PDO _{fjk}	0.025 (0.034)		0.115 (0.071)	
PDO _{fjk} × EU _j		0.021 (0.041)		0.110 (0.087)
PDO _{fjk} × non-EU _j		0.034 (0.059)		0.066 (0.099)
PDO _{fjk} × IHH _k			-0.351 (0.246)	
PDO _{fjk} × IHH _k × EU _j				-0.321 (0.276)
PDO _{fjk} × IHH _k × non-EU _j				-0.140 (0.345)
Cheese industry _f	-0.071 (0.052)	-0.071 (0.052)	-0.071 (0.052)	-0.062 (0.052)
Productivity _f	-0.080*** (0.007)	-0.080*** (0.007)	-0.081*** (0.007)	-0.081*** (0.007)
1st class of nber of Employees _f	Ref.	Ref.	Ref.	Ref.
2nd class of nber of Employees _f	0.033 (0.037)	0.033 (0.037)	0.033 (0.037)	0.032 (0.037)
3rd class of nber of Employees _f	-0.076*** (0.026)	-0.075*** (0.026)	-0.074*** (0.026)	-0.074*** (0.026)
4th class of nber of Employees _f	-0.158*** (0.026)	-0.158*** (0.026)	-0.157*** (0.026)	-0.157*** (0.026)
Fixed effects	kj	kj	kj	kj
Nber Obs.	4651	4651	4651	4636
r2	0.56	0.56	0.56	0.56

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Robustness : direct effect of PDO on trade - PPML estimators

	(1)	(2)	(3)	(4)
PDO _{<i>fjk</i>}	0.648***		0.844***	
	-0.05		-0.1	
PDO _{<i>fjk</i>} × EU _{<i>j</i>}		0.877***		0.985***
		-0.067		-0.129
PDO _{<i>fjk</i>} × non-EU _{<i>j</i>}		0.329***		0.822***
		(0.081)		(0.169)
PDO _{<i>fjk</i>} × IHH _{<i>k</i>}			-0.798**	
			-0.345	
PDO _{<i>fjk</i>} × IHH _{<i>k</i>} × EU _{<i>j</i>}				-0.403
				-0.408
PDO _{<i>fjk</i>} × IHH _{<i>k</i>} × non-EU _{<i>j</i>}				-1.933***
				-0.621
Cheese industry _{<i>f</i>}	1.066***	1.072***	1.065***	1.078***
	-0.083	-0.083	-0.083	-0.083
Productivity _{<i>f</i>}	0.458***	0.457***	0.457***	0.454***
	-0.013	-0.013	-0.013	-0.013
1st class of nber of Employees _{<i>f</i>}	Ref.	Ref.	Ref.	Ref.
	-	-	-	-
2nd class of nber of Employees _{<i>f</i>}	0.211***	0.208***	0.215***	0.209***
	-0.066	-0.066	-0.066	-0.066
3rd class of nber of Employees _{<i>f</i>}	0.538***	0.540***	0.540***	0.545***
	-0.042	-0.042	-0.042	-0.042
4th class of nber of Employees _{<i>f</i>}	1.354***	1.350***	1.356***	1.348***
	-0.043	-0.043	-0.043	-0.043
Fixed effects	kj	kj	kj	kj
Nber Obs.	54,091	54,091	54,091	54,091
r2	0.2	0.2	0.2	0.2

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : direct effect of PDO

- Positive impact of PDO labelling on the **probability of trade**, whatever the destination
 - higher impact to European markets
- The impact of PDO labelling on **trade quantities** depends on the level of firm's **concentration** for the product
 - 11 products (among 16) with positive effect ($IHH < 0.318$)
 - Effect on **European markets** only
- No significant effect of PDO labelling on **Trade Unit Value**

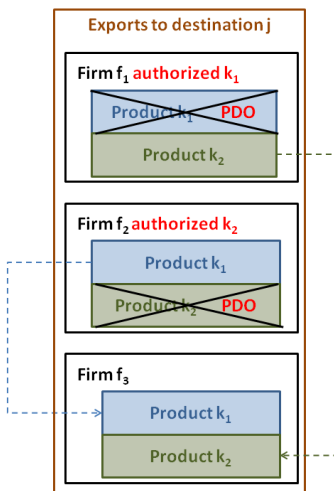
Spillover effect of PDO : empirical strategy

- Does authorization entail better performances for non PDO products?

Spillover Effect:

Authorized versus non authorized firms for a given destination j and a given product k_1 for non PDO flows

(Across firm comparison)



Spillover effect of PDO : empirical strategy

- Empirical model :

$$\begin{cases} X_{fjk} \\ \ln Q_{fjk} \\ \ln uv_{fjk} \end{cases} = \gamma_0 + \gamma_1 Authfirm_f + \gamma_2 Z_f + \Gamma Y_{fkj} + \epsilon_{fjk} \quad (2)$$

- three dependant variables:
 - **Extensive margin** ($X_{fjk}=0$ or 1 if $Q_{fjk} > 0$)
 - **Intensive margin** ($\ln Q_{fjk}$: log quantity exported by firm f of product k to j)
 - **Unit value** uv_{fjk} of product k exported to country j by firm f
- estimation on non-PDO flows only
- Key variables: $Authfirm_f$, dummy indicating whether firm f is authorized to handle PDO products
- Z_f firm controls (size and productivity)
- Y_{kj} product NC8-destination fixed effects

Results : Spill-over effect of PDO - Extensive Margin

	(1)	(2)	(3)	(4)
Auth. $firm_f$	0.001 (0.001)		0.010*** (0.002)	
Auth. $firm_f \times EU_j$		0.039*** (0.003)		0.053*** (0.006)
Auth. $firm_f \times non-EU_j$		-0.007*** (0.001)		0.003 (0.002)
Auth. $firm_f \times IHH_k$			-0.029*** (0.006)	
Auth. $firm_f \times IHH_k \times EU_j$				-0.037*** (0.012)
Auth. $firm_f \times IHH_k \times non-EU_j$				-0.033*** (0.006)
Cheese industry f	0.020*** (0.002)	0.020*** (0.002)	0.021*** (0.002)	0.021*** (0.002)
Productivity f	0.014*** (0.000)	0.014*** (0.000)	0.014*** (0.000)	0.014*** (0.000)
1st class of nber of Employees f	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
2nd class of nber of Employees f	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)	-0.002 (0.002)
3rd class of nber of Employees f	0.009*** (0.001)	0.009*** (0.001)	0.008*** (0.001)	0.008*** (0.001)
4th class of nber of Employees f	0.041*** (0.001)	0.041*** (0.001)	0.041*** (0.001)	0.040*** (0.001)
Fixed effects	kj	kj	kj	kj
N	115,197	115,197	115,197	115,197
r2	0.17	0.17	0.17	0.17

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : Spill-over effect of PDO - Intensive Margin

	(1)	(2)	(3)	(4)
Auth. $firm_f$	-0.180 (0.113)		0.672*** (0.199)	
Auth. $firm_f \times EU_j$		0.113 (0.149)		0.670** (0.274)
Auth. $firm_f \times non-EU_j$		-0.533*** (0.164)		0.140 (0.262)
Auth. $firm_f \times IHH_k$			-2.889*** (0.555)	
Auth. $firm_f \times IHH_k \times EU_j$				-1.681** (0.691)
Auth. $firm_f \times IHH_k \times non-EU_j$				-2.361*** (0.712)
Cheese industry f	2.246*** (0.270)	2.252*** (0.269)	2.277*** (0.268)	2.362*** (0.269)
Productivity f	0.493*** (0.039)	0.483*** (0.039)	0.482*** (0.039)	0.477*** (0.039)
1st class of nber of Employees f	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>	<i>Ref.</i>
2nd class of nber of Employees f	0.144 (0.213)	0.126 (0.213)	0.168 (0.212)	0.158 (0.212)
3rd class of nber of Employees f	0.849*** (0.141)	0.812*** (0.142)	0.874*** (0.141)	0.837*** (0.141)
4th class of nber of Employees f	1.708*** (0.142)	1.688*** (0.142)	1.764*** (0.141)	1.729*** (0.142)
Fixed effects	kj	kj	kj	kj
N	4,274	4,274	4,274	4,259
r2	0.56	0.56	0.57	0.57

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : Spill-over effect of PDO - Trade Unit Value

	(1)	(2)	(3)	(4)
Auth. firm _f	-0.154*** (0.023)		-0.188*** (0.040)	
Auth. firm _f × EU _j		-0.164*** (0.030)		-0.184*** (0.055)
Auth. firm _f × non-EU _j		-0.141*** (0.033)		-0.171*** (0.053)
Auth. firm _f × IHH _k			0.117 (0.111)	
Auth. firm _f × IHH _k × EU _j				0.057 (0.139)
Auth. firm _f × IHH _k × non-EU _j				0.101 (0.143)
Cheese industry _f	-0.064 (0.054)	-0.064 (0.054)	-0.065 (0.054)	-0.058 (0.054)
Productivity _f	-0.066*** (0.008)	-0.066*** (0.008)	-0.066*** (0.008)	-0.065*** (0.008)
1st class of nber of Employees _f	Ref.	Ref.	Ref.	Ref.
2nd class of nber of Employees _f	0.033 (0.043)	0.034 (0.043)	0.032 (0.043)	0.034 (0.043)
3rd class of nber of Employees _f	-0.100*** (0.028)	-0.098*** (0.028)	-0.101*** (0.028)	-0.097*** (0.028)
4th class of nber of Employees _f	-0.122*** (0.028)	-0.121*** (0.028)	-0.124*** (0.028)	-0.120*** (0.029)
Fixed effects	kj	kj	kj	kj
Nber Obs.	4274	4274	4274	4259
r2	0.57	0.57	0.57	0.57

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Results : spillover effect of PDO

- Being authorized has a positive impact on the **probability to export** non-PDO products
 - for 15 products among 40 ($IHH < 0.345$)
 - for all products on European markets
- The impact of authorization on **trade quantities** of non-PDO products depends on the level of firm's **concentration** for the product
 - 8 products with positive effect ($IHH < 0.23$)
 - Positive effect on **European markets** for 18 products ($IHH < 0.932$)
- Authorized firms export non-PDO products with smaller **Trade Unit Values**

Conclusion

- Our results confirm the **export competitiveness role** of PDO labelling in the French firm industry
 - PDO products benefit from better export performance
 - This advantage mainly holds on **EU markets**
 - This advantage depend on the level of concentration of French firms for the product
 - **Spill-over effect** for authorized firms for their non-PDO products
- The effect on **unit value / price** has to be further investigated
 - Difficult the disentangle the "**quality**" effect to the "**productivity**" effect
 - Small evidence of price premium for PDO products in the literature
 - The **productivity** effect is unclear : authorized firms are bigger and more productive, but PDO specifications require more expensive inputs and sometimes entail production constraints

Further research

- Further investigate the differences among **destination** countries
 - Heterogeneity within and outside the European Union
- Consider the belonging to a **group / brand name** as explanatory variable
- Perform **robustness checks**