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## On the competitiveness effects of quality labels: Evidence from 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 international negotiations
- Included in trade agreements' **negotiations** (CETA Canada, EPA Japan)



# 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

⇒ We do not know the impact of PDO on **export competitiveness** and whether **foreign consumers** value PDO products

## This paper

- Analyses the Link between official labels and higher prices and perception of quality
  - On unit values
  - On quality perceived by foreign consumers
- Analyzes the role of official labels (PDO) on **export performance** at the firm-product level in the French cheese industry
  - At the extensive (probability of export) margin
  - At the intensive (quantity) margin
- 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 (value and quantity available at the firm-product-destination level)

## Insight of the model

- Consumers value vertical variety

$$q_{ijk}(v) = [\lambda_{jk}(v)]^{\varepsilon-1} E_{jk} P_{jk}^{\varepsilon-1} [p_{ijk}(v)]^{-\varepsilon} \quad (1)$$

with

$$\lambda_{jk}(v) = [\theta_{ik} e^{\xi_j \times \text{PDO}(v)}] \eta_j \quad (2)$$

- $\lambda_{kj}(v)$  quality perceived by consumers of  $j$  for variety  $v$  of product  $k$
- $\xi_j$  quality shifter associated with PDO labeling
- $\theta_{ik}$  minimum quality offered for product  $k$
- $\eta_j$  consumer valuation of variety  $v$

## Insight of the model

- **Additional cost shifter due to PDO labelling**

$$c_{ijk}(f) = \omega_i(f)[\theta_{ik}]^\alpha e^{\beta \text{PDO}_{fk}} \tau_{ijk} / \varphi_{fk} \quad (3)$$

- $\omega_i(f)$  price index of inputs used by firm  $f$
  - $\tau_{ij}$  trade costs for product  $k$  shipped from country  $i$  to country  $j$
  - $[\theta_{ik}]^{\alpha_j}$  cost shifter due to product quality without PDO label
  - $e^{\beta \text{PDO}_{fk}}$  additional cost shifter due to PDO labelling
- Additional product entails a decrease in productivity  $\varphi_{fk} = \varphi(f) \times \text{Rank}_{fk}^{-\gamma}$

⇒ **Profit-maximizing prices**

$$p_{ijk}(f) = \frac{\varepsilon}{\varepsilon - 1} \frac{\omega_i(f)[\theta_{ik}]^\alpha e^{\beta \text{PDO}_{fk}} \tau_{ijk}}{\varphi(f) \text{Rank}_{fk}^{-\gamma}} \quad (4)$$

## 21 French cheeses with PDO certification

**FROMAGES, BEURRES ET CRÈMES AOP DE FRANCE**

**THIÉRACHE / BRIE**

**NORMANDIE**

**FRANCHE-COMTÉ / ALSACE-LORRAINE**

**BOURGOGNE / CHAMPAGNE**

**CENTRE / VAL-DE-LOIRE**

**Auvergne**

**Savoie**

**CHARENTES-POITOU**

**Rhône-Alpes**

**Aquitaine / MIDI-PYRÉNÉES**

**Méditerranée**

**LA PLUS BELLE PREUVE D'AUTENTICITÉ**

**A.O.P.**

**LA PLUS BELLE PREUVE D'AUTENTICITÉ**

**AQUITAINE / MIDI-PYRÉNÉES**

- Ossau-iraty
- Rocamadour
- Laguiole
- Brie des Causses
- Roquefort

**Auvergne**

- Saint-nectaire
- Cantal
- Fourme d'Ambert
- Bles d'Auvergne
- Salers

**Bourgogne / Champagne**

- Epoisses
- Beurre et crème de Bresse
- Mâconnais
- Langres
- Chaource
- Chablis

**Centre / Val-de-Loire**

- Chaource
- Sainte-maure de Touraine
- Préaliquy-Saint-Pierre

**Normandie**

- Camembert de Normandie
- Pont-l'Évêque
- Livarot
- Neuchâtel
- Beurre et crème d'Alsace

**Franche-Comté / Alsace-Lorraine**

- Comté
- Moudou
- Bles de Gex

**Charentes-Poitou**

- Chabichou du Poitou
- Beurre Charentes-Poitou

**Rhône-Alpes**

- Piard
- Fourme de Montbrison
- Brie de Valromey Saas-et-Vaast
- Rigotte de Comté

**Savoie**

- Beaufort
- Reblochon
- Abondance
- Chevillard
- Tomme des Bauges

**Méditerranée**

- Maroilles
- Brie de Melun
- Brie de Meaux

**THIÉRACHE / BRIE**

**www.fromages-aop.com**

POUR VOTRE SANTÉ, ÉVITEZ DE GRIGNOTER ENTRE LES REPAS. WWW.MANGERBOUGER.FR

## 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 SIREN-NC8 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) to limit our analysis to agri-food firms

## Direct effect of PDO on unit value and perceived quality: empirical strategy

- Empirical model:

$$Y_{fjk} = \gamma_0 + \gamma_1 PDO_{fk} + FE_f + FE_{jk} + \varepsilon_{fjk} \quad (5)$$

- Two dependent variables:
  - **Unit value**  $\ln(uv_{fjk})$  of product  $k$  exported to country  $j$  by firm  $f$ , computed as value exported divided by quantity exported
  - **Quality value (perceived by consumers)**  $\ln(qual_{fjk})$  of product  $k$  supplied by firm  $f$  consumed in country  $j$ , computed from a CES demand as in Kandhelwal, Schott and Wei (2013) in two steps:

$$\ln Q_{fjk} + \sigma \times \ln(uv_{fjk}) = FE_k + FE_j + \eta_{fjk} \quad (6)$$

with  $\sigma = 5$ . Conditional on price, a variety with a higher quantity is assigned higher quality. It follows that:

$$\ln(\widehat{qual}_{fjk}) = \widehat{\eta}_{fjk} / (\sigma - 1) \quad (7)$$

## Direct effect of PDO on unit value and perceived quality: results

### • Unit value

- PDO products benefit from a price premium, as compared to non-PDO products, whatever the destination country (EU and non-EU)
- Surprisingly no effect on countries with knowledge of GIs in 2012 (own GIs or agreements: Japan, Switzerland, South Korea)

### • Perceived quality

- PDO products considered as a product of higher quality by consumers
- Quality perceived on EU and non-EU markets

## Direct effect of PDO on margins: empirical strategy

- Empirical model :

$$Y_{fjk} = \gamma_0 + \gamma_1 PDO_{fk} + FE_f + FE_{jk} + \varepsilon_{fjk} \quad (8)$$

- Two dependent 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  $j$ )
- Key variable:  
 $PDO_{fk}$ , dummy indicating whether firm  $f$  benefits from PDO labeling for  $k$
- $FE_f$  firm fixed effects
- $FE_{jk}$  product NC8-destination fixed effects

## Direct effect of PDO on margins: results

- **Extensive margin**

- PDO labeling increases the probability to export
- Especially on EU markets and countries with knowledge of GIs in 2012

- **Intensive margin**

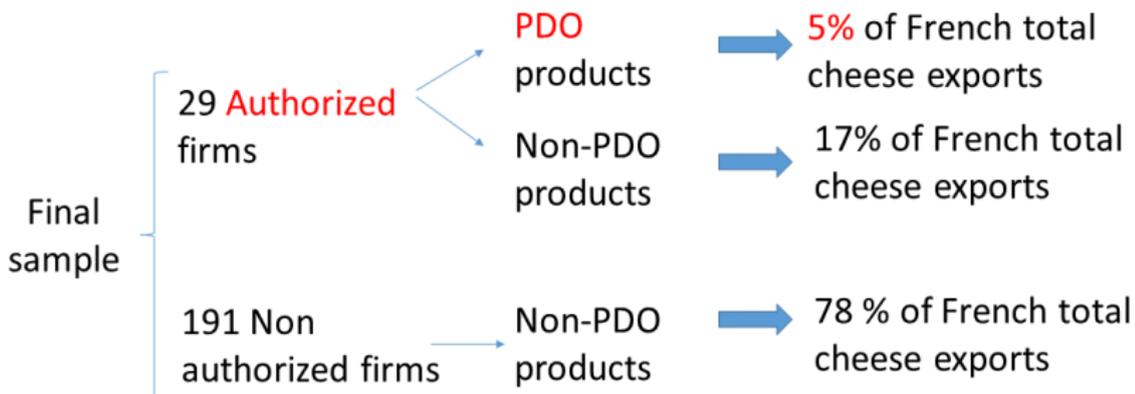
- No significant effect of PDO
- Expected negative impact of the product rank on the exported quantity

## Conclusion

- Our results confirm the **export competitiveness role** of PDO labelling in the French cheese industry
  - On the unit value, the quality perceived and the extensive margin
  - Especially if these products are among the main exported products of the firm
  - Higher impact on the European market and on countries who recognize PDO
- Coming back to our **theoretical model** : two channels for PDO effects
  - Increase in the unit value of PDO products (**cost and demand effect**)
  - Increase the quality perceived by the consumers (**demand effect**)
  - Increase in the probability to export PDO products (**demand effect**)
  - No impact on the demand (neither positive nor negative) addressed to PDO compare to non-PDO products (**volume constraints**)

⇒ Our empirical analysis shows that the **demand effect dominates**

## Annex 1: Stylized facts (1)



## Annex 2: Stylized facts (2)

Table: Descriptive statistics on authorized and non authorized firms

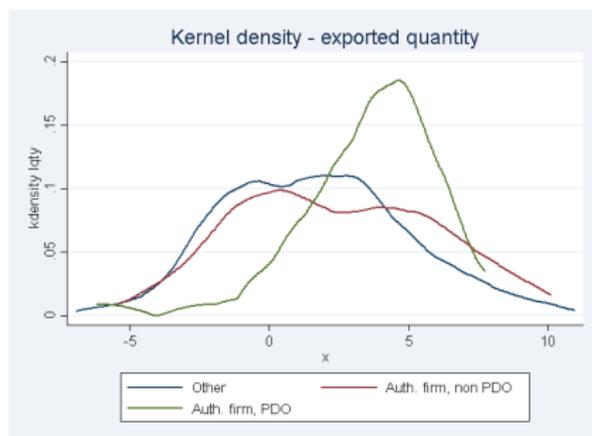
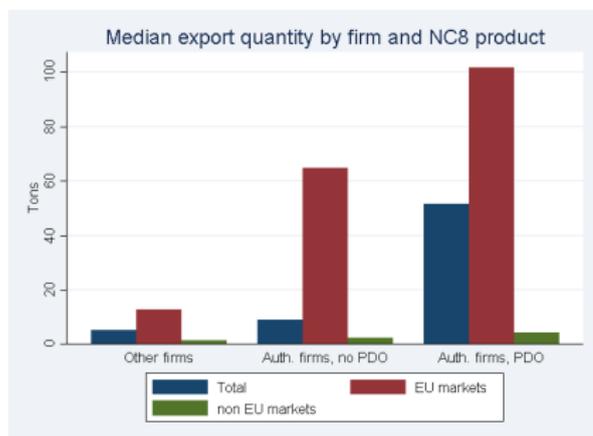
|                                   | Type of firm          | Nber of firms | Mean     | Sd       | Median  | Min   | Max      |
|-----------------------------------|-----------------------|---------------|----------|----------|---------|-------|----------|
| productivity<br>(1000 €/employee) | <i>Authorized</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<br>Employees            | <i>Authorized</i>     | 29            | 244      | 428      | 87      | 10    | 1,744    |
|                                   | <i>Non-authorized</i> | 191           | 211      | 383      | 52      | 1     | 2,620    |
| Number of<br>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<br>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<br>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

## Annex 3 Stylized facts (3)

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



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

## Annex 6 Results : direct effect of PDO on unit values

| Dependent variable                      | ln $uv_{fkj}$      |                   |                    |
|---|--------------------|-------------------|--------------------|
|   | (1)                | (2)               | (3)                |
| PDO <sub>fk</sub>                       | 0.115**<br>(0.052) |                   |                    |
| ln Rank <sub>fk</sub>                   | -0.012<br>(0.022)  | -0.012<br>(0.022) | -0.011<br>(0.022)  |
| PDO <sub>fk</sub> × UE <sub>j</sub>     |                    | 0.104*<br>(0.059) | 0.104*<br>(0.059)  |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> |                    | 0.133*<br>(0.070) | 0.164**<br>(0.080) |
| PDO <sub>fk</sub> × GI <sub>j</sub>     |                    |                   | 0.008<br>(0.092)   |
| Fixed effects                           | f, kj              | f, kj             | f, kj              |
| N                                       | 2,365              | 2,365             | 2,365              |
| r2                                      | 0.71               | 0.71              | 0.72               |

Notes: Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .  
Standard errors are clustered at the destination-8-digit-product level.

## Annex 7 Results : direct effect of PDO on perceived quality

| Dependent variable                      | ln Qual <sub>fkj</sub> |                    |                     |
|---|------------------------|--------------------|---------------------|
|   | (1)                    | (2)                | (3)                 |
| PDO <sub>fk</sub>                       | 0.140***<br>(0.077)    |                    |                     |
| PDO <sub>fk</sub> × UE <sub>j</sub>     |                        | 0.157**<br>(0.05)  | 0.157**<br>(0.05)   |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> |                        | 0.112**<br>(0.095) | 0.121***<br>(0.094) |
| PDO <sub>fk</sub> × GI <sub>j</sub>     |                        |                    | 0.074<br>(0.125)    |
| Fixed effects                           | f                      | f                  | f                   |
| N                                       | 2,365                  | 2,365              | 2,365               |
| r2                                      | 0.19                   | 0.19               | 0.19                |

Notes: Standard errors in parentheses. \*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . Standard errors are clustered at the destination-8-digit-product level.

## Annex 5: Results : direct effect of PDO on the extensive margin

| Dependent variable   | $X_{fjk} = 1$ if $q_{fjk} > 0$ and $= 0$ , otherwise |                      |                      |                      |
|--|--|----------------------|----------------------|----------------------|
|  | (1)  | (2)                  | (3)                  | (4)                  |
| PDO <sub>fk</sub>  | 0.539***<br>(0.113)                                  |                      |                      |                      |
| ln Rank <sub>fk</sub>  | -0.950***<br>(0.060)                                 | -0.947***<br>(0.061) | -0.949***<br>(0.061) | -0.911***<br>(0.062) |
| PDO <sub>fk</sub> × UE <sub>j</sub>  |  | 0.855***<br>(0.143)  | 0.867***<br>(0.144)  |                      |
| PDO <sub>fk</sub> × non-UE <sub>j</sub>                                      |  | 0.167<br>(0.159)     | -0.019<br>(0.167)    |                      |
| PDO <sub>fk</sub> × GI <sub>j</sub>  |  |                      | 1.447***<br>(0.369)  |                      |
| PDO <sub>fk</sub> × UE <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>      |  |                      |                      | 1.316***<br>(0.180)  |
| PDO <sub>fk</sub> × UE <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup>     |  |                      |                      | 0.259<br>(0.215)     |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>  |  |                      |                      | 0.008<br>(0.205)     |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup> |  |                      |                      | 0.103<br>(0.268)     |
| PDO <sub>fk</sub> × GI <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>      |  |                      |                      | 1.641***<br>(0.425)  |
| PDO <sub>fk</sub> × GI <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup>     |  |                      |                      | 1.305*<br>(0.682)    |
| # of obs.  | 26317  | 26317                | 26317                | 26317                |

## Annex 6: Results : direct effect of PDO on the intensive margin

| Dependent variable   | $\ln Q_{fkj}$       |                     |                      |                      |
|--|---------------------|---------------------|----------------------|----------------------|
|  | (1)                 | (2)                 | (3)                  | (4)                  |
| PDO <sub>fk</sub>  | 0.141<br>(0.247)    |                     |                      |                      |
| Rank <sub>fk</sub>   | -1.387***<br>(0.12) | -1.387***<br>(0.12) | -1.391***<br>(0.121) | -1.382***<br>(0.118) |
| PDO <sub>fk</sub> × UE <sub>j</sub>  |                     | 0.227<br>(0.3)      | 0.23<br>(0.299)      |                      |
| PDO <sub>fk</sub> × non-UE <sub>j</sub>                                      |                     | -0.008<br>(0.365)   | -0.189<br>(0.376)    |                      |
| PDO <sub>fk</sub> × GI <sub>j</sub>  |                     |                     | 0.73<br>(1.016)      |                      |
| PDO <sub>fk</sub> × UE <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>      |                     |                     |                      | 0.374<br>(0.340)     |
| PDO <sub>fk</sub> × UE <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup>     |                     |                     |                      | -0.242<br>(0.660)    |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>  |                     |                     |                      | -0.420<br>(0.475)    |
| PDO <sub>fk</sub> × non-UE <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup> |                     |                     |                      | 0.466<br>(0.619)     |
| PDO <sub>fk</sub> × GI <sub>j</sub> × Rank <sub>fk</sub> <sup>1-3</sup>      |                     |                     |                      | 0.734<br>(1.246)     |
| PDO <sub>fk</sub> × GI <sub>j</sub> × Rank <sub>fk</sub> <sup>4-15</sup>     |                     |                     |                      | 0.795<br>(0.969)     |
| Fixed effects  | f, kj               | f, kj               | f, kj                | f, kj                |
| N  | 2365                | 2365                | 2365                 | 2365                 |
| r2   | 0.67                | 0.67                | 0.67                 | 0.67                 |