Environmental Public Policies in Multi-Level Supply Chains

Evidence from the French Milk Market

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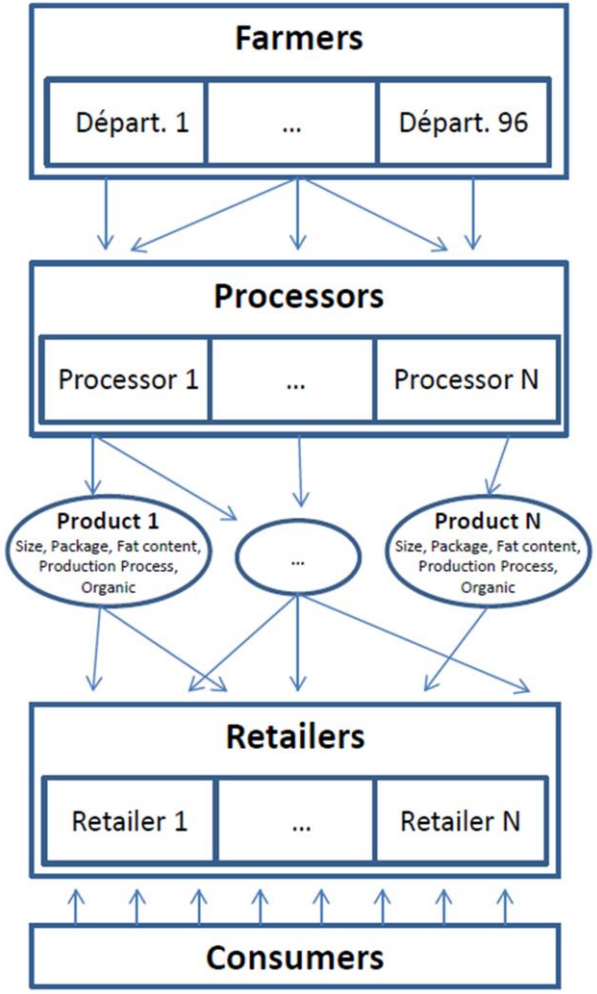
The dairy sector is one of the industries with the highest impact on the environment

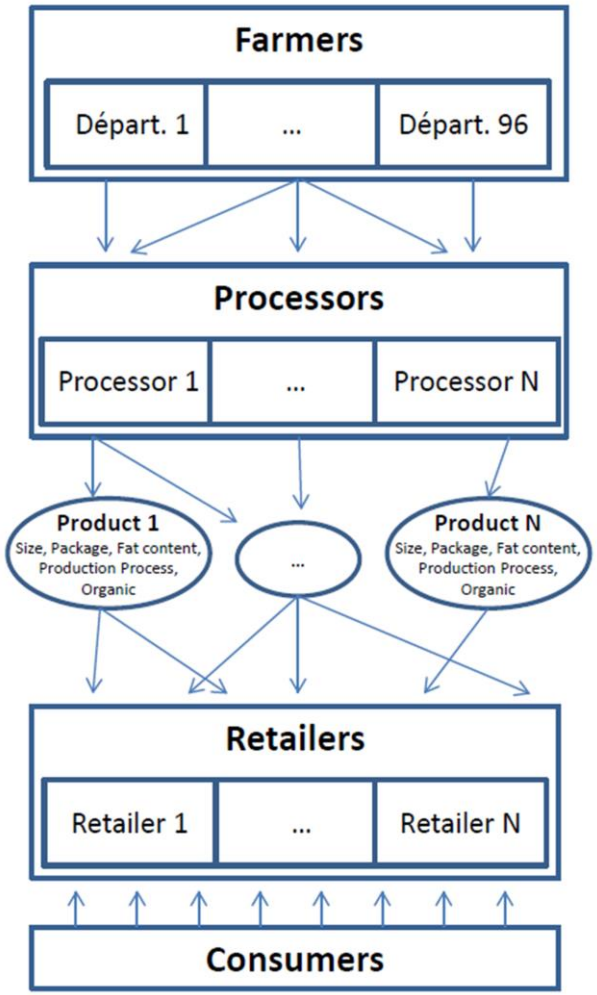
- CO2 emission, eutrophication, land use, water use and pesticides (direct and indirect)

- Understand demand for milk characteristics impacting environment
  - organic,
  - packaging size and packaging type,
  - location
- Incidence on profits and value sharing between processors and retailers
- Incidence for farmers
- Implication for environmental policy

FRENCH MILK MARKET



FRENCH MILK MARKET



Step 1:

Demand estimation and identification of processor-retailer relationship

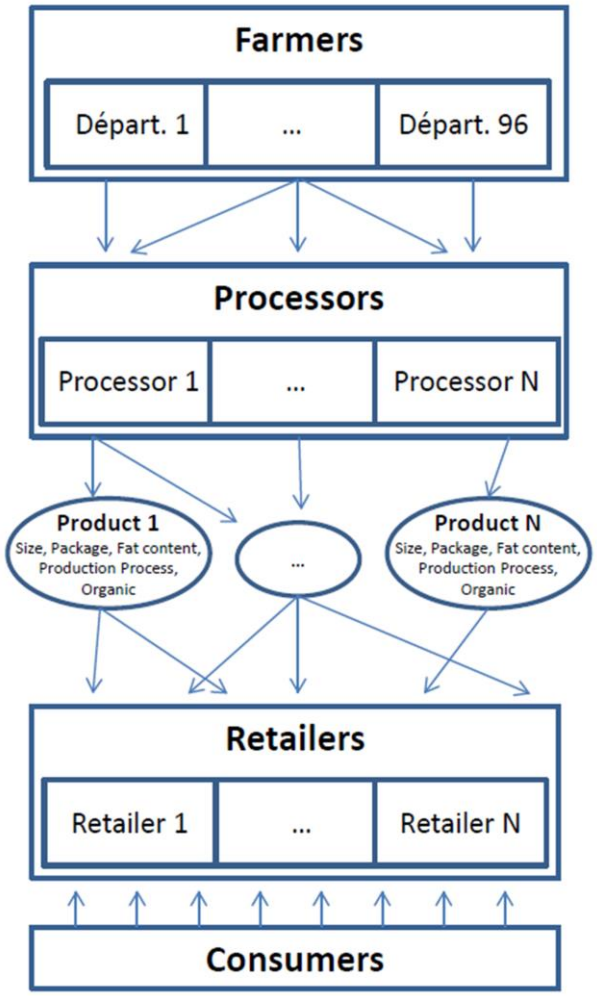
KANTAR World Panel - Food Purchase

- Purchased brand, chosen retailer, time
- Link between retailers and processors
- Prices, package type, size, fat content, organic/conventional

Data used for

- Demand Model
  - identify substitution patterns
- Supply Model
  - identify (non-observed) costs and price-cost margins

FRENCH MILK MARKET



Step 2:

Integrate farm level into processor-retailer relationship

EAL/ESANE (processor survey data)

- Collected raw milk quantities (organic/conventional)
- Processed raw milk quantities per product
- Milk wholesale price
- Number of farms at department level

A MODEL OF CONSUMER DEMAND FOR MILK

Random coefficients logit model to estimate demand and substitution patterns (price elasticities):

$$V_{ijt} = \beta_{b(j)} + \beta_{r(j)} + \alpha_i p_{jt} + \rho_i l_j + \kappa_t + \varepsilon_{ijt}$$

Price elasticities report the percentage share of consumers switching (to other brands) after a price increase of 1%

BARGAINING MODEL BETWEEN RETAILERS AND PROCESSORS

Profits of retailers and processors for product j given by:

$$\Pi^r = Q \sum_{j \in \theta^r} (p_j - w_j - c_j)\, s_j(p)$$

$$\Pi^m = Q \sum_{j \in \theta^m} (w_j - \mu_j)\, s_j(p)$$

PROBLEM:

WHOLESALE PRICE, RETAIL COST, AND WHOLESALE COST ARE NOT OBSERVED

BARGAINING MODEL BETWEEN RETAILERS AND PROCESSORS

a) Bertrand-Nash Model of retail competition

Retail margins as a function of prices, market shares, and substitution patterns

b) Vertical supply model to infer on **wholesale margins**

$$\underset{\{w_j\}}{\operatorname{argmax}} \left[\Pi_j^r(w, p^*) - \Pi_{-j}^r(w_{-j}^*, p^*)\right]^{\lambda_B} \left[\Pi_j^m(w, p^*) - \Pi_{-j}^m(w_{-j}^*, p^*)\right]^{1-\lambda_B}$$

PRELIMINARY RESULTS ON THE FIRST STEP: CONSUMPTION

Characteristic	Elasticities	SD
Organic Characteristic		
Conventional	-2.76	1.16
Organic	-4.26	1.22
Total	-3.05	1.31
Packaging size		
Under 1 lt.	-4.82	1.27
1 Lt. or more	-2.61	0.88
Total	-3.05	1.31
Packaging type		
Carton	-2.30	0.80
Bottle	-3.65	1.34
Total	-3.05	1.31

Policy Questions

Can be evaluated having identified demand substitution and profits

- Who is going to benefit from introduction of organic labels
- Environmental impact of package sizes and type
- The effect of regional brands on competition
- At which level to tax

Thank you for your attention!

Contact:

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