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Innovation and Export Behavior: A Within-Farms Analysis on French Dairy Farms

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Product innovation and Export behaviour in French dairy industry

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IATRC

Motivations & objective

Motivations

- Innovation is widely considered as the major driving force behind:
 - economic growth
 - industrial evolution
- Promotion of innovation is increasingly at the core of public policies
 - European institutions repeatedly state that a sound innovation policy is the key to recovering EU competitiveness:
 - The Lisbon Strategy in 2000 proposed the stimulation of innovation and knowledge through greater investment in RD and Information and Communication Technologies

The question of the role of innovation in competitiveness is an important issue

Motivations & objective

Motivations

- The world market for dairy products is growing

Demand trends between 2013 and 2030:

Europe: 3,7%; North America: 5,1%; Asia et Pacific : 28,8%; Africa: 23,9% and Latin America and the Caribbean: 12,1%.

- Evolution of dairy firms' exports between 2011 and 2017 according to the export area

Europe: 2,9%; North America: 17,79%; Asia et Pacific : 86,8%; Africa: 22,5%, and Latin America and the Caribbean: 58,04%

- The growth of French exports remains lower than for other countries.

cheese exports on the Chinese market: France +5% , New-Zealand +46%

The question of the competitiveness of French dairy firms in the international market remains an important issue

Objective

- Understand the relationship between innovation and export behavior of French dairy firms.

Outline

- Our question and the state of the art
- Data and stylized facts
- Results
- Discussion

Empirical studies

Positive link between "product innovation" and export behaviour

- Becker and Egger (2007): German manufacturing industry
- Cassiman and Martinez-Ros (2007): Spanish manufacturing industry
- Damijan et al. (2008)
- Caldera (2009): Spanish manufacturing industry
- Bocquet and Musso (2010): French manufacturing industry

No link between "product innovation" and export behaviour

- Damijan et al. (2010): English manufacturing industry
- Beveren and Vandebussche (2010): Belgian manufacturing industry

Theoretical starting point

Caldera (2009) model

Model assumptions

- Melitz (2003), (monopolistic competition and CES demand)
- Firms invest in innovation before the production process to improve their production technology (process innovation) or improve their products (product innovation)
- Innovation (product or process) increases the productivity

Model prediction

- Only the most productive firms invest in innovation
- Investment in innovation reduces marginal costs of production, and hence prices.
- Innovation indirectly affects demand (quantity sold)

Theoretical analyses

Corollary: companies that innovate will also be more likely to export.

The reason is that innovators find export more profitable than non-innovators: since innovators' marginal costs of production are lower, they may charge a lower price, which will increase total sales more than proportionately because the demand is supposed to be elastic.

Theoretical model

Several contributions

- We develop a trade model in which product innovation enters both supply and demand sides
- Demand side
 - Dairy industries conform reasonably well to the heterogeneous firm monopolistic competition assumption
 - Product innovation is user-oriented in food industries
 - Product innovation: a process in which the understanding of consumers' desires, needs and preferences play a key role

Product innovation is modelled as a utility shifter on the demand side

- Supply side **Product innovation development generates additional production costs**

Data

Period under analysis: 2011-2017

- **Global New Product Database** : is a dataset provided by Mintel, the global marketing trends analysis company. All "new" products marketed, regardless of the distribution channel, are listed in the dataset. New measure of "product innovation" provided.
 - Z_{fjkt} : 1 if firm f introduced a new product in product category k in country j at time t



Period under analysis: 2011-2017

- **French customs data** : quantities and values exported by French dairy firms.

Flows disaggregated at the firm-product-destination level

- q_{fjkt} : quantity sold by firm f for product category k in country j at time t
 - v_{fjkt} : value exported by firm f for product category k in country j at time t
 - p_{fjkt} : price (unit value) for firm f for product category k in country j at time t
- **PRODCOM dataset**: Production in quantity and value of French dairy firms. Data are disaggregated at the firm-product level. A specific product nomenclature is used

Final dataset

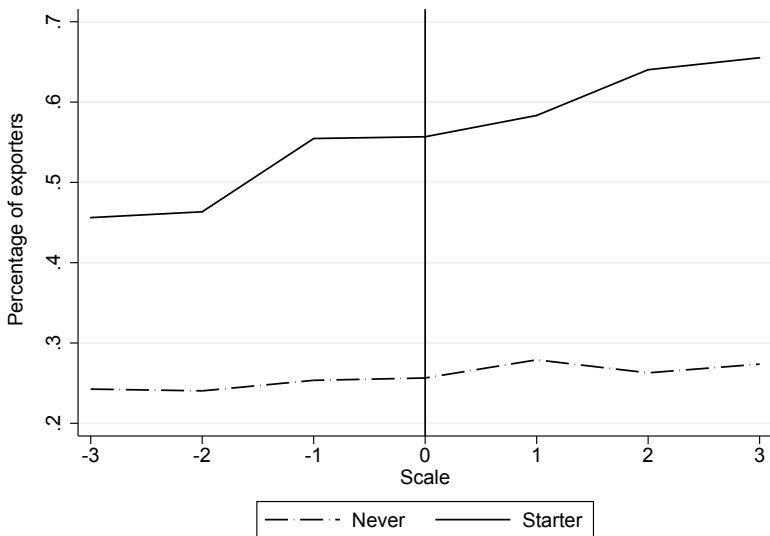
Table: Descriptive statistics

Variables	Mean	Standard Deviation	Number of Observations
<i>Quantity</i>	2.775	2.990	17,846
<i>Price</i>	1.208	0.942	17,846
<i>Productquality</i>	-0.078	0.525	1,952
<i>Productrank</i>	0.614	0.487	1,952
<i>Productivity</i>	16.217	1.251	831
<i>Size</i>	4.645	2.902	831

- Variables *Quantity* and *Prices* come from the French customs data and they are measured at the firm-product-country level
- Variable *Productquality* and *Productrank* have been computed using PRODCOM and they are measured at the firm-product level
- Variable *Productivity* and *Size* come from the PRODCOM and they are measured at the firm level

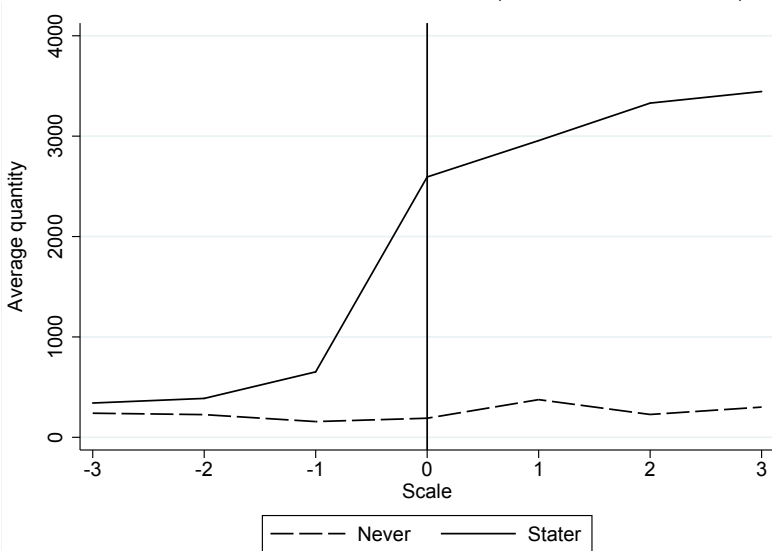
Stylized facts

Figure 1: Innovation and export in the cheese sector (prodcom code: 10.51.40.50)



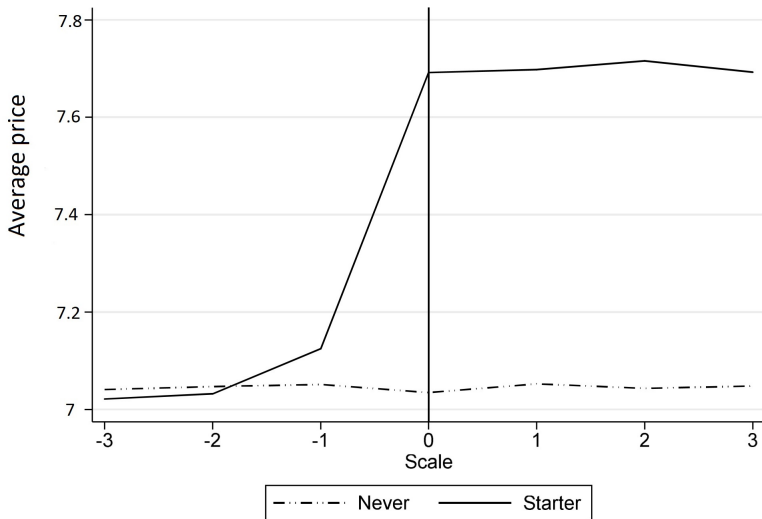
Stylized facts

Figure 2: Innovation and quantity sold in Germany (prodcom code: 10.51.40.50)



Stylized facts

Figure 3: Innovation and unit value for cheese sold in Germany (prodcom code: 10.51.40.50)



Difference between *Starter* and *Never* groups

Table: Difference in firms' characteristics between *Starter* and *Never* groups before introduction of new product

Variables	All	Mean characteristics		
		<i>Never</i>	<i>Starter</i>	Difference
<i>Product quality</i>	- 0.009	- 0.037	0.090	0.128***
<i>Products' rank</i>	0.306	0.311	0.280	0.032
<i>Productivity</i>	16.528	16.377	17.069	0.692***
<i>Size</i>	5.546	5.398	6.076	0.679***

*** denotes significance at 1%

Econometric model

$$ATE = E \left[\frac{Z_{fjk} Y_{fjk}}{e_{fjk}} - \frac{(1 - Z_{fjk}) Y_{fjk}}{1 - e_{fjk}} \right]$$

Y_{fjk} is the outcome of firm f in country j for product k

Z_{fjk} take the value 1 if firm f has introduced new product in country j for product k and 0 otherwise

e_f is the propensity score that firm f has introduced new product in country j for product k and 0 otherwise

$$e_{fjk} = e(\mathbf{X}_{fjk, s_0-1}) = \Lambda(\alpha' \mathbf{X}_{fjk, s_0-1} + u_i)$$

\mathbf{X}_{ijk, s_0-1} includes:

- Destination (j) fixed effect
- Product (k) fixed effect
- $Rank_{fk}$: take the value 1 if product k is the core product of the firm f
- θ_{fk} : is the quality perceived of product k for firm f ("vertical differentiation" component)
- φ_f : turnover per employee of the firm f
- $Size_f$: number of employee of the firm f
- u_f : Random component for firm f

Empirical estimate of ATE

- Estimation following the the nonparametric estimator proposed by Li et al. (2013)

$$\hat{ATE}^{s_0+h} = \frac{\sum_{jk} w_{jk} \hat{ATE}_{jk}^{s_0+h}}{\sum_{jk} w_{jk}},$$

Where

$$\hat{ATE}_{jk}^{s_0+h} = \frac{\sum_{Z_{fjk}=1} Y_{fjk}^{s_0+h} w_{fjk}}{w_{fjk}^1} - \frac{\sum_{Z_{fjk}=0} Y_{fjk}^{s_0+h} w_{fjk}}{w_{fjk}^0},$$

$$w_{jk} = \sum_{f \in jk} w_{fjk}$$

$$w_{jk}^{0,1} = \sum_{f \in jk}^{Z_{fjk}=0,1} w_{fjk}$$

$$w_{fjk} = 1/e_{fjk} \text{ if } Z_{fjk} = 1$$

$$w_{fjk} = 1/(1 - e_{fjk}) \text{ if } Z_{fjk} = 0$$

Results

Table: ATE estimates: New product (firm-product-destination)

	s_0	$s_0 + 1$	$s_0 + 2$
<i>Outcome: Export price</i>			
	0.074*** (0.009)	0.033*** (0.011)	0.037** (0.014)
<i>Outcome: Quantity sold</i>			
	0.910*** (0.045)	0.726*** (0.054)	0.649*** (0.066)

* denote significance at 10%, ** 5% and *** 18%, respectively. Standard errors are denoted in parentheses.

- Introduction of new product at s_0 increase price and quantity sold by 7% and 91%, respectively.
- The effect of new product on price and quantity sold persist over time.
- This persistence decreases over time for a given product-destination.

Results

Table: ATE estimates: New product (firm-product)

	s_0		$s_0 + 1$		$s_0 + 2$
<i>Outcome: Probability to export</i>					
	0.000	(0.006)	0.062***	(0.011)	0.107*** (0.014)
<i>Outcome: Quantity sold</i>					
	0.323**	(0.135)	0.528***	(0.120)	1.049*** (0.191)
<i>Outcome: Export price</i>					
	0.067***	(0.015)	0.087***	(0.014)	0.083*** (0.023)

- Introduction of new product at s_0 increase price and quantity sold by 7% and 32%, respectively.
- The effect of new product on price and quantity sold persist over time.
- This persistence decreases over time for a given product.

Results

Table: ATE estimates: According to the export zone

	Western Europe	Other European countries	North America	Asia
<i>Price</i>	0.016*** (0.003)	0.107*** (0.008)	0.113*** (0.042)	0.334*** (0.050)
<i>Quantity</i>	1.030*** (0.057)	1.674*** (0.052)	0.707*** (0.074)	0.879*** (0.298)

- Introduction of new product at s_0 increase price and quantity in different zones.
- Effect on prices for Asia (specific status of dairy products in this new market).
- Effect on quantity on other European countries.

Conclusion

- We measure the role of "product innovation on export performances of French dairy firms
 - We use 3 sources of information to dataset to build a unique dataset
- Our results confirm the role of product innovation on export performance over time
- Our results show that the role of innovation on dairy markets differ according to the export zone

Thanks for your attention

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