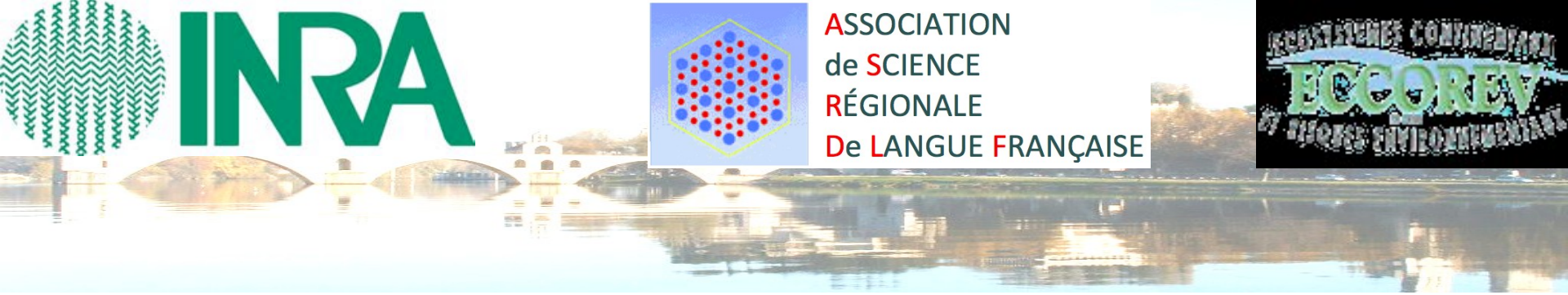
Les structures de localisation des industries agro-alimentaires dans le secteur coopératif : Apports et limites des mesures d'autocorrélation spatiale couplées à une modélisation économétrique

Pierre Triboulet, Stéphanie Pérès



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Spatial patterns of agro-food firms in the cooperative sector: a spatial analysis linked to econometric modelling

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Problematic

Industrial activities of agricultural cooperatives:

- Links to agricultural production
- Impact of reorganisation and industrial concentration
- Existence of location externalities

How do cooperatives organise their activities geographically?

Issues and objectives

- To describe and explain the spatial organization of agro-food firms in the French cooperative sector in 1995 and 2005.
  - Measurement and methodological issues:
    - Concentration and spatial autocorrelation
    - Testing the choice of concentration indicators and levels of industrial and geographic aggregation
  - Explanatory factors of spatial patterns
    - Cooperative organization and territorial factors

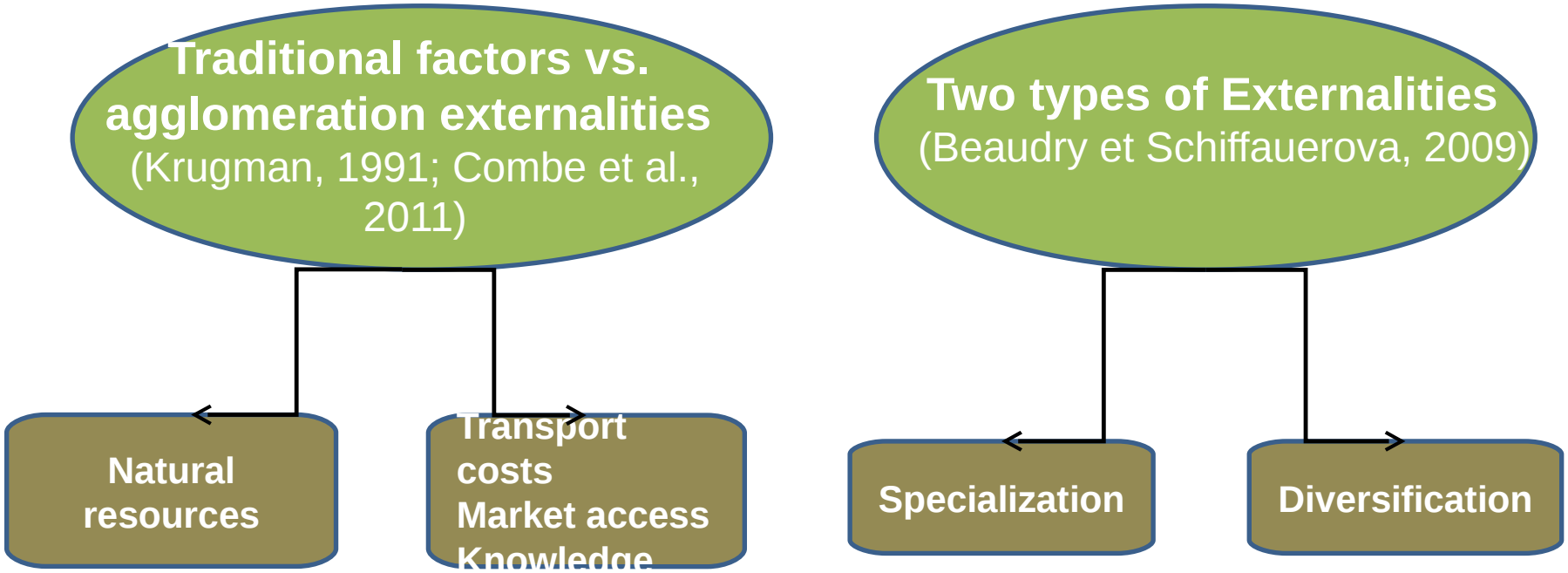
Outline

- 1. Theoretical background: understanding of spatial patterns and measurement problems
- 2. Data analysis: presentation of databases and methods
- 3. Main results and Discussion

1. Theoretical background

The geographic concentration of industrial activities

- The expected profits of a localized group of firms



- How to take the specificities of each area into account: urban vs. rura

1. Theoretical background

The spatial concentration of industrial activities

- Spatial concentration measurement problems
  - Concentration index
    - ✓ Herfindhal index
    - ✓ Gini index
    - ✓ Ellison-Glaeser index

    }
    - MAUP (scale and aggregation problems)
    - Not taking the neighbourhood into account
  - Spatial autocorrelation measures
    - ✓ Moran's I: Global
    - ✓ LISA: detection of "clusters" and "hot spots"

➢ Sensitivity to the indicators and to the sectoral and geographical levels of aggregation

2. Data analysis

The three main stages of our methodology

2. Data analysis

Two original databases

- A database of agro-food firms in the cooperative sector in 1995 and 2005
  - An exhaustive database at firm unit level
  - 56,526 employees in 1995 and 76,514 employees in 2005
  - Segmentation into 5 product families: beverage, cereals, milk, meat, others
- A “cantonal” database to test explanatory factors in 2005
  - Agricultural Profile (AP): weight of agriculture and production system
  - Demographic Profile (DP): urban/rural and growth rate of

3. Main results

Measurement of the global concentration

- The Gini index shows the spatial concentration of agro-food firms in the cooperative sector
  - GI varies from 0.271 to 0.473
  - The trend is relatively stable for 1995 and 2005 regardless of product family
  - Highest GI values at “canton” level and lowest at “department” level
- The Moran’s I indicates the presence of spatial autocorrelation for the different product families
  - The results vary widely according to product family, levels of spatial aggregation and intra-sectoral (absolute)/global (relative LQ) levels

3. Main results

Measurement of the local autocorrelation

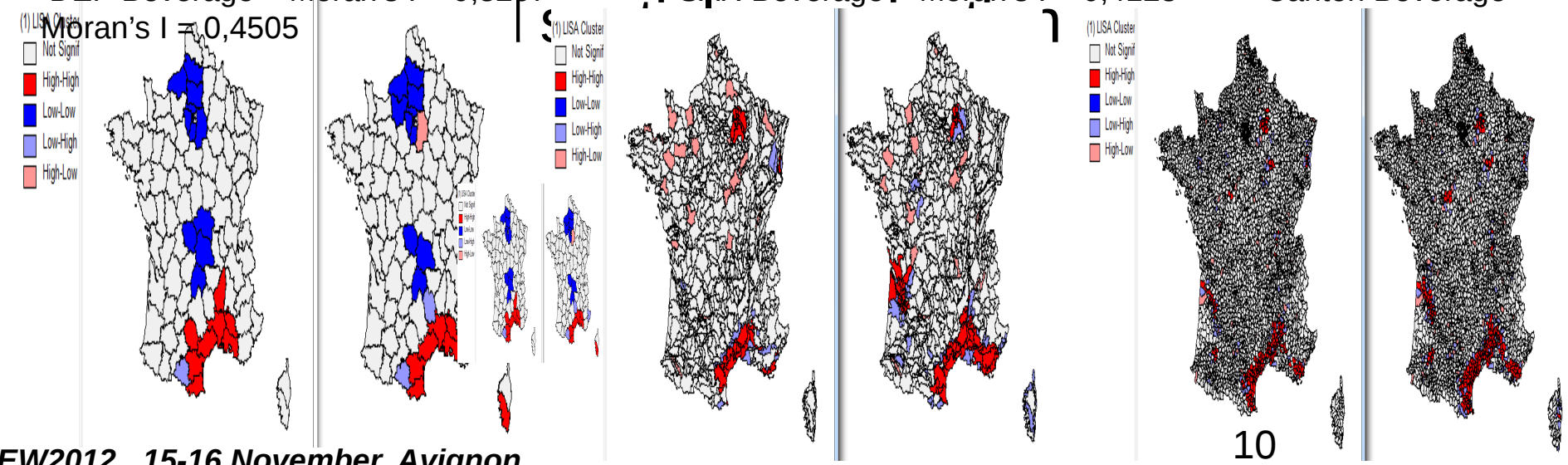
- Significant “clusters” (HH) and “hot spots” (HL) of cooperative activities are very sensitive to the different analysis dimensions
- A comparison of the results can help to better understand the connection between industrial

Comparison by geographic level: Beverage – relative QL in 2005

DEP Beverage – Moran’s I = 0,3267

SAR Beverage – Moran’s I = 0,4123

Canton Beverage – Moran’s I = 0,4505



3. Main results

- Logit modelling of cantonal spatial patterns in relation to the location of agro-food cooperatives in 2005 $y_{AB} = \alpha_{AB}\,AP + \beta_{AB}\,DP + \gamma_{AB}\,SE + \mu_{AB}$

Agricultural Profile
positive effect

Demographic Profile
ambivalent effect

Spatial Environment
Positive effect for medium-sized urban areas

$$A = \{C_{HH \wedge HL \wedge LH}; C_{HH}; C_{HL}; C_{LH}\}$$

$$B = \{C_{allproducts}; C_{beverage}; C_{wheat}; C_{milk}; C_{meat}\}$$

3. Main results

Logit model A: belonging to a type of canton (HH - cluster, HL - hot spot, or LH) regardless of product type

Dependent variable	A1: Canton HHHLLH	A2: Canton HH (cluster)	A3: Canton HL (hot spot)	A4: Canton LH
Agricultural Profile				
Weight of Agriculture (UTA)	**1.290 *****	**2.658 *****	**1.517 *****	**1.080 ****
Predominant production syst.	**spec. crops +**	**spec. crops ++**		**spec. crops -**
Demographic profile				
Peri-urban dominant	**0.909 ns**	**0.490 *****	**1.034 ns**	**1.140 ns**
Urban dominant	**1.052 ns**	**0.600 *****	**2.084 *****	**1.049 ns**
Growth rate of the population	**1.015 *****	**1.049 *****	**0.987 ns**	**1.010 ****
Spatial Environment: ***size of the nearest Urban Area***				
35 to 100,000 inh.	**1.292 *****	**0.703 ***	**1.306 ***	**1.481 *****
100 to 500,000 inh.	**1.343 *****	**1.365 ns**	**1.159 ns**	**1.243 ****
> 500,000 inh.	**0.812 ns**	**0.655 ns**	**0.836 ns**	**0.899 ns**

*Exponentiated coefficients - * p<.10, ** p<.05, *** p<.01*

3. Main results

Logit model B: belonging to a canton (HH HL LH) according to product type

DepVar.: Canton HHHLLH for	B1 All products	B2 Beverage	B3 Cereals	B4 Milk	B5 Meat
Agricultural Profile					
Weight of Agriculture (UTA)	1.290 ***	1.547***	1.241***	1.055	1.206***
Predominant production syst.	spec. crops +	spec. crops +	arable crops+	Mixed farming+	Mixed farming+
Demographic profile					
Peri-urban dominant	0.909 ns	0.800 ns	0.823*	1.085 ns	1.078 ns
Urban dominant	1.052 ns	0.652**	0.948 ns	1.062 ns	2.000***
Growth rate of the population	1.015 ***	1.019**	1.007 ns	1.023***	0.995 ns
Spatial Environment: *size of the nearest Urban Area*					
35 to 100,000 inh.	1.292 ***	0.921 ns	1.050 ns	1.404***	1.631***
100 to 500,000 inh.	1.343 ***	1.107 ns	1.284**	1.229 ns	1.444**
> 500,000 inh.	0.812 ns	0.643*	1.316*	0.497***	0.893 ns

*Exponentiated coefficients ; * p<.10, ** p<.05, ****

3. Main results

Model A: Canton (HH - cluster, HL - hot spot, or LH)
Model B: Product type

- ***AP***: Positive impact of the agricultural weight on the probability of having a significant cooperative potential
  - The greatest impact is for HH cantons, which confirms a strong link between agricultural potential and the existence of cooperatives.
- ***DP***: Population growth rate has a global positive effect on the probability of cantons to have a high level of cooperative activities
  - Model A: in particular for HH and LH cantons
  - Model B: in particular for Milk and Beverage

Type of area has a different effect according to spatial patterns and product type.

- Model A: urban cantons have a higher probability to be a “hot spot” for coops.
- Model B: urban cantons have an unfavourable effect on wine but a favourable one on meat.

- ***SE***: Similar effects for canton type, however different according to product type.
  - Model A: positive impact of mid-sized urban areas and not significant for large

4. Conclusion and further research

- Choice of indicators and geographic levels influence the concentration and spatial autocorrelation measurements
  - *We must remain cautious in the interpretation of observed spatial patterns.*
- Cooperative industries prefer to locate in areas:
  - With high agricultural potential
  - With population growth
  - Near mid-sized urban areas

However there are specific patterns according to

4. Conclusion and further research

- Further research
  - Deepening the understanding of “urban vs. rural” constraints and strengths for cooperative activities.
  - Comparison between “cooperative” sector and “private” sector
  - Further analysis of the “pertinent” levels of spatial aggregation (associated with data collection problems)

Thank you for your attention

Characteristics of the three geographic levels used

Geographic level	Number of entities	Average surface area (km2)	Standard deviation area (km2)	Average connectivity
Department	96	5 666.4	1 923.8	4.96
Small Agricultural Region	714	761.9	717.1	5.79
Canton	3 689	147.5	98.6	5.79