Adaptation Strategies of Bordeaux's wine growers to face Climate Change

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Introduction

- There is a strong consensus among international scientists regarding the existence of climate change (CC)
- Evidence of this phenomenon is provided by several empirical studies (for a review, see Ashenfelter and Storchmann, 2014).
- Scholars have demonstrated that climate affects :
  - **vineyard yields** (Lobell *et al.*, 2006; Fraga *et al.*, 2014),
  - **wine quality** (Jones *et al.*, 2005; de Orduna, 2010 ; Ashenfelter and Storchmann, 2010b),
  - **wine prices** (Ashenfelter *et al.*, 1995 ; Lecocq and Visser, 2006 ; Chevet *et al.*, 2011),
  - the economic effect on **wine firms' profitability** in terms of net revenue or profit (Haeger and Storchmann, 2006 ; Ashenfelter and Storchmann, 2010a ; Ashenfelter and Storchmann, 2010b; Marinoni *et al.*, 2012).

But about almost nothing is known about the potential responses and efficient adaptation strategies implemented by wine growers to these different changes (Seguin, 2007).

Research question

- To produce relevant models about wine growing areas evolution in the future, research has to consider the adaptation strategies adopted by the wine growers.

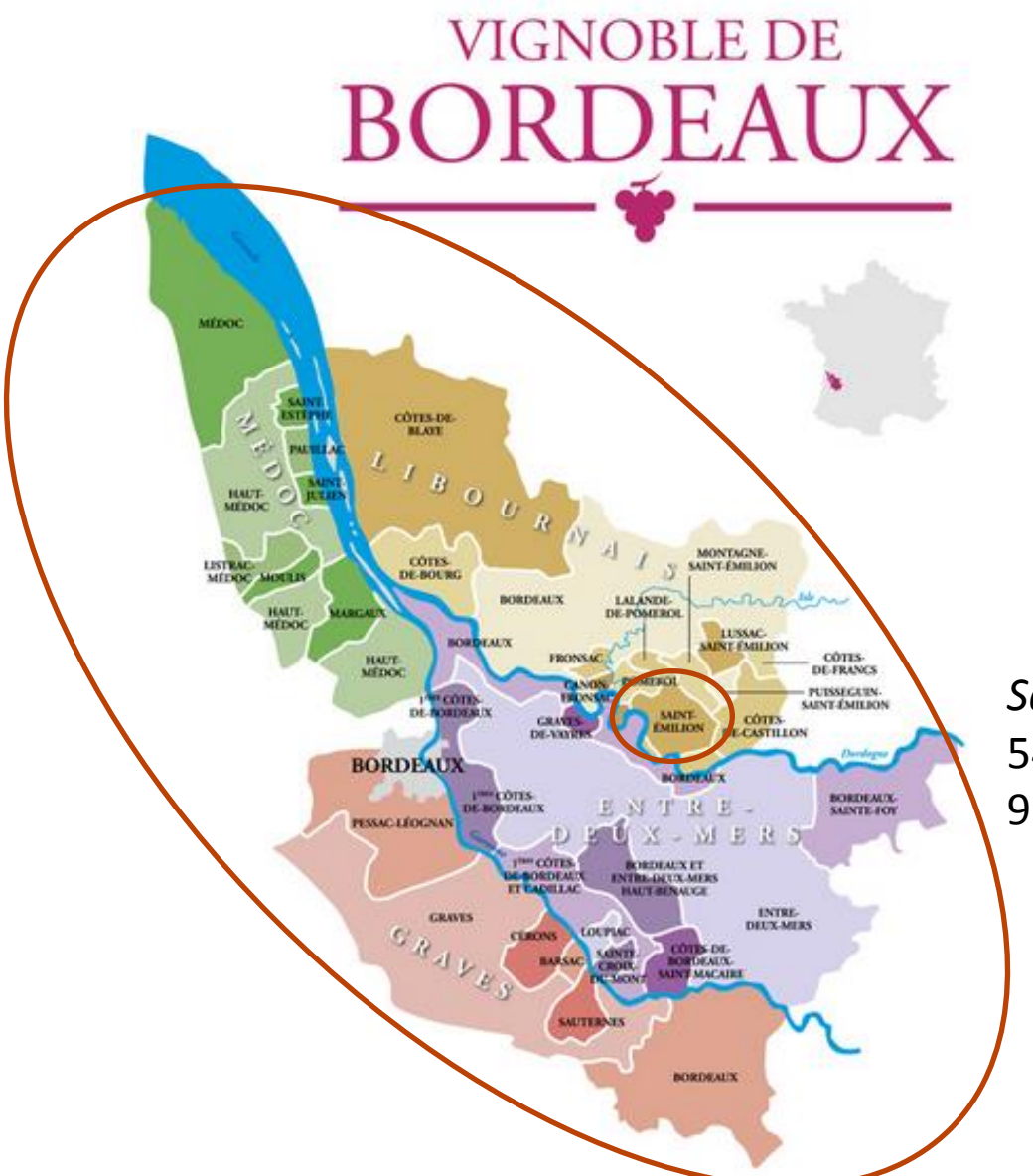
  → Wine growers could have to consider every year differently the harvest date, the spraying, green harvesting, tillage, irrigation and so on… : modifications in the technical routes, oenological processes or marketing strategies are required

- But are wine growers really adapting their vineyard/cellar management or marketing strategies to climate change ?
  - **CC**: maintaining a **strategic flexibility** (when necessary) thanks to annual or one-time changes
    => short-run, every year, different for every vintage
  - **GW** (Global Warming): adaptation to the climate **structural evolution** (higher temperatures)
    => changes in the long-run, routines modification

Objectives

Trying to identify if and how the wine growers are adapting to CC/GW in the Bordeaux wine area:

- In the short-run (within a vintage): adaptation to CC. Which changes ?
- From a vintage to another
- In the long-run: adaptation to GW. Which changes ?



- The Bordeaux wine region

  113 000 ha

  57 appellations (97% of the production)

- 2015 (CIVB, 2016):

  4.8 MhL, 640 Mbt (-5%)

  3.8 billion € (+1%)

Saint-Emilion vineyards
5400ha
966 growers

Bordeaux - Bordeaux supérieur area
55% of the production
4281 growers

I. Methodology: a survey-based on wine growers from *Saint-Emilion* and *Bordeaux-Bordeaux Supérieur* appellations

- A survey: **321 grape and wine growers** in the Bordeaux wine region (focus on 2 groups of appellations: *Bordeaux-Bordeaux Supérieur* and *Saint-Emilion*) about the adaptation of the growers according to CC
- Economic evaluation of these practices according to the so-called « *effet millésime* »

2003
2010
2013

All
5247 contacts (web+phone surveys)

Bordeaux - Bordeaux supérieur appellation
4281 contacts

Saint-Emilion appellation
966 contacts

Answers
321 questionnaires

Bordeaux – Bordeaux supérieur
233

Saint-Emilion
88

Questionnaire:
« Sustainability and effet millésime in viticulture »

II. Adaptation as a routine

- Producers are aware of climate change because when speaking about "*effet millésime*" with them; they directly associate climate change and climatic variations (sun, rain, climate, temperature, meteorology).

  → 2003, 2005, 2009, 2010, 2013 for the more quoted ones.

- They estimate to globally benefit from CC.

- They are adapting depending on the vintage and the appellation group

Table 1: Adaptation according to the vintage and the appellation group

	Saint-Emilion group	Bordeaux-Bordeaux supérieur group
2003	55/88=62.5%	142/233=60.9%
2010	38/88=43.2%	76/233=32.6%
2013	55/88=62.5%	103/233=44.2%
All	61/88=69%	154/233=66%

II. Adaptation as a routine

- **Which adaptations in the short-run ?**

  → mainly technical ones for grape production, depending on the vintage

Strategic Flexibility

Table 2: Adaptations according to the different vintages

Vintage	% growers	Operations concerned	Regrets	Identified brakes
2013 (cold, humid)	62%	**Grapevine management (especially chemical treatments)** Early harvest for sanitary reasons (Botrytis) Thermo-vinification	Grapevine Management	Organization Anticipation Production cost
2010 (« perfect » vintage)	48%	**Vinification-wine processing** Grapevine management Soil management	Vinification-wine processing (pumping)	Investment Organization Anticipation Production cost
2003 (very hot summer)	75%	**Early harvest** Soil management Grapevine management	Soil management (management of the grass in the ranks)	Anticipation Production cost Equipment Appellation rules

II. Adaptation as a routine

- **Which adaptations in the long-run ?**

Structural Evolution

Maximum 22% of them are considering long-term modifications (depending on the type of practice).

→ Date of harvest, plantation density (especially in the *Bordeaux Bordeaux-supérieur* area), change in grapevine varieties and rootstocks.

→ Mainly technical aspects for the vineyards, instead of wine processing and marketing.

Appellations rules defining a lot of things like the possibility to irrigate, the authorized varieties and rootstocks and their %, the density, …

→ The growers don't see these rules as important brakes for changing and coping with climate change.

→ Could easily be changed (55% of them are favorable to modify them) when percieved as constrainsts, especially for irrigation issues, authorized varieties according to their adaptation or not to climate change.

III. Experience matters

Probit model (2013 vintage)

Yi = 1 if adaptation occurred in year 2013 ; 0 otherwise

Wald chi2(10) = 106.45
Prob > chi2 = 0.0000
Log pseudolikelihood = -134.31608 Pseudo R2 = 0.3496

	Variables	Coef	Robust Std.Err.
Traditional factors	Age	-0.005	0.007
	Diploma	0.458***	0.199
	UAA vines	0.000	0.003
	UTH (labor)	0.012	0.013
Production/Marketing informations	St Emilion Appell	0.593***	0.199
	Coop	-0.881***	0.266
	Bottle	0.303*	0.238
	Mix	0.198	0.379
	Env	0.348**	0.181
Expérience	Adapt_2003	1.841***	0.207
	cste	-1.238***	0.477

*p < .10, ** p < .05, *** p < .01

III. Experience matters

- General information has a significative impact on the adaptation strategy
  - *Profile of the wine grower: high education level is the only variable able to significantly affecting the adaptation in 2013*

- Information about production and marketing
  - *Bottle vs bulk: a high valuation of the product (bottles) leads to a higher probability of adaptation*
  - *Cooperatives: not managing the wine process*
  - *Territorial issue: the appellation context matters (village appellation vs regional appellation)*
  - *Implementing environmental approaches affects the adaptation in 2013*

- Experience matters

  To understand a 2013 decision, it is very important to know the past!

  Even if the adaptation in the short-run is not the same in 2003 and 2013, the probability to adapt in 2013 depends strongly on the adaptation in 2003.

Conclusion

- 1/ Based on the conducted survey, grape and wine growers are anticipating the changes from one vintage to another, in *Bordeaux-Bordeaux supérieur* and *Saint-Emilion* appellations
  => **Strategic flexibility in the short-run to face CC**

- 2/ Based on the estimated probit model, we also show that they have the ability to develop a structural adaptation in the way they are designing their vineyards (vine management, plant material, …) and a dependance between vintages
  => **Anticipation in the long-run to face GW**

- **3/ Parallel evolution between technical routes and annual climate change/global warming**

- **4/ Work is still ongoing:**
  -improving the probit model (introducing the dynamics ⇒ dynamic probit model, new variables, other vintages),
  -identifying different types of behavior (MCA) and criteria for decision
  -analyzing the dynamics of the industry to help grape growers anticipate and implement change in appellation systems (AOCs).

Thank you for your attention

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