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; 2016).
- 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-Émilion 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* »

<table>
<thead>
<tr>
<th>Year</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>5247</td>
</tr>
<tr>
<td>2010</td>
<td>233</td>
</tr>
<tr>
<td>2013</td>
<td>88</td>
</tr>
</tbody>
</table>

**Questionnaire:** « *Sustainability and effet millésime in viticulture* »
I. Methodology: a survey-based on wine growers from *Saint-Emilion* and *Bordeaux-Bordeaux Supérieur* appellations

- **General information**
  - Profile of the wine grower (gender, age, education)
  - Information about the grape/wine firm (UAA, labor force, type of firm)

- **Informations about production and commercialization**
  - Type of wine
  - AOC/AOP
  - Cépages/varieties
  - Phytosanitary treatments
  - Certifications & environmental approaches
  - Distribution channels (direct selling, negotiant...)
  - Type of products sold (bulk, bottles, BIB...)
  - Price

- **Technical (grapes, wine) and marketing practices for 3 specific vintages and the associated economic consequences (short-run)**

- **Long-term anticipations**
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).
- 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

<table>
<thead>
<tr>
<th>Year</th>
<th>Saint-Emilion group</th>
<th>Bordeaux-Bordeaux supérieur group</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>55/88=62.5%</td>
<td>142/233=60.9%</td>
</tr>
<tr>
<td>2010</td>
<td>38/88=43.2%</td>
<td>76/233=32.6%</td>
</tr>
<tr>
<td>2013</td>
<td>55/88=62.5%</td>
<td>103/233=44.2%</td>
</tr>
<tr>
<td>All</td>
<td>61/88=69%</td>
<td>154/233=66%</td>
</tr>
</tbody>
</table>
II. Adaptation as a routine

- **Which adaptations in the short-run?**
  - mainly technical ones for grape production, depending on the vintage

*Table 2: Adaptations according to the different vintages*

<table>
<thead>
<tr>
<th>Vintage</th>
<th>% growers</th>
<th>Operations concerned</th>
<th>Regrets</th>
<th>Identified brakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 (cold, humid)</td>
<td>62%</td>
<td><strong>Grapevine management</strong> <em>(especially chemical treatments)</em>&lt;br&gt;Early harvest for sanitary reasons <em>(Botrytis)</em>&lt;br&gt;Thermo-vinification</td>
<td>Grapevine Management</td>
<td>Organization&lt;br&gt;Anticipation&lt;br&gt;Production cost</td>
</tr>
<tr>
<td>2010 <em>(« perfect » vintage)</em></td>
<td>48%</td>
<td><strong>Vinification-wine processing</strong>&lt;br&gt;Grapevine management&lt;br&gt;Soil management</td>
<td>Vinification-wine processing <em>(pumping)</em></td>
<td>Investment&lt;br&gt;Organization&lt;br&gt;Anticipation&lt;br&gt;Production cost</td>
</tr>
<tr>
<td>2003 <em>(very hot summer)</em></td>
<td>75%</td>
<td><strong>Early harvest</strong>&lt;br&gt;Soil management&lt;br&gt;Grapevine management</td>
<td>Soil management <em>(management of the grass in the ranks)</em></td>
<td>Anticipation&lt;br&gt;Production cost&lt;br&gt;Equipment&lt;br&gt;Appellation rules</td>
</tr>
</tbody>
</table>
II. Adaptation as a routine

• Which adaptations in the long-run?

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 perceived as constraints, 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

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coef</th>
<th>Robust Std.Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>-0.005</td>
<td>0.007</td>
</tr>
<tr>
<td>Diploma</td>
<td>0.458***</td>
<td>0.199</td>
</tr>
<tr>
<td>UAA vines</td>
<td>0.000</td>
<td>0.003</td>
</tr>
<tr>
<td>UTH (labor)</td>
<td>0.012</td>
<td>0.013</td>
</tr>
<tr>
<td>St Emilion Appell</td>
<td>0.593***</td>
<td>0.199</td>
</tr>
<tr>
<td>Coop</td>
<td>-0.881***</td>
<td>0.266</td>
</tr>
<tr>
<td>Bottle</td>
<td>0.303*</td>
<td>0.238</td>
</tr>
<tr>
<td>Mix</td>
<td>0.198</td>
<td>0.379</td>
</tr>
<tr>
<td>Env</td>
<td>0.348**</td>
<td>0.181</td>
</tr>
<tr>
<td>Adapt_2003</td>
<td>1.841***</td>
<td>0.207</td>
</tr>
<tr>
<td>cste</td>
<td>-1.238***</td>
<td>0.477</td>
</tr>
</tbody>
</table>

Log pseudolikelihood = -134.31608

Wald chi2(10) = 106.45
Prob > chi2 = 0.0000
Pseudo R2 = 0.3496

*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, we can say 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 to anticipate and implement change in appellation systems (AOCs).
Thank you for your attention
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