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1 Do wine experts share the same mental representation? A drawing elicitation study with wine  
2 makers, sellers, and critics

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9  
10 Abstract:

11 Wine experts' mental representations have often been studied by comparing experts and  
12 novices without differentiating between the types of experts. Yet, it seemed that experts  
13 developed skills through their training and practice, and thus may have different wine  
14 representations. The first objective of this study was to examine the effect of experts'  
15 background and actual occupation on their wine representation. Beaujolais was used as a  
16 case study as this vineyard was in constant evolution with the emergence of new mentions  
17 such as *Pierres Dorées*. The second objective was to evaluate how new information was  
18 integrated in experts' mental representation. Three panels were recruited: wine makers, wine  
19 sellers, and wine critics. To access their mental representations, a drawing elicitation method  
20 was combined with an interview. The results highlighted a common structure in the  
21 representations of experts based on two poles: the first pole was linked to the environment  
22 and the vineyard, and the second pole was linked to the intrinsic aspects of wines. This  
23 universal mental representation of wine would be based on the experts' long-term memory  
24 knowledge acquired during training. Some differences linked to the experts' profession,  
25 experience and exposure were also observed. These differences could be explained in terms  
26 of perceptual learning. Through shared experiences and exposures, experts with similar  
27 occupations and backgrounds developed similar mental representations (*e.g.*, wine makers  
28 or wine sellers). Conversely, despite a common occupation, experts with a different  
29 experience, practice and background developed idiosyncratic wine representations (*e.g.*,  
30 wine critics).

31 Keywords: expertise, wine, mental representation, perceptual learning, drawing elicitation,  
32 Beaujolais

33 1. Introduction

34 A wine expert can be defined as a person with extensive knowledge in wine and who could  
35 conduct wine tasting (Grohmann *et al.*, 2018). From the consumer point of view, a wine  
36 expert is a person who can provide help in choosing a wine for a special occasion thanks to  
37 his or her knowledge and advice (Lesschaeve, 2007). According to Croijmans and Majid  
38 (2016), the most important determinant in becoming a wine expert is to study wine for many  
39 years and even after becoming a wine expert, people still need to train and practice. This is  
40 an idea that was akin to Ericsson's (2007) deliberate practice theory. According to this  
41 author, deliberate practice leads to both the enhancement of skills a person already  
42 possesses and the development of the scope and breadth of those skills. To become a wine  
43 expert, wine knowledge is important but deliberate practice and wine tasting are crucial.

44 Different types of wine experts are recognized by the public and their peers: experienced  
45 wine makers, wine sellers or wine writers (Lesschaeve, 2007). These experts attended  
46 different types of training (*e.g.*, oenology, sommelier, or self-learning) and worked in different

47 wine areas (Grohmann *et al.*, 2018). Wine makers (*i.e.*, oenologists or winegrowers) have  
48 attended courses on the sciences of the vine and wine such as physiology, management and  
49 protection of the vine, microbiology, biochemistry, and the oenological practices related to  
50 winemaking. They also attended wine tasting courses to learn how to evaluate wine quality  
51 and to recognize wine defects. According to the International Organisation of Vine and Wine  
52 (OIV), their main job consists in transforming the grape harvest into qualitative wine  
53 (International Organisation of the Vine and Wine, 2013). The training of wine sellers (*i.e.*,  
54 sommeliers and wine merchants) in hospitality or wine schools is dedicated to the study of  
55 wines and wine-producing areas, wine packaging and marketing, wine tasting, gastronomy  
56 and food and beverage pairing principles. Their main job consists in analysing and capturing  
57 customers' tastes to help them select the wines, or other types of beverages, that best match  
58 their tastes and their dishes (International Organisation of Vine and Wine, 2014). Unlike wine  
59 makers and wine sellers, wine writers are often self-taught and/or attended journalism  
60 courses without any scientific or technical training related to vine or wine. They define  
61 themselves as wine lovers whose main job is to provide recommendations on wine  
62 selections to wine consumers through the targeted publication of press articles or wine  
63 guides.

64 While these different types of experts are socially acknowledged, studies on wine expertise  
65 rarely consider them. Most wine studies are focused on the differences between experts and  
66 novices taking experts as a unified group. Yet, recently, Pearson *et al.* (2020) showed that  
67 although different types of experts share common competencies on the description of wines,  
68 they also differ in some ways. In their study, they asked a group of sommeliers from around  
69 the world and a group of Australian winemakers to describe a set of wines using a pivot  
70 profile methodology (Thuillier *et al.*, 2015). Results showed that the sensory  
71 characterizations were globally similar between the two groups of wine experts. Pearson *et al.*  
72 (2020) reported that “*the two groups of judges used slightly different lexicons to describe*  
73 *the products (p.89)*” and “*the winemakers used a more technical lexicon, with terms such as*  
74 *volatile acidity, reductive and developed, which were not used by the sommeliers (p.88)*”.  
75 Further work, however, is needed to better understand the differences between different  
76 types of experts. An interesting way to look at these differences is to look at the wine  
77 representations experts have developed through their training and wine experience. As  
78 different experts have different training and different wine experience, we can expect them to  
79 have different wine representations.

80 Manetta and Urdapilleta (2011) defined mental representations as “*knowledge or beliefs that*  
81 *are well stabilized in the subject's memory, but which may change as a result of experience*  
82 *or instruction (p.71)*”. Solomon (1997) was one of the first authors who studied experts' wine  
83 representations. He asked wine experts (wholesale buyers, retail managers, sommeliers,  
84 wine educators and writers) and novices to describe a set of wines and then to sort the wines  
85 according to their similarities. For both experts and novices, the descriptions generated for  
86 wines from a given grape variety were more similar among them than the descriptions  
87 generated for wines of different grapes suggesting that “*experts and novices appear to agree*  
88 *on what it is to constitute an attribute of a wine (p.54)*” However, in the sorting task, only  
89 experts relied on this concept of grape variety to group together the wine samples. Novices  
90 sorted the wines based on sensory attributes such as fruitiness bitterness and sweetness.  
91 According to Solomon, experts used top-down processing (*i.e.*, their knowledge) to describe  
92 and classify the wines whereas novices relied on bottom-up processing (*i.e.*, sensory

93 attributes). To test this hypothesis, Hughson and Boakes (2002) investigated experts' and  
94 novices' memory for wine descriptions. They showed that wine experts had better memory  
95 performance than novices only when the descriptions corresponded to a wine from a specific  
96 grape variety. On the contrary, their performance was lower than that of novices when the  
97 descriptions were random. In agreement with Solomon (1997), Hughson and Boakes (2002)  
98 concluded that "*experts automatically use their knowledge about the typical characteristics of*  
99 *particular varieties of wine (p.470)*" and "*It appears that experts identify characteristics of a*  
100 *wine by comparing it with models and by searching for only those features previously*  
101 *associated with a model (p.470)*".

102 Around the same time, Brochet and Dubourdiou (2001) arrived at the same conclusion by  
103 analysing the wine notes of four wine critics. Results suggested that wine critics used an  
104 associative system based on a few prototypes to write their wine notes. According to the  
105 authors, wine critics develop prototypes of red and white wines through their frequent wine  
106 tastings. Then, to write their wine notes they would compare the wine they taste with all the  
107 wine prototypes they have stored in memory and use this information to describe the new  
108 wine. This idea has also been put forward by Ballester *et al.* (2008) using a sorting task of  
109 Chardonnay and Muscadet (Melon de Bourgogne) wines based exclusively on smell.  
110 According to these last authors, experts' wine mental representations are structured  
111 according to a typicality gradient based on their perceptual similarities with wine prototypes.

112 Recently, Honoré-Chedozeau *et al.* (2017) explored wine experts' mental representations via  
113 a hierarchical sorting task based on Beaujolais wine labels, rather than tasting. Most experts  
114 sorted the wines according to a hierarchical taxonomy corresponding to the Beaujolais wine  
115 appellation-based system, suggesting a taxonomy-based organization of their knowledge.  
116 Interestingly, some experts chose not to use their taxonomic based representations to  
117 perform the task but relied on ad-hoc or goal-oriented strategies based on salient features of  
118 the wine labels. The authors interpreted this phenomenon as an indication of the flexibility of  
119 wine experts' representations. This flexibility results from training and allows experts to deal  
120 with changes in the environment, and thus adapt their behaviour to the situation.

121 Experts' mental representations are therefore not static and can change over time. Although  
122 this dynamical dimension has not been studied for wine representation it was explored in  
123 other fields. For example, Sauv e & Machab ee (2000) investigated how a teacher's mental  
124 representations evolve when new information appears. They observed three patterns of  
125 evolution depending on the compatibility of the new information with the existing  
126 representation: i: the new information was totally compatible with the mental representation  
127 and did not change the mental representation, ii: the new information was partially  
128 compatible, thus the new elements of representation are added to those that already existed,  
129 in order to enrich the mental representation without changing the global structure of the  
130 mental representations, and iii: the new information was incompatible with the structure of  
131 the mental representation, thus, to reduce the problem linked to the incompatibility of  
132 information, pre-existing elements are transformed or eliminated in favour of new elements,  
133 and the general structure of the mental representation is modified. If the new elements were  
134 in total rupture with the existing mental representation, the structure of the mental  
135 representation could thus be completely upset.

136 Another aspect of experts' mental representation of wine that has not been studied is the  
137 effect of skill level. While this effect has been widely documented in diverse domains (chess

138 (Freyhof *et al.*, 1992), medicine (Patel & Groen, 1991), music (Sloboda, 1984), sport (Allard  
139 & Starkes, 1991)), research examining how experts' mental representations are affected by  
140 the type of expertise is lacking. This is especially true in the wine domain where most studies  
141 pool together different types of experts (wine critics, sommeliers, winegrowers) without  
142 looking at the difference among them (Melcher & Schooler, 1996; Parr, Heatherbell and  
143 White, 2002; Bastian *et al.*, 2010; Sàenz-Navajas *et al.*, 2013; Tempère *et al.*, 2014;  
144 Croijmans *et al.*, 2020). Yet, according to Brochet & Dubourdieu (2001), experts' mental  
145 representations could depend on the type of expertise: winemakers would have "*winemaking*  
146 *prototypes*" and wine critics "*quality prototypes*".

147 Based on these considerations, the objective of our study was to evaluate the effect of the  
148 type of expertise on the structure and content of wine mental representations and to  
149 understand the evolution of these representations. Three types of wine experts were  
150 recruited (wine makers, wine sellers and wine critics) to participate in a drawing elicitation  
151 task. Coupled with semi-directed interviews, this task was shown to be an efficient tool to  
152 access the structure and content of mental representations (Bagnoli, 2009; Umoquit *et al.*,  
153 2011). Its main advantage is that participants can freely and spontaneously describe their  
154 mental representations without being influenced by specific questions.

155 The Beaujolais vineyard (*i.e.*, a wine-producing region) was chosen as a case study as it has  
156 gone through recent developments in terms of marketing which led to a new vision of the  
157 diversity of Beaujolais wines. Among these new developments, a specific wine mention  
158 within the Beaujolais PDO was created in 2017: the *Pierres Dorées* mention. Classically, the  
159 PDO wines from the Beaujolais area are classified into three main categories: Beaujolais,  
160 Beaujolais-Villages and Cru Beaujolais. The Cru Beaujolais category is divided in 10 crus.  
161 The new mention separates the Beaujolais PDO category in three: Beaujolais, Beaujolais  
162 Nouveau and Beaujolais *Pierres Dorées*.

163 Our specific research questions were the following: i: Do wine experts' mental  
164 representations of the Beaujolais wines vary according to the type of expertise? ii: How is the  
165 new *Pierres Dorées* mention incorporated in the mental representations of Beaujolais wines  
166 of the three groups of experts? Based on the work of Sauv e & Machab ee (2000), three  
167 possibilities can be considered: (1) the mention *Pierres Dor ees* is not incorporated in the  
168 mental representation of the Beaujolais wines, (2) the mention *Pierres Dor ees* is added to  
169 the representation as a peripheral element, and (3) the mention *Pierres Dor ees* is integrated  
170 in the core of the mental representation of the Beaujolais wines and increases its complexity.

## 171 2. Materials and Methods

### 172 2.1 Participants

173 A total of 52 wine experts (35 men and 17 women) with an average age of 49 years old were  
174 recruited via an internal database and the LinkedIn social network. Wine experts were  
175 separated into three panels based on their main professional activity. The first panel, named  
176 Makers, was composed of people who make, supervise, or advise on all the stages and  
177 operations of winemaking in the Beaujolais vineyard. This panel was composed of eleven  
178 winemakers and five consultants in oenology. The second panel, named Sellers, was  
179 composed of people who participate in the direct trade of wine bottles with consumers in  
180 stores or restaurants in the Beaujolais region. This panel was composed of eight sommeliers  
181 and ten wine merchants. The third panel, named Critics, was composed of seventeen  
182 professionals who taste wines to write articles, books, or blogs. They were preferably  
183 recruited at the regional level, and then at the national and international levels, checking in

184 advance that they were all French speaking and had knowledge about the Beaujolais wines.  
185 Only experts with at least one year of experience in their profession were selected to  
186 participate in the study. A questionnaire was sent *a posteriori* to the participants to obtain  
187 information on their training and experiences with Beaujolais and *Pierres Dorées* wines. Only  
188 85% of the participants completed it. Participants' characteristics are reported in Table 1.  
189

190 The three panels were balanced for age but not for gender, the proportion of men was higher  
191 than that of women in the Seller and Critic panels. This low proportion of women reflected the  
192 actual workforce in these occupations where there were more men than women. All the  
193 Makers were trained in winemaking. Most of the Sellers (50%) had sommelier training and  
194 35.7% of them are self-taught. As for the Critics, 46.6% of them considered themselves to be  
195 self-taught. They acquired their knowledge of wine through personal reading and research,  
196 personal tastings, visits to wineries, discussions with professionals in the industry, or by  
197 participating in wine competitions as tasters. The Makers and the Sellers were more familiar  
198 with Beaujolais wines because they lived and worked in the Beaujolais area. On the contrary,  
199 the Critics had less experience in Beaujolais because they did not all work in the Beaujolais  
200 region (59% of them were located outside the Beaujolais region). In fact, some of them lived  
201 in Paris or abroad but they all wrote articles about Beaujolais wines. All the experts knew the  
202 wines of the *Pierres Dorées*, but 13.6% of them had only heard about the wines of the  
203 *Pierres Dorées* without ever having tasted them yet.

## 204 2.2 Procedure

205 An interview was used to explore participants' Beaujolais wine diversity representation. The  
206 interview included two successive steps: a free word association task and a drawing  
207 elicitation task. The interview was conducted individually with the same experimenter. Each  
208 interview was recorded with a mobile phone to be transcribed and further analysed.

### 209 2.2.1 Free word association task

210 The free association task was used as a warm up before the drawing elicitation task. The  
211 experimenter asked the participants to indicate the five words that came to their mind when  
212 he said the words: "car" and "sky". After this familiarization phase, participants were asked by  
213 the experimenter the following question: "*Give me the first five words that come to your mind*  
214 *spontaneously when I say "Beaujolais wines"*". As this task was used as a warm up, the data  
215 are not presented in this paper.

### 216 2.2.2 Drawing elicitation task

217 Participants received the following instructions: "*Draw me a picture to explain the diversity of*  
218 *Beaujolais wines. You can use words, numbers, symbols... Whatever you think is*  
219 *necessary*". Participants could use words or symbols because some of them may have been  
220 uncomfortable with the idea of drawing or may have been blocked by having to make a  
221 drawing that would be analysed later (Greyson *et al.*, 2017). They had at their disposal a  
222 square white sheet of paper 29.7 cm wide and a black pen. No further instruction was given.  
223 They were free to speak or not during the drawing process and had no time limit. Once the  
224 drawing elicitation task was completed, the experimenter asked the participants to explain  
225 their drawing and the decisions they made to produce it.

226 If participants had placed the term “*Pierres Dorées*” on their drawing the experimenter asked  
227 them to speak about their knowledge about *Pierres Dorées*. Otherwise, the experimenter  
228 introduced the idea of *Pierres Dorées* by asking them “*If I tell you about “Wines of the Pierres*  
229 *Dorées”, does that mean anything to you?*”. Participants were asked to write the term *Pierres*  
230 *Dorées* on a Post-it note and to place it on their drawing. They were then asked to explain  
231 why they positioned it in this specific place and what *Pierres Dorées* meant to them.

## 232 2.3 Data Analysis

233 As the drawings obtained in the drawing elicitation task were used as a support for  
234 participants to express their thoughts, the analysis was carried out only on the explanations  
235 of the drawing. Nevertheless, we looked at the styles (*e.g.*, the use of words, symbols,  
236 numbers, hierarchies, or maps) and the level of details of each drawing. The drawings  
237 produced were very heterogeneous from one expert to another within a same panel, but this  
238 heterogeneity remained similar between the three expert panels. As an illustration, four  
239 different drawings of the Maker panel are shown in Figure 1.

240 Thus, fifty-two interviews were transcribed and separated into three corpuses, one for each  
241 panel: Makers, Sellers, and Critics. These corpuses were separated into two sub-corpuses: a  
242 first sub-corpus including the verbalization of the drawing about the diversity of Beaujolais  
243 wines and a second one, the verbalization of the knowledge on wine from *Pierres Dorées*.  
244 Our strategy was to analyse separately the Beaujolais wines diversity sub-corpuses, and  
245 then to introduce the *Pierres Dorées* sub-corpus in the analysis to evaluate how the new  
246 *Pierres Dorées* category was positioned in the representation of Beaujolais diversity. Two  
247 analyses were carried out in parallel for each sub-corpus: an automatic analysis and a  
248 thematic analysis.

### 249 2.3.1 Automatic analysis

250 The automatic analysis was carried out with the IRaMuTeQ textual analysis software version  
251 0.7 alpha 2 (Ratinaud, 2009) based on the R statistical software version 4.0.3 for Windows  
252 (R Core Team, 2020) and Python language. Following Souza *et al.* (2018), all corpuses were  
253 pre-processed using the following steps: 1) lemmatization (singular/plural,  
254 masculine/feminine, infinitive/conjugation); 2) binding of certain inseparable words (*e.g.*,  
255 Beaujolais\_Villages, Beaujolais\_Nouveaux, Pierres\_Dorées); 3) simplification of the corpus  
256 by removing verbs, adverbs, and prepositional phrases (only nouns and adjectives were kept  
257 in the analysis). The rationale to remove verbs was that most of the verbs used were common  
258 French verbs (*e.g.*, to be, to have, to do, to go) which did not bring useful information; and 4)  
259 suppression of the words with a frequency lower than five (only words occurring more than  
260 five times in each corpus were kept for the analyses). Although this cut-off point might seem  
261 drastic, this was not a problem as the goal of this analysis was to have a simplified  
262 representation of the structure of the corpus. A co-occurrence analysis was then carried out.  
263 Each corpus was divided into word segments. Since spoken language has not been  
264 extensively studied, there is no standard to decide the size of the word segment. We fixed  
265 the segment size to 15 words to obtain short segments. The co-occurrence of words within a  
266 segment was then computed and graphically represented using Kamada & Kawai (1989)  
267 spring-based algorithm. This algorithm represented the corpus as a co-occurrence or  
268 similarity tree. The size of the word labels was proportional to their frequency: the bigger the  
269 label the more frequently the word was used in the corpus. The link connecting two words

270 represented the co-occurrence between the two words. Only the strongest links appeared in  
271 the tree. A threshold was iteratively computed by the algorithm and links below this threshold  
272 were deleted to emphasize the most important links between words. Some words with co-  
273 occurrence lower than the threshold may be isolated without link with the other words. The  
274 thickness of the links between two words was proportional to the co-occurrence of the words:  
275 the thicker the link between two words, the more often these words have been used together.  
276 The length of the link reflected the agreement between experts: the shorter the link, the more  
277 consensus there was among experts on the use of these two words together (Broc *et al.*,  
278 2017).

### 279 2.3.2 Thematic analysis

280 Three independent judges read the transcripts of the interviews to identify the main themes  
281 addressed by each type of expert. Following this work, a comparison of the different themes  
282 identified was made between the three judges to obtain a list of common themes for the  
283 three types of panels. In a second step, two of the three judges took over the interviews of  
284 the three panels and selected the most representative verbatims of each theme. Only  
285 themes that were cited by at least three experts in the same panel were retained.

## 286 3. Results

287 The results of the automatic and manual analyses were interpreted conjointly. The automatic  
288 co-occurrence analysis provided similarity trees reflecting the structure of the experts' mental  
289 representations. The manual thematic analysis added content to the structure of the mental  
290 representation highlighted by the automatic analysis.

291 To address the first research question, we analysed only the first part of the corpus related to  
292 the diversity of Beaujolais wines. Then, to address the second research question, the second  
293 part of the corpus on *Pierres Dorées* has been added to the analysis.

### 294 3.1 Do wine experts' mental representations of the Beaujolais wines vary according to 295 the type of expertise?

#### 296 3.1.1 The structure of the mental representations

297 Figure 2 represented the similarity trees derived from the three corpuses. The comparison of  
298 the trees revealed both differences and similarities between the three panels of experts.  
299 First, the structure of the trees was relatively similar with two central points, or poles,  
300 *Beaujolais*, and *wine*. The three panels agreed to associate the words related to the territory  
301 and the region to the Beaujolais pole and the sensory characteristics and moments of  
302 consumption to the wine pole. For the Makers (Figure 2a), a third pole, *diversity*, appeared  
303 between the two other poles. This third pole was related to the terroir and the grape variety  
304 concepts. These two concepts seemed to be key drivers of the diversity of Beaujolais wines  
305 for the Makers.

306 Although the general structure of the co-occurrence tree was similar for the three groups of  
307 experts, differences could be observed in terms of the importance of the poles, their  
308 richness, and their connectivity. Somewhat unexpectedly, the wine pole of the Maker panel  
309 was less developed than the Beaujolais pole. It was not well structured with only two  
310 dimensions: a sensory one with terms like aromatic profile and complexity, and a second one  
311 linked to both the type of wine (white, rosé, red) and the region. A few additional terms were

312 linked to the wine pole, but were not linked together (*winemaker, appellation, and pleasure*).  
313 By contrast, the Beaujolais pole was much more structured with dimensions such as the  
314 vine, the opposition between north and south, a dimension related to the practices and  
315 philosophies of production, and a last dimension describing Beaujolais as being linked to  
316 Burgundy and marked by landscapes and fruity wines.

317 The opposite configuration was observed for the Critic panel (Figure 2c) with a wine pole  
318 richer than the Beaujolais pole. The Beaujolais pole was only composed of two dimensions:  
319 one describing the history linked to wine-growing area, and the other one describing the  
320 region producing different appellations. The wine pole was more developed with three  
321 dimensions. The most important one was based on the appellations found in the region  
322 (*Moulin-à-Vent, Morgon*) as well as Men and some sensory characteristics (*easy to drink and*  
323 *simple*). The second one was linked to the terroir and the climate which allows to have  
324 different wines. And the third one described the idea of making different wines from a single  
325 grape variety, the Gamay, but also differences in the landscapes and villages of the  
326 Beaujolais region. A particularity of the Critics' similarity tree was that it was less developed  
327 and less structured than those of the Makers and the Sellers. The length of the links between  
328 words was greater than for the other two panels. This difference in length suggested that the  
329 Critics had a more idiosyncratic view while the Makers and the Sellers were more  
330 consensual with each other.

331 The configuration observed for the Seller panel (Figure 2b) was closer to that of the Makers:  
332 the Beaujolais pole was richer and more structured than the wine pole. As for the Makers,  
333 the Beaujolais pole was structured in several dimensions with themes related to the wine-  
334 growing region and the diversity of the appellations. Several differences were to be noted  
335 such as the link with the dimension related to the colour of the wines which for the Makers  
336 was found around the wine pole. The Sellers also associated the Beaujolais pole to the  
337 concept of terroir which is associated with winegrowers, and an idea of wealth. The wine pole  
338 was focused on the sensory description of wines and the moments of consumption with a  
339 peripheral part dedicated to the grape variety, the Gamay in particular.

340 Another difference between the three groups of experts concerned *Pierres Dorées*. This term  
341 appeared only in the Makers' similarity tree and was positioned in a structured branch related  
342 to the Beaujolais pole. This term was used by only five experts, and therefore provides little  
343 information in the analysis of the structure of the similarity tree.

344 To sum up, despite similarities in the structure of the representations of the three panels of  
345 experts, the corpuses also revealed differences in the organization of their representation.  
346 The thematic analysis of the three corpuses provided a way to explore further these  
347 differences.

### 348 3.1.2 Makers, proud of their region and their know-how

349 The main theme that emerges within the Makers' discourse through the diversity of  
350 Beaujolais wines was the geography of Beaujolais. This theme was described as an  
351 opposition between the northern and the southern areas, addressed by 62% of the Makers,  
352 as illustrated by Maker M9: "*there is the north and the south*" and Maker M15: "*northern*  
353 *Beaujolais landscape [...] and southern Beaujolais landscape". The Beaujolais also referred  
354 to people, and viticultural and winemaking practices, in relation to a deep commitment to the  
355 environment. This theme seemed important as 37% of the Makers mentioned it. By*

356 describing respect for the environment, several of them explained the different types of  
357 certification and practices at the viticultural level such as: “*the conventional winemakers [...] the certifications HVE, Terra Vitis and thus, the reasoned production*” (M8), or at the  
358 winemaking level: “*it is the difference in philosophy the difference between young and old*  
359 *how they see their products*” (M11), “*the differences in the techniques used,*  
360 *thermovinification or not, traditional or not, the differences in breeding also for me it is*  
361 *important*” (M11), “*the Beaujolais vinification or not, organic or not those who use yeast or*  
362 *not and the famous thermovinification which is the subject of great debate*” (M13). When they  
363 were talking about the diversity of Beaujolais wines, the Makers obviously talked about  
364 Gamay. Indeed, 56% of them mentioned this grape variety considered as a king grape  
365 variety: “*a single grape variety, Gamay*” (M1), “*Gamay remains the identity of the Beaujolais*  
366 *region (M6)*”, “*so there is only Gamay*” (M13). This single Gamay grape led to a diversity of  
367 Beaujolais wines illustrated by the 12 PDOs resulting from it: “*Gamay is a grape variety that*  
368 *allows for an incredible diversity of products*” (M6), “*12 PDO is a lot for the same grape*  
369 *variety*” (M11). These different PDOs also conferred a diversity of sensory profiles whose  
370 common descriptors expressed the fruitiness, the lightness, and the suppleness in mouth:  
371 “*Gamay is really the grape variety of the fruit*” (M2), “*light wines*” (M7), “*supple wines*” (M14).  
372 Some Makers compared wine profiles with each other: “*light wines with little structure [...]*  
373 *wines with more complex and spicy aromas*” (M7), “*on the one hand, fruity and light wines*  
374 *[...] and wines with a more complex aromatic profile, more structured and more tannic*”  
375 (M13). For the Makers, these wines were also linked to a diversity of consumption moments  
376 through the diversity of the wines (e.g., the Beaujolais Nouveau PDO wines for a festive  
377 occasion, rosé or white wines for a seasonal consumption), as explained by Maker M7: “*on*  
378 *as well as light wines for tasting in spring or summer [...] and more complex wines for autumn*  
379 *and winter*”, or Maker M8: “*we have profiles of wines that are quite diverse and that will be*  
380 *associated with different moments of consumption*”. In addition, one third of the Makers  
381 described a diversity of values that they were committed to defend: pleasure, sharing and  
382 conviviality. This state of mind constituted the soul of the Beaujolais region which was  
383 reflected in the discourse of the Makers such as: “*the pleasure of having a drink with others,*  
384 *sharing*” (M3), “*Beaujolais wines are convivial [...] and for me, they are above all wines for*  
385 *pleasure*” (M4) or “*simple wines for convivial moments*” (M8).

387 To sum up, the Makers’ corpus reflected a strong and shared identity of the Beaujolais region  
388 among winemakers. They mostly spoke about the viticultural and winemaking methods they  
389 used in their job to elaborate the diversity of Beaujolais PDO wines, immersed in a mosaic of  
390 landscapes and moments of conviviality.

### 391 3.1.3 Sellers, arousing emotion for the region and its wines

392 The most important dimension of the diversity of Beaujolais wines for the Sellers was the  
393 Gamay grape. Indeed, 90% of them mentioned this single grape variety which offers a great  
394 diversity of wines through the 12 PDOs, as explained by Seller S9: “*there are 12 appellations*  
395 *in Beaujolais [...] the Beaujolais more in the south, the Beaujolais-Villages [...] and the 10*  
396 *Crus that can only be found in the northern part of the region*”. For the Sellers, these PDOs  
397 represented a hierarchy of quality, as expressed by Seller S3: “*there are crus, there are*  
398 *Beaujolais-Nouveaux, there are Beaujolais-Villages so there are several quality*  
399 *classifications*”, but these wines could be different because of the diversity of terroirs and  
400 soils in the different PDOs. The Sellers explained that the “*richness of the terroir*” (S3) was  
401 important and Seller S5 added that “*we do not make the same wine with the same grape*

402 *variety [...] we have only one grape variety and we are going to make different wines*. The  
403 notion of geology was mentioned by the Sellers, as it was by the Makers, to explain the  
404 differences between the north and the south of the Beaujolais, as expressed by Seller S9:  
405 *“we can clearly distinguish the northern part on granitic soils and the southern part on much*  
406 *more schist soils”* and Seller S12: *“we can have appellations on granite as well as on*  
407 *limestone, on marls as well as on clay and sand”*. Unlike the Makers, the Sellers insisted on  
408 the crus by considering them individually, and not as a group of wines named “*Beaujolais*  
409 *crus*”. For instance, many Sellers detailed the list of these 10 PDOs, like Sellers S7, S8 and  
410 S9: *“Brouilly, Côte-de-Brouilly, Chénas, Chiroubles, Fleurie, Juliéna, Morgon, Moulin-à-*  
411 *Vent, Regnié, Saint-Amour”*. The Sellers also referred to the declination of Beaujolais and  
412 Beaujolais-Villages PDOs into white, rosé, and red wines: *“12 appellations and the three*  
413 *colours”* (S5), *“mainly red but also white and then a little rosé”* (S1), and *“in the Beaujolais we*  
414 *still have the three colours of wine”* (S14).

415 Like the Makers, 58% of the Sellers described the sensory profile of Beaujolais wines. They  
416 were consensual on the overall characteristics of Beaujolais wines, expressed as: *“simple,*  
417 *fruity, easy to drink”* (S1), *“supple, light, fruity”* (S3), *“light wines”* (S5), *“supple, fruity”* (S12),  
418 *“fruity”* (S14), and *“fruity, easy to drink”* (S15). They also spoke about other descriptors to  
419 complete their presentation of the wines, like the Makers, by using more precise words such  
420 as *“fleshy”* (S1), *“heady”* (S7), *“elegant and feminine”* (S7), *“greedy”* (S9) and *“mineral”* (S10).  
421 This developed sensory description was materialized on the similarity tree by the number of  
422 words that surround the wine pole (Figure 1b). For the Sellers, the presentation of the wines  
423 was more important to describe the diversity of the wines than the notion of terroir, as in the  
424 case of the Makers.

425 However, the notion of terroir was also important for the Sellers, as illustrated by Seller S11:  
426 *“Beaujolais is not only wines, but also a region too”*. They presented the Beaujolais region as  
427 a beautiful area: *“I think it is a beautiful region”* (S1), *“we have beautiful landscapes”* (S11),  
428 so beautiful that Seller S13 compared it to the Tuscany region in Italy: *“we have a super*  
429 *vineyard of hillsides that we call little Tuscany”*. Like for the Maker panel, 42% of the Sellers  
430 discussed the values and the state of mind associated to the Beaujolais region. They  
431 described it as a friendly region: *“the friendly Beaujolais”* (S1), *“convivial wines”* (S3), *“a*  
432 *friendly soul”* (S18) with a strong notion of sharing: *“a tradition of hospitality in Beaujolais”*  
433 *(S5), “it is a place where we exchange quite easily, there is really a welcome [...] there is*  
434 *really a big notion of sharing and encounters in the region”* (S14), and an idea of pleasure: *“it*  
435 *is always a pleasure to drink a Beaujolais wine”* (S3), *“we really manage to enjoy ourselves”*  
436 *(S12), “it is still mainly pleasure wines”* (S14). The Sellers also focused on the human aspect,  
437 on the importance of Men in the vineyard, as expressed by Seller S5: *“it is still the*  
438 *winemakers who make the wine [...] it is nevertheless the winegrowers who make the typicity*  
439 *of the wines, hence the tradition”*. In addition, they mentioned a more human approach of  
440 wine than a technical one: *“I have been around a lot of domains and I find that in the last few*  
441 *years there is a young generation that has an open mind”* (S12), *“there are many takeovers*  
442 *of estates by children, and women winemakers are more and more women”* (S15), and *“the*  
443 *guy's vision of his land [...] it is a changing vineyard”* (S19). This discourse allowed them to  
444 make the vineyard more human in the eyes of consumers to arouse an emotion, and  
445 therefore, to encourage the purchase of Beaujolais wines. Sixteen percent of the Sellers also  
446 described the gastronomy and in particular the food and Beaujolais wine pairings: *“wines that*  
447 *go well with gastronomy as well as with cold meats”* (S13) and *“you can accompany*

448 *practically everything, from cold cuts to red meat, even cheese*” (S16). This theme was one  
449 of the characteristics of their job, whose main activity is to suggest wines that best match  
450 with the dishes chosen by consumers.

451 To sum up, the Sellers’ corpus reflected a promotional representation of wine. They  
452 described in detail the different appellations by naming each of them and their main sensory  
453 characteristics and food pairings. They also described the beauty of the region as their job  
454 aimed to arouse emotion, the desire to taste, and the dream to their customers.

#### 455 3.1.4 Critics, an idiosyncratic vision of Beaujolais wines

456 The Critics shared themes with either the Makers or the Sellers, without having their own  
457 specific themes. For almost three quarters of the Critics, the diversity of Beaujolais wines  
458 could be summed up in the expression of the Gamay grape variety: *“the typicality found with*  
459 *Gamay”* (C3), *“we have the Gamay”* (C4), *“let us start with Gamay”* (C5) and *“Gamay is a*  
460 *very great grape variety”* (C11). This expression was modulated by the diversity of the PDOs,  
461 as explained by different Critics: *“because there are different crus it makes different wines”*  
462 (C3), *“the famous Beaujolais crus [...] Fleurie, [...] Moulin-à-Vent, [...] Juliéna*  
463 *s”* (C4), *“there are several Beaujolais, there are the crus in the north [...] and there are the villages in the*  
464 *south”* (C12), and by a diversity of terroirs: *“the soils that give the wines their typicity”* (C3)  
465 *and “granitic terroirs [...] clay-limestone terroirs”* (C4). The diversity of soils was compared to  
466 *“a mantle of Harlequin with islets which are the crus”* (C6). Like the Makers, this diversity was  
467 also expressed by an opposition between the north and the south of the vineyard: *“because*  
468 *the Beaujolais it is divided in two, there we are on the crus and then there we have the*  
469 *Beaujolais-Villages and the simple Beaujolais”* (C13), and *“there are the crus in the north [...]*  
470 *and there are a few villages in the south where there are a few scattered vineyards”* (C12).

471 Like the Makers and the Sellers, 47% of the Critics also described the sensory profile of the  
472 wines. Although some descriptors were frequently used: *“fruity”* (C7, C8, C13, C15), *“light”*  
473 (C8, C13, C15), the other descriptors were not consensual, such as: *“the juicy side the*  
474 *elegant side”* (C3), *“low acidity wines, the velvety, roundness”* (C4), *“wines that play more on*  
475 *power and structure, they can also be floral”* (C8), *“sometimes it goes towards the cherry,*  
476 *sometimes it's fine, sometimes it's light”* (C13), or *“it is a wine that is quite delicate”* (C15).  
477 The Critics also referred to the quality of the wines as *“exceptional”* (C11) but also to the fact  
478 that *“the quality is ascending, and they are wines of the future”* (C16). The Critics, like the  
479 Makers, linked the diversity of the wines to the diversity of the moments of consumption, as  
480 described by Critic C9: *“wines can be a little easier to drink, like with a pizza or in front of the*  
481 *TV during the week [...] wines that are a little more structured, a little more complex and*  
482 *therefore will serve for family meals or for less ordinary events”*.

483 While the Beaujolais central pole was not very developed on the similarity tree (Figure 1c),  
484 the thematic analysis helped to understand the content of this pole. For 23% of the Critics,  
485 Beaujolais was related to a beautiful region with *“natural beauty”* (C3), *“beautiful landscapes”*  
486 (C15), and *“the Beaujolais mountains which are superb”* (C11). In connection with this  
487 region, there was also the importance of the diversity of winegrowers, as expressed by Critic  
488 C9: *“there are co-operators, former co-operators who may have had their fields or who were*  
489 *co-operators, who explain to the young people who are settling in a little bit what the work is*  
490 *like”*. The Beaujolais vineyard was presented as a *“vineyard on a human scale”* (C9), *“with a*  
491 *proximity of winegrowers”* (C10) with a *“joy of life”* (C11). This joy of life constituted a part of

492 the values of the Beaujolais, already described by the Maker and the Seller panels. The  
493 triptych pleasure, sharing and conviviality was thus retrieved in the Critics discourse, as  
494 illustrated by Critic C7: “wines of pleasure”, and Critic C9: “everyone shares their  
495 experiences, everyone supports each other”.

496 To sum up, the Critics had an idiosyncratic representation of the diversity of Beaujolais  
497 wines, probably due to their different backgrounds (many are self-taught). Despite their  
498 differences, a major part of them described the Beaujolais as a beautiful region bringing  
499 together a human dimension, a triptych of values and a diversity of sensory profiles and  
500 quality.

501 3.2 How is the new *Pierres Dorées* mention incorporated in the expert mental  
502 representations of Beaujolais wines?

503 To evaluate at which level the *Pierres Dorées* mention was incorporated in the mental  
504 representations of Beaujolais wines of the three panels of experts, we added the second part  
505 of the corpuses in the co-occurrence analysis. Figure 3 represented the resulting similarity  
506 trees.

507 The global structure of the trees was not much changed. For the three panels, the term  
508 *Pierres Dorées* was linked to the Beaujolais central pole. For the Makers, unlike the other  
509 two panels of experts, the term *Pierres Dorées* was spontaneously present in the discourse  
510 of some participants. Only 25% of the Makers spontaneously described the term *Pierres*  
511 *Dorées* which is linked to the Beaujolais central pole (Figure 1a). For them, *Pierres Dorées*  
512 was an area which was in the southern part of the Beaujolais vineyard, as explained by  
513 Maker M1: “the south zone of the *Pierres Dorées*”, Maker M15: “lower is the *Pierres Dorées*”,  
514 and Maker M13 who is the only one to spoke about the wines of *Pierres Dorées* briefly and  
515 explicitly: “there is the appellation Beaujolais *Pierres Dorées* now”. When we added the  
516 second part of the corpus in the analysis, the position of *Pierres Dorées* did not change  
517 (Figure 2a). However, the structure of the branch where the term *Pierres Dorées* was located  
518 was much more structured in the first analysis than in the second one, for which only the  
519 word *zone* was associated to *Pierres Dorées*. The *Pierres Dorées* term has been similarly  
520 integrated for the Sellers (Figure 2b) and the Critics (Figure 2c). For both panels, the term  
521 *Pierres Dorées* represented a dimension related to the Beaujolais pole and was defined as a  
522 region marked by hills and villages.

523 The thematic analysis of the second part of the corpus did not show any difference between  
524 the panels of experts. For all panels, the geographical location stood out the most when  
525 referring to the wines of *Pierres Dorées*. For 67% of the experts, the wines of *Pierres Dorées*  
526 were in the south of the vineyard: “*Pierres Dorées* is the south” (M9), “*Pierres Dorées* is the  
527 south Beaujolais” (S4), “it is in the south of Beaujolais” (C2). This area was famous for its  
528 architecture and heritage: “it describes the heritage with a lot of castles” (M15), “*Pierres*  
529 *Dorées* is the heritage” (S11), “these are some of the prettiest wine villages” (C16) which  
530 makes it a nice tourist region: “a very touristic sector” (M4), “it is very beautiful” (S9), “nice  
531 area” (C4). For them, the *Pierres Dorées* region was also linked to a specific terroir: “the  
532 Pierres Dorées zone is a clay-limestone zone” (M1), “clay-limestone terroir” (S8), “an area a  
533 little peculiar because it is made of clay-limestone” (C1). This terroir allowed the creation of  
534 different wine profiles: “light, simple, easy-drinking wines” (M8), “wine for laying down” (M7),  
535 “fruity and light wines” (S16), “both wines that are easy to drink and at the same time things

536 *that are a little more complex*" (C9) with a notion of quality: "*quality wines*" (S12), and "*very*  
537 *nice wines*" (S17) for which a new mention appeared: "*there are the wines now with this*  
538 *under denomination*" (M14), "*appellation Beaujolais Pierres Dorées*" (M13), "*new appellation*"  
539 (S5), and "*13<sup>th</sup> appellation of the Beaujolais*" (C17). These wines were thus wines of the  
540 future which would allow to "*add a string to the bow of the Beaujolais*" (M7) because the  
541 wines allow to "*heighten and to redecorate a little the coat of arms of the Beaujolais*" (S19).  
542 Despite this, these wines were still little known by the wine professionals: "*I know the Pierres*  
543 *Dorées but not the wines of the Pierres Dorées*" (S3), "*Pierres Dorées wines no, but Pierres*  
544 *Dorées yes*" (C15).

545 To sum up, the emergence of the *Pierres Dorées* mention did not change the representation  
546 of the three panels of experts as it described a region located to the south of the vineyard. It  
547 was thus added to the representation of the Beaujolais region, not to the representation of  
548 the Beaujolais wines. However, the thematic analysis has shown that some experts also  
549 associate *Pierres Dorées* with quality wines that may represent the future of a particular  
550 region.

#### 551 4. Discussion

552 Until now, many studies on expertise have focused on the different stages of expertise within  
553 a specific domain (Freyhof *et al.*, 1992, Patel & Groen, 1991, Sloboda, 1984, Allard &  
554 Starkes, 1991), but very few were interested in the heterogeneity that could exist between  
555 experts from a same specific domain. Our main objective was to explore this heterogeneity  
556 within the wine domain. Our hypothesis was that wine experts with different professions  
557 would have developed different skills and knowledge representation through different  
558 trainings and daily practice. The IRaMuTeQ textual analysis of Makers', Sellers', and Critics'  
559 discourses highlighted those mental representations of Beaujolais wines were organized  
560 around two interconnected poles, wine, and Beaujolais. These two poles seemed to be  
561 central to the representation of all experts. The interconnection between wine and Beaujolais  
562 indicated that wines constituted an indissociable part of the identity of the region where they  
563 are produced. In other words, wine was not considered as a separate representational  
564 element but as a part of a larger entity. The content analysis of the experts' discourses  
565 indicated that some elements associated to the wine and Beaujolais poles were shared by all  
566 wine experts and seemed to be universal and to represent the core of the mental  
567 representations. Other elements, more peripheral, were specific to each type of experts  
568 reflecting their practice and concerns.

##### 569 4.1 A universal basis for experts' mental representation of wines

570 Most representational elements shared by the three expert panels are linked to specific  
571 knowledge of wine such as the Gamay grape variety, the different appellations of the  
572 Beaujolais vineyard and the sensory profile of the wines produced. These elements had also  
573 been highlighted in previous studies of experts' wine mental representation carried out on  
574 other wines than those of Beaujolais. For instance, some studies highlighted that experts'  
575 mental representations of wine were based around grape variety wine prototypes (Ballester  
576 *et al.*, 2008; Hughson & Boakes, 2002; Solomon, 1997). More recently, Honoré Chedozeau  
577 *et al.* (2017) showed that wine experts categorize the wine labels according to different  
578 vineyards, grape varieties and PDOs. The fact that these same elements were found for all  
579 types of experts and for all the wines studied led to the idea of a common universal base of

580 knowledge shared by wine experts regardless of their origin or type of expertise. The  
581 existence of a universal knowledge basis was described in other fields of expertise such as  
582 computer programming. For example, Pennington (1987) compared two types of  
583 professional programmers (COBOL and FORTRAN programmers) with differences in  
584 educational level, college major, number of programming languages known, and number of  
585 years programming. Results of this study highlighted that the mental representations of  
586 different professional programmers were consensually based on procedural units. This  
587 knowledge was stored in experts' long-term memory and allowed them to structure their  
588 mental representations around this precise knowledge.

589 Thus, all experts, and especially wine experts, had common knowledge stored in long-term  
590 memory and acquired through training or personal research. When we looked at the common  
591 elements of wine experts' mental representation in more detail, it became clear that they  
592 were all an integral part of the various training programs followed by the experts. Indeed,  
593 grape variety, wine appellations and wine sensory profile constituted an important part of the  
594 wine experts' training. During the learning process of the experts, these elements constituted  
595 the basis of the knowledge about wine. According to the training programs for oenologists or  
596 sommeliers described by the OIV, training on the different appellations, and grape varieties  
597 as well as knowledge on the sensory profiles of wines corresponded to more than half of the  
598 training hours. In the same way, we found this important proportion of information in the  
599 various books dedicated to wine. For instance, Kevin Zraly (2020) described the different  
600 grape varieties that existed in the world as well as the different vineyards and the wines that  
601 are produced there.

602 To summarize experts' wine mental representations, had a universal basis built around three  
603 elements: grape varieties, appellations, and sensory characteristics of wines. These  
604 elements would be stored in the experts' long-term memory and are based on knowledge  
605 acquired during their training.

#### 606 4.2 Peripheral elements based on specific expert wine experience

607 Both the IRaMuTeQ textual analysis and the manual content analysis revealed that the  
608 universal base of experts' wine mental representation was surrounded by peripheral  
609 representational elements reflecting the experiences and objectives of each expert's daily  
610 work. The experiential dimension of experts' mental representation had been previously  
611 reported by Medin *et al* (1997). In this study, the performance of three types of tree experts  
612 (taxonomists, landscape workers and parks maintenance personnel) in a name card sorting  
613 task composed of 48 tree species were compared. Authors highlighted that each type of tree  
614 experts categorized the tree cards according to the specificity of each professional concerns.  
615 For instance, the taxonomists used the scientific taxonomy of trees to sort the different tree  
616 cards whereas the landscape workers used goal-derived categories representing utilitarian  
617 concerns on each type of tree (*e.g.*, weed trees, ornamentals, specimens, and street trees).  
618 These specific categorizations reflected the practice and the concerns of their daily  
619 profession. According to Gibson (1969), experience and practice allowed to increase the  
620 ability to extract information from the environment and could be defined as perceptual  
621 learning. The role of perceptual learning in experts' representations has been discussed by  
622 Honoré-Chedozeau *et al.*, (2019). In this review, authors suggested that perceptual learning  
623 modifies the mental representations of wine and beer experts, but the authors insisted that

624 the type of learning of experts was not controlled in the studies cited. The present study  
625 provides some answers to this question.

#### 626 4.2.1 How perceptual learning influences the mental representations of wine?

627 The influence of perceptual learning on mental representations has already been studied in  
628 several fields. Studies conducted in sports such as tennis (Schack & Mechsner, 2006) and  
629 volleyball (Schack, 2004) have shown that high-level experts had similar mental  
630 representations focused on the functional and biomechanical demands of the action related  
631 to their sport. In a same way, a consensus based on experience was also found in the music  
632 field (Canonne & Aucouturier, 2015). In this study, results highlighted that career musicians  
633 who had a common experience, who are used to playing together, shared knowledge that  
634 was not necessarily specific to the piece played but rather to the task at hand. According to  
635 these studies, experts shared a mental representation based on their common experience.

636 In our study, we constituted our different panels according to experts' professions and  
637 therefore according to their background and experiences with wine. Our results showed that,  
638 when experts shared common experiences, a consensus in their mental representation of  
639 wines appeared. For instance, the Makers on the one hand and the Sellers on the other hand  
640 shared common experiences and therefore had common perceptual learning within their  
641 expert type. In both examples, the experts had, for the most part, followed common training  
642 courses: 80% of the Makers have followed the same training as oenologists and 50% of the  
643 Sellers have followed the same sommelier training in hotel school. If the consensus between  
644 the Makers could be explained by the homogeneity of their training, for the Sellers the case  
645 was different. Indeed, if only 50% of the Sellers had a common training, the consensus  
646 between them must come from elsewhere. An explanation would be about self-taught  
647 Sellers, who have probably followed similar content on food and wine pairing or the  
648 management on a wine cellar through their personal training and/or experiences. The  
649 experts' profession entailed a specific experience and a specific exposure to wines. Thus,  
650 exposure could also play a role in the consensus that existed in the mental representations  
651 of experts. Indeed, the Makers and the Sellers were very exposed to Beaujolais wines. On  
652 the one hand, they all lived and worked in the Beaujolais region. On the other hand, they  
653 were used to tasting many Beaujolais wines for several decades. Indeed, 67% of the Makers  
654 and 50% of the Sellers claimed to have been tasting Beaujolais wines for more than 20  
655 years, and 87% of the Makers and 71% of the Sellers claimed to taste more than 50  
656 Beaujolais wines per year. This frequent wine-related experience certainly allowed the  
657 experts to enhance their specific knowledge of wines, especially regarding to the specific  
658 sensory characteristics of each Beaujolais PDO wine. According to the literature and our  
659 results, a common perceptual learning would lead to a consensus among expert panels.

660 This notion of consensus between experts should be considered for the practice of sensory  
661 analysis. Indeed, for studies recruiting panels of wine professionals, those panels often hide  
662 a variability of professional activities, backgrounds, and exposure to wines. Our results could  
663 provide insight into panel recruitment based on the purpose of each study. When the study is  
664 designed to meet a specific objective, a consensus among the panel could be a real  
665 advantage. The results of this study would provide a proposal for a recruitment strategy  
666 based on the expert activity to reach a better consensus within a wine expert panel, that  
667 would be linked to a common perceptual learning.

668 4.2.2 An idiosyncratic view due to the heterogeneity of wine professional experiences

669 Unlike the Makers and the Sellers, 80% of the Critic panel was composed of self-taught  
670 people, so they acquired wine knowledge in a quite different and individual way, through  
671 reading and personal research, personal wine tastings, wine estate discoveries, meetings,  
672 and discussions with winemakers and/or participation in wine contests as wine judges. Only  
673 20% of the Critics have followed a similar wine professional course. These heterogeneous  
674 professional curricula probably led to a different level of wine knowledge among the Critics,  
675 and thus different mental representations of wines. The training and experience were finally  
676 specific to each Critic, whose job was ultimately to individually blind taste and write precise  
677 and specific topics about wines or about a wine tasting set to constitute a wine guide. Thus,  
678 this variety of training and experience that was unique to each Critic finally explain the very  
679 numerous and non-consensual themes spontaneously discussed from one Critic to another  
680 about the diversity of Beaujolais wines. This idiosyncratic mental representation was  
681 probably also reinforced by the lack of exposition with Beaujolais wines because of their  
682 geographical distance from the Beaujolais region (59% of them were located outside the  
683 Beaujolais region), comparing to the other two expert panels. Indeed, the exposition with the  
684 wines was an important aspect to consider in the acquisition of wine expertise. Honoré-  
685 Chedozeau *et al.* (2017), for example, showed that familiarity with Beaujolais wines affects  
686 people's mental representation. The knowledge representation of familiar consumers (*i.e.*,  
687 consumers from around the Beaujolais region) was rigid, based on a single categorization of  
688 the Beaujolais red wines reflecting the appellation-based taxonomy, while that of unfamiliar  
689 consumers (*i.e.*, who were in a region very far away from the Beaujolais region without  
690 vineyard or wine culture) was fragmented by mainly the lack of exposure and familiarity with  
691 both the Beaujolais region and wines. Because of their profession, the Critics were used to  
692 taste wines from all over France and even from all over the world and were therefore less  
693 used to tasting wines from a specific region. This less frequent exposure was also explained  
694 by a more recent experience with Beaujolais wines: only 29% of the Critics declared they  
695 have been used to tasting Beaujolais wines for more than 20 years against 67% for the  
696 Makers and 50% for the Sellers. The Critics were not therefore specific experts for Beaujolais  
697 wines, contrary to the Maker and the Seller panels.

698 4.2.3 What role does perceptual learning play in the perception of a new mention?

699 Perceptual learning through experience and exposure allowed mental representations to be  
700 modified. In their study, Bigand and Poulin-Charronnat (2006) highlighted that perceptual  
701 learning with musical stimuli would lead to an increase in familiarity with these stimuli. Thus,  
702 when a new mention appeared, in our case the mention *Pierres Dorées*, exposure to wines  
703 bearing the mention would increase familiarity with these wines. According to Alba and  
704 Hutchinson (1987), the increase in familiarity played different roles in expertise such as  
705 generating accurate knowledge but also remembering more easily this knowledge about  
706 familiar products. This familiarity would modify the mental representation of the wines already  
707 in place, thanks to the addition of knowledge about the wines with this new mention. In our  
708 case, it appeared that the exposure of the experts with the *Pierres Dorées* wines was finally  
709 weak. Indeed, only 13% of the Makers produced wines bearing this mention, 28% of the  
710 Sellers sold wines bearing this mention, 21% of the Critics wrote an article about *Pierres*  
711 *Dorées* wines, and 13,6% of all experts had only heard about them without ever having  
712 tasted them yet. All experts shared the same mental representation since *Pierres Dorées*  
713 was more considered as a region with beautiful landscapes rather than as a new mention of

714 the Beaujolais PDO. This mental representation could come from the fact that the experts did  
715 not have much experience or exposure with *Pierres Dorées* wines because the new mention  
716 only dates from 2017. Thus, all experts shared a greater experience and familiarity with the  
717 *Pierres Dorées* region rather than the wines, which generate a mental representation of  
718 *Pierres Dorées* based on the region for all experts.

## 719 5. Conclusion

720 The main objectives of this study were to evaluate the effect of the type of expertise on wine  
721 mental representations and to understand the evolution of these representations. A drawing  
722 elicitation task combined with a semi-directed interview permitted to access the mental  
723 representation of the diversity of the Beaujolais wines, and of the *Pierres Dorées* Beaujolais  
724 PDO wines.

725 The results highlighted a common core in the experts' mental representation of Beaujolais  
726 wines structured around two poles: Beaujolais and wine. The Beaujolais pole was linked to  
727 the environment and the vineyard, and the wine pole was linked to the intrinsic  
728 characteristics of the wines such as the grape variety or their sensory profile. The results  
729 also highlighted representational elements specific to each type of expert. The common core  
730 would be the result of knowledge acquisition by the experts during specific training or  
731 personal research and would constitute a universal basis of the experts' wine mental  
732 representation. The elements specific to each type of expert would result from differences in  
733 experience and exposure to wines. When experiences and exposures were shared, experts  
734 would develop consensual mental representations of wines through perceptual learning (*e.g.*,  
735 Makers and Sellers). Conversely, when experts in the same panel did not share common  
736 experiences and exposures to wines, they developed idiosyncratic mental representations  
737 (*e.g.*, Critics).

738 This exploratory study needed to be further developed to better understand the degree of  
739 importance of both scientific, technical, or theoretical knowledge acquired through each type  
740 of expert training, and the type of exposure to the Beaujolais wines on the construction of  
741 mental representations. We needed also to better understand how the daily work of each  
742 type of expert could affect their wine mental representation. This study however permitted to  
743 provide insights on the main representations and specificities of each type of expert, which  
744 are strongly linked with the practice of their daily job.

745 For the three panels of experts the new *Pierres Dorées* mention was associated with the  
746 south Beaujolais region, but not with a specific type of wine. More exposition to wines from  
747 this area was needed for a better integration of this new mention in experts' wine mental  
748 representation.

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753 transcription of the interview. The authors also thank Catalina Onofrei for her proofreading  
754 and corrections of the article.

## 755 Figure captions

756 *Figure 1:* Examples of drawings obtained during the graphic elicitation task by three experts  
757 from the Critic panel.

758 *Figure 2:* Graphical representations about the diversity of Beaujolais wines derived from the  
759 automatic co-occurrence analysis for a) the Maker, b) the Seller and c) the Critic panels. *The*  
760 *size of the word corresponds to their frequency. The link connecting two words represents*  
761 *the co-occurrence between those two words. The thickness of the links between two words is*  
762 *proportional to the co-occurrence of the words. The length of the link reflects the agreement*  
763 *between experts. The colours associated to the groups of words correspond only to a better*  
764 *reading of the structured branches for each graphical representation.*

765 *Figure 3:* Graphical representations about the diversity of Beaujolais wines and knowledge  
766 about Beaujolais *Pierres Dorées* derived from the automatic co-occurrence analysis for a)  
767 the Maker, b) the Seller and c) the Critic panels. *The size of the word corresponds to their*  
768 *frequency. The link connecting two words represents the co-occurrence between those two*  
769 *words. The thickness of the links between two words is proportional to the co-occurrence of*  
770 *the words. The length of the link reflects the agreement between experts. The colours*  
771 *associated to the groups of words correspond only to a better reading of the structured*  
772 *branches for each graphical representation.*

773 Table caption

774 *Table 1:* Participant characteristics

775

776

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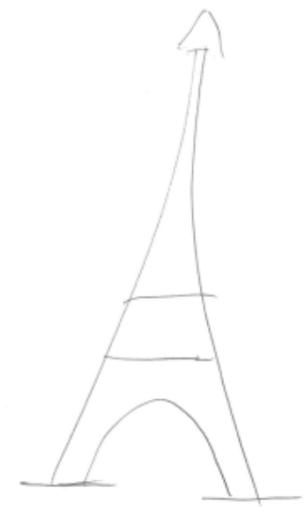
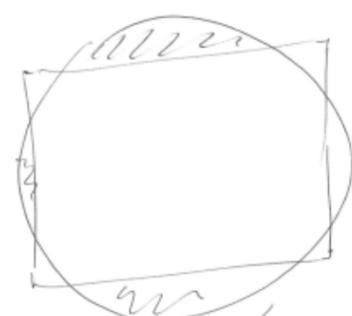
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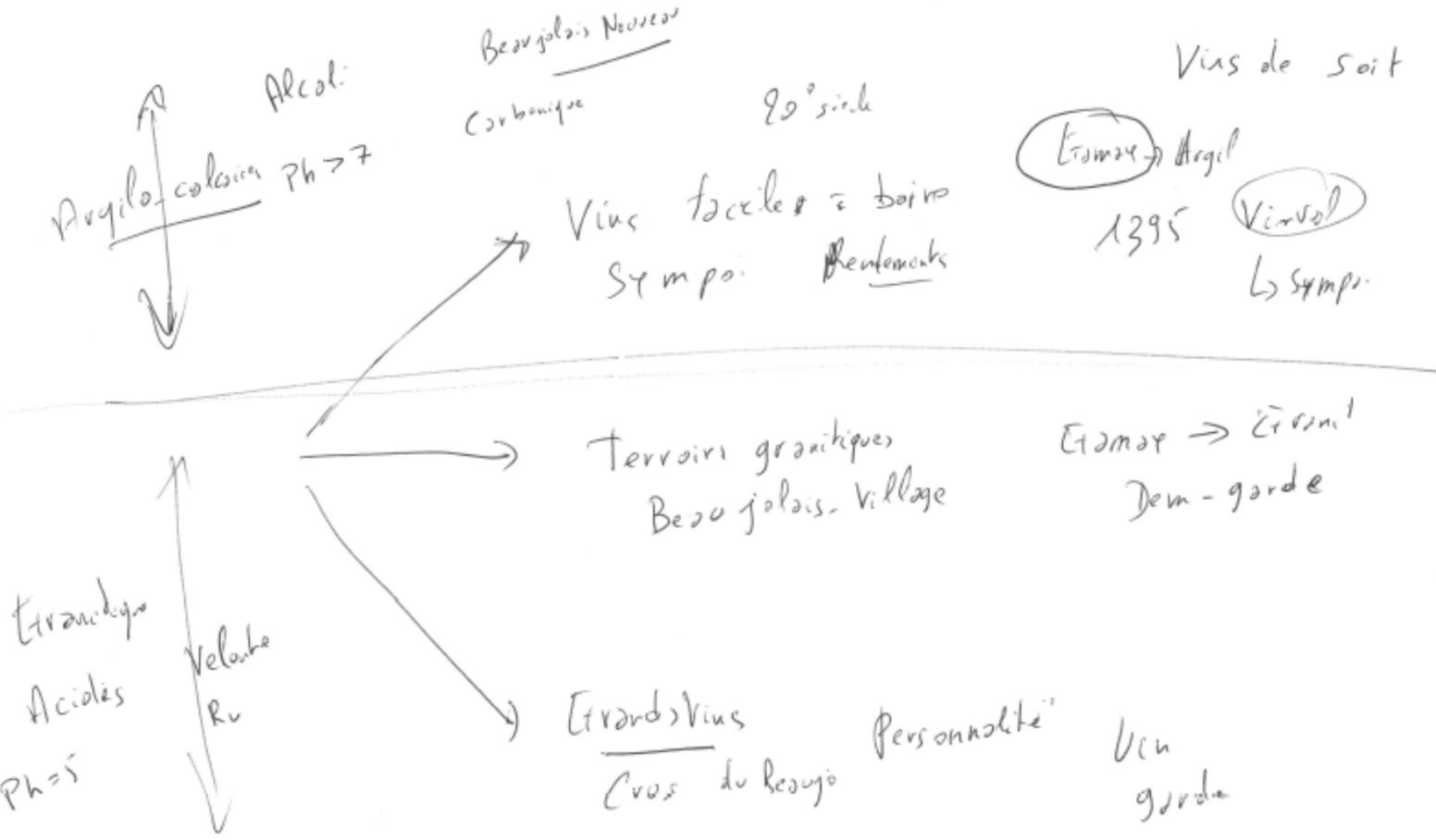
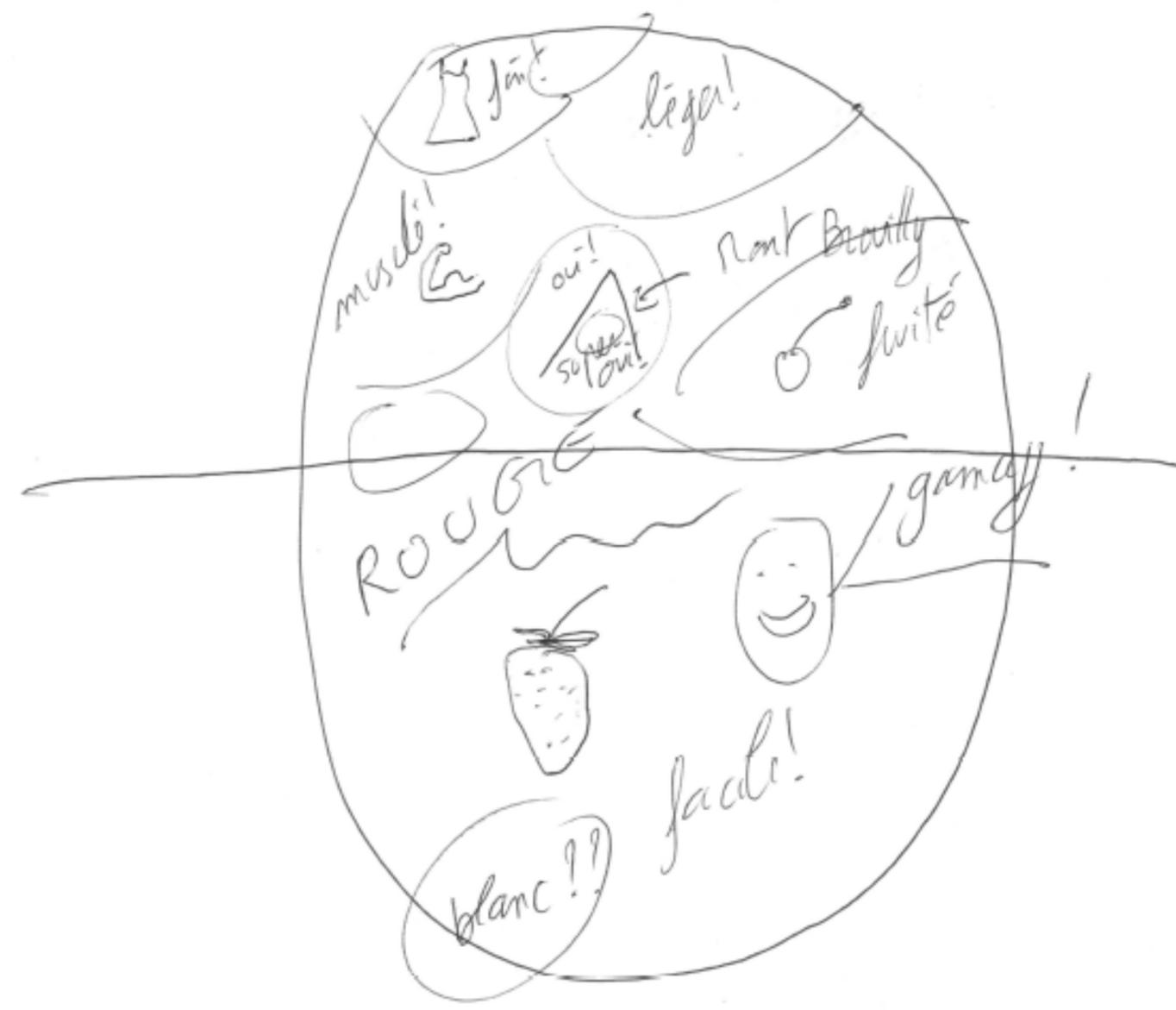


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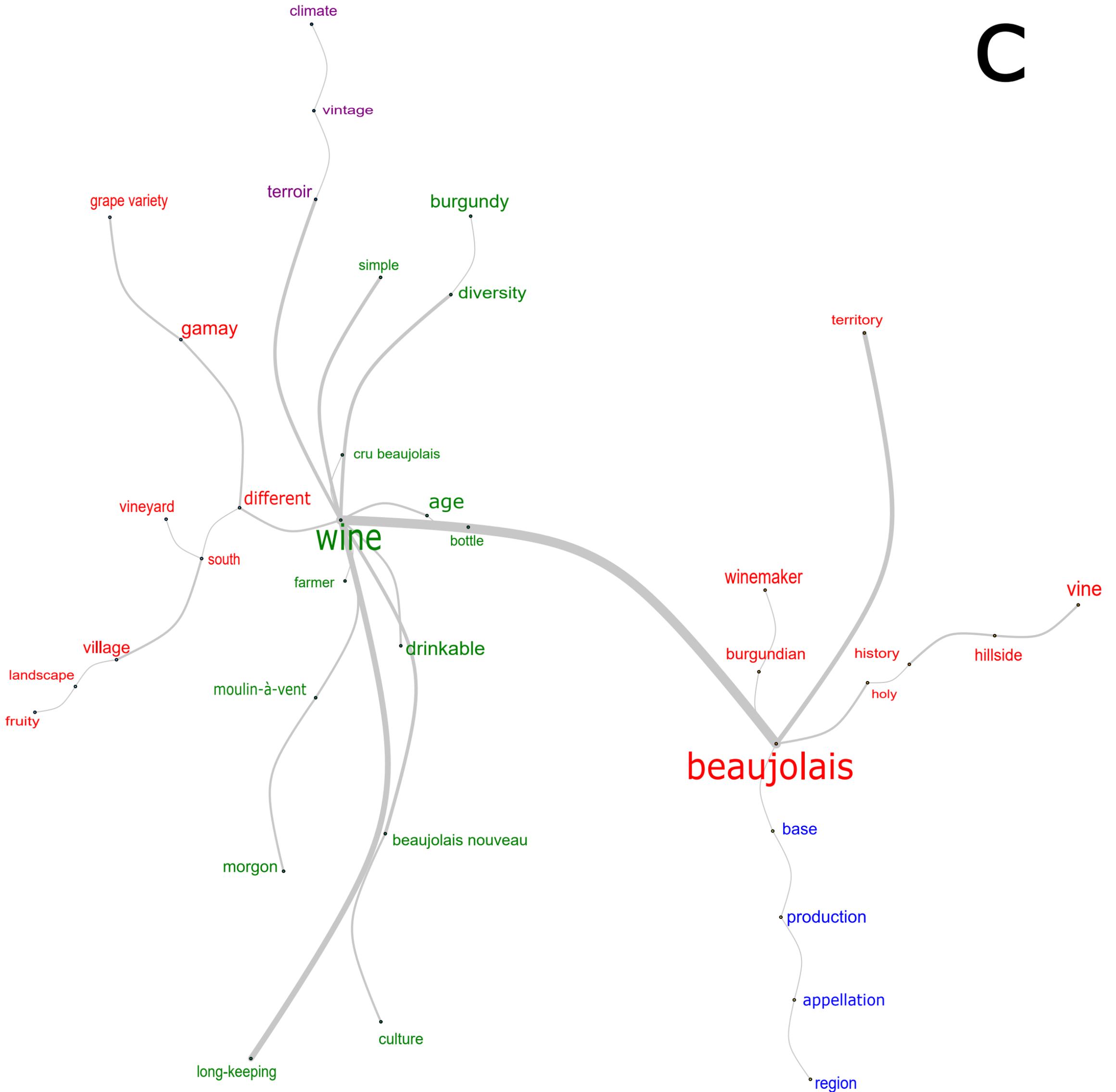


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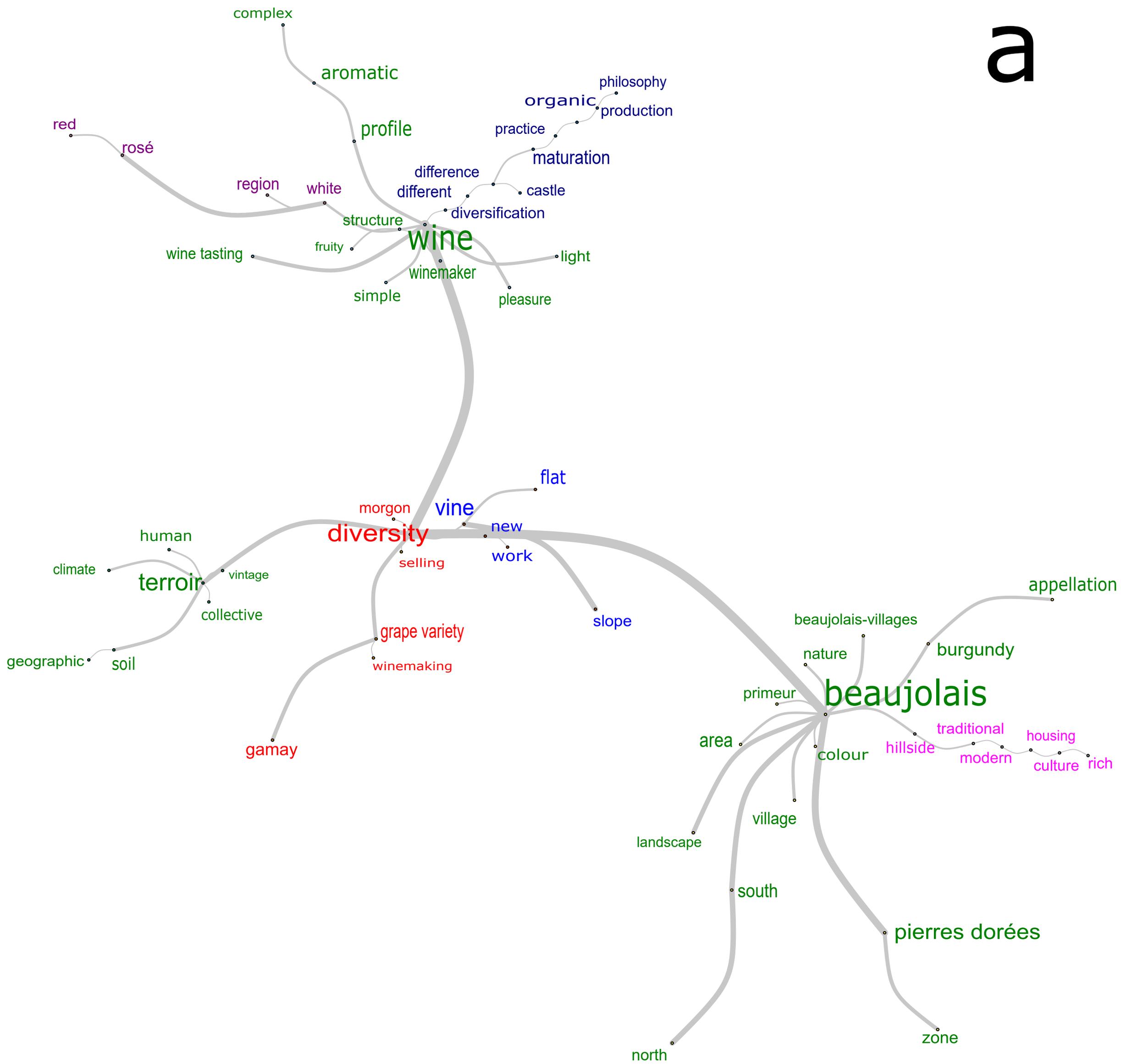




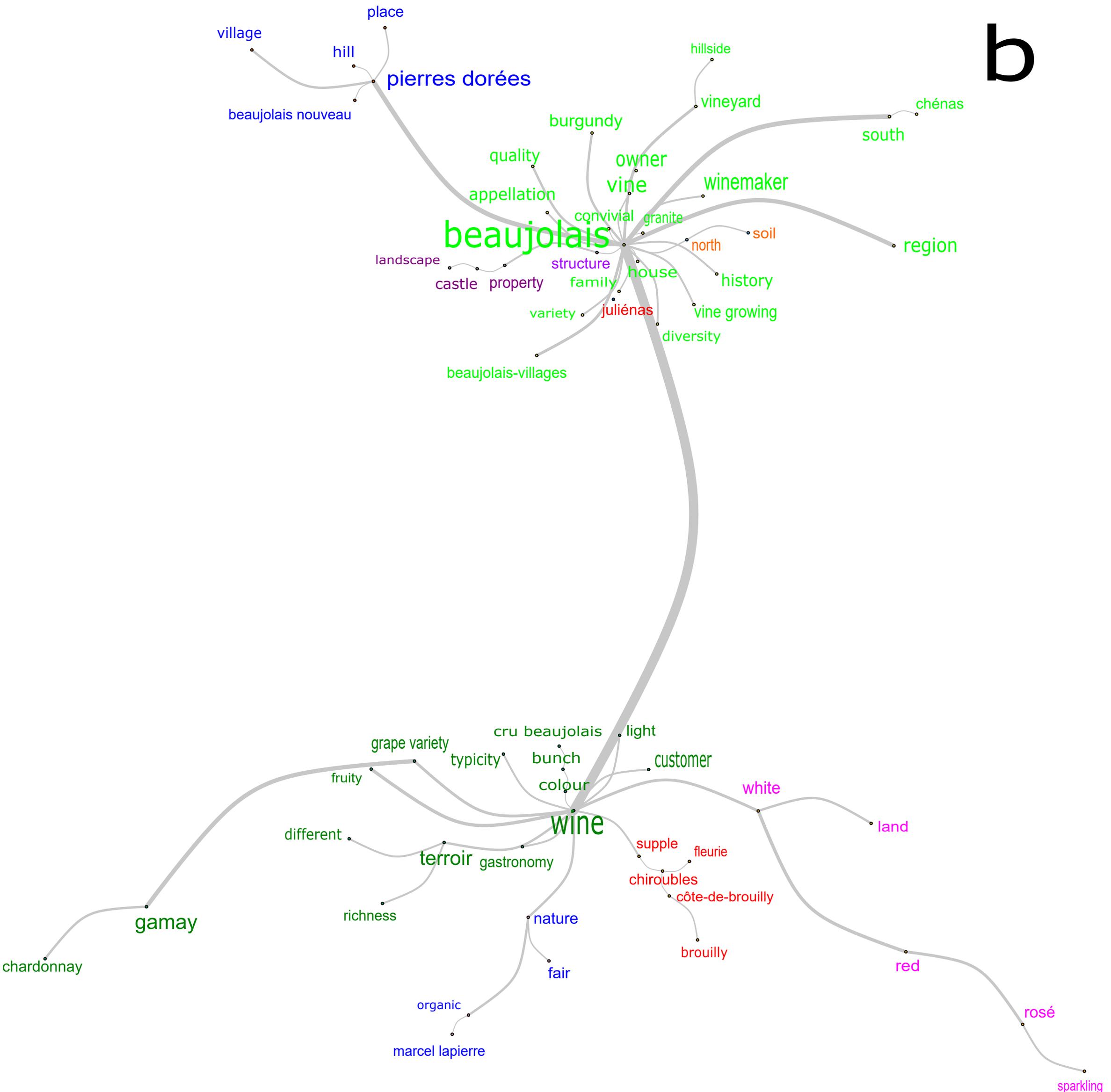
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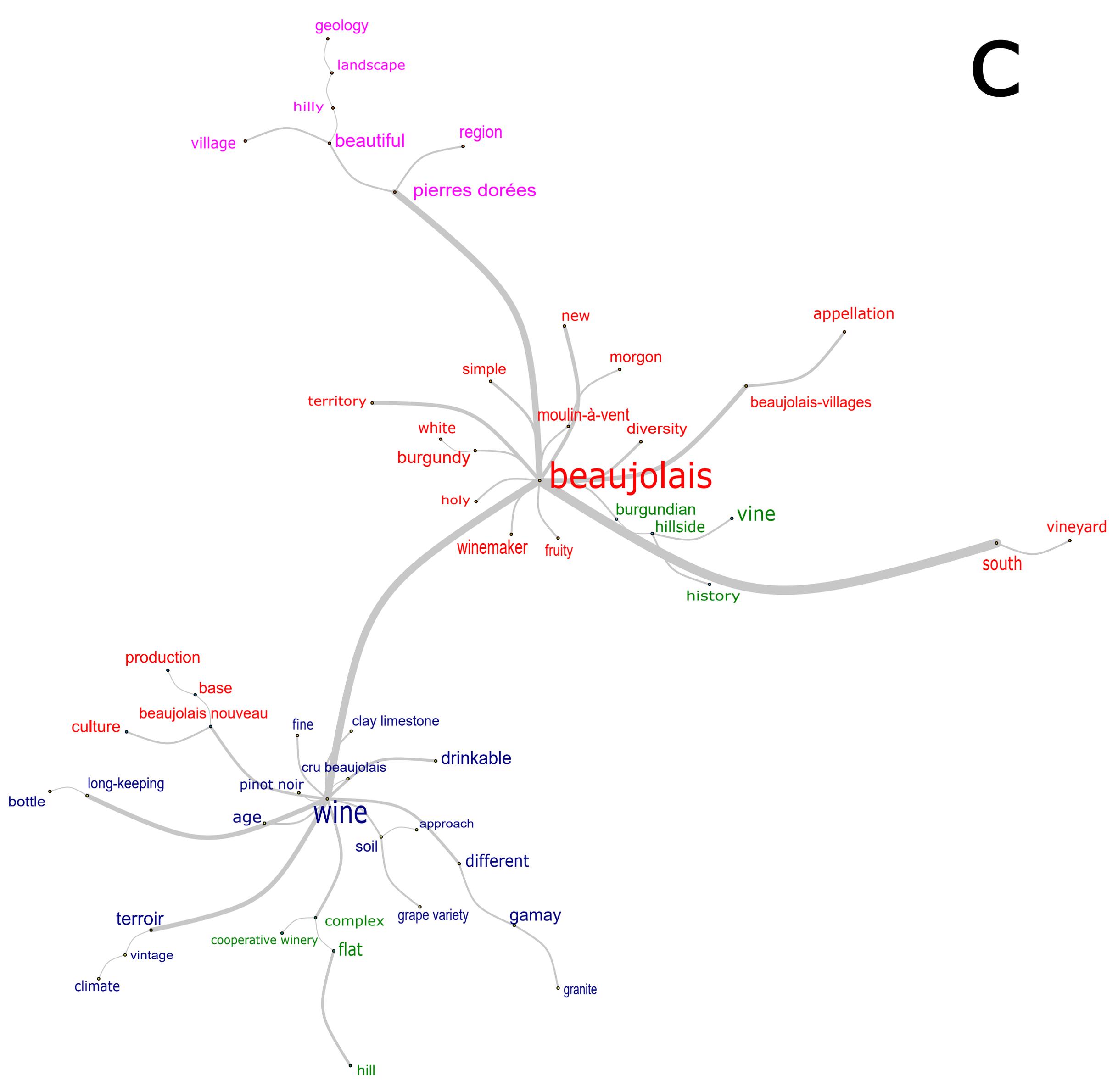
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Panel	Makers (n=16)	Sellers (n=19)	Critics (n=17)
<b>Gender (Men/Women)</b>	9 / 7	14 / 5	12 / 5
<b>Mean age (min/max)</b>	51 (28/79)	48 (23/80)	49 (28/69)
<b>Content of the training courses attended</b>			
Winemaking	17	1	3
Agronomy	2	1	1
Wine tasting	2	1	3
Sommelier	0	7	0
Self-educated	0	5	7
Wine producing law	0	0	1
Culture and wine	0	0	1
<b>Estimation of the Beaujolais wine tasting experience</b>			
For 5 years	0	0	1
For ten years	1	4	2
For twenty years	4	3	5
For more than twenty years	9	7	4
<b>Estimation of the quantity of Beaujolais wine bottles tasted per year</b>			
About 50	1	4	2
About 100	2	4	0
More than 100	11	6	9
<b>Estimation of the Beaujolais wine drinking experience</b>			
For 5 years	0	0	0
For ten years	1	3	2
For twenty years	2	3	5
For more than twenty years	11	8	5
<b>Estimation of the quantity of Beaujolais wine bottles drunk per year</b>			
About 50	4	8	10

About 100	7	4	1
More than 100	3	2	1
<b>Origin of the knowledge with <i>Pierres Dorées</i> Beaujolais wines</b>			
Winemaking	2	0	0
Wine sales	1	4	0
Wine tasting	12	11	7
Wine consuming	6	9	10
Through information received/read on	2	4	5
<b>Number of years of knowledge about Beaujolais <i>Pierres Dorées</i> wines</b>			
Less than a year	0	0	1
One to five years	6	6	4
Five to ten years	7	8	9