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Sub-Cluster Dynamics of an Organizational Population

Ecological Analysis of Wine making in Tokaj-Hegyalja 1989-2014

Domokos Károly Nagy

Durham University Business School

A Thesis Submitted for the Degree of Doctor of Philosophy at the
University of Durham

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ABSTRACT

Cluster Dynamics of an Organizational Population

Ecological Analysis of Winemaking in Tokaj-Hegyalja 1989-2014

Domokos Károly Nagy, Durham University Business School

This thesis addresses two aspects of organizational ecology. Firstly it aimed to test whether contrast dependence applied to similarity clusters, and on the sub-population level. Secondly, it proposed and studied contrast mechanisms that a dynamic feature space induces.

The empirical setting was the wine producer population of Tokaj-Hegyalja, a traditional wine region in Hungary, which went through a major transition in terms of winemaking technology, cultivation method and products between 1989 and 2014. This work argues that the groups of wineries that took different paths in terms of these features were perceived as fuzzy sub-clusters within the main population by the audience. Thus, their yearly vital rates were determined by their contrast level, even though these similarity clusters never became legitimate sub-categories. Besides that, introduction of novel methods and innovations were perceived as the expansion of the relevant feature set, thus the clustering system of the audience was dynamic.

In terms of methodology the research significantly differed from existing studies. Instead of gathering membership data directly from the audience, similarity sub-clusters were modeled by using the retrospectively collected relevant features of the main population. As the relevant feature set changed during the studied period, this approach allowed the modeling of a dynamic space of fuzzy similarity clusters at the sub-population level.

The steps in the analysis were as follows. First the main population was defined as a crisp set of wineries. Second the yearly sets of relevant features were modeled, which was based on past publications of wine experts. Third, the feature vectors of the wineries were coded according to collected feature value data. Fourth, fuzzy cluster analysis was conducted for each year, which determined the number of similarity clusters, their centers, their contrast levels and grade of memberships of organizations. Finally, a statistically significant correlation was found between the entry rates and the contrasts of the sub-clusters. In addition, by investigating the development of Tokaj winemaking the study showed that a dynamic feature space can induce contrast change; thus it influences category/cluster legitimation. In fact, in Tokaj these mechanisms were the main driving forces.

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CHAPTER 1

INTRODUCTION

1.1. EMPIRICAL CHALLENGE

The empirical structure of the research is based on Tokaj-Hegyalja, a historic wine region in Northern Hungary. The area is a World Heritage Site consisting of 28 settlements with an overall population of 80,000 inhabitants. The total area of designated vineyards is 7000 hectares (17,000 acres), of which 5,000 hectares (12,000 acres) are planted with vines today. They cover the southeastern and southwestern slopes of the volcanic Zemplén Hills in a strip 70-80 kilometers long by 3-4 kilometers wide. (Boros 1996)

Tokaj is noted for its natural sweet wines that are produced as a result of the unique climatic conditions. In late autumn, mist rises from the two adjacent rivers, which allow the *Botrytis cinerea* a microscopic fungus to infect the grapes. As a result, the berries shrivel up, which increases their sugar concentration. The must of these grapes is so rich in sweetness that not all the sugar content can ferment into alcohol, which results in a sweet wine. (Bene 2004) This wine played an important role in the history of Hungary

1.1.1 EARLY HISTORY

It is uncertain as to when viticulture first began in Tokaj. However, according to historical records, in the second half of the 12th century vines had already been planted throughout the area (Kézdy 2014 p 292.). It became an important wine region in the 16th century, when the Ottomans occupied most of the other wine growing areas of the country. Production of sweet wines, including the most well-known, *aszú*, also began during this period. (Csorba 2016)

The Golden age of Tokaj comprised the 17th and 18th centuries, when the export revenues provided sufficient income to local landowners to finance a war of independence against the Habsburg Empire for almost a decade. (Szomolányi 1999) It also indicates the importance of Tokaj in that a royal

decree demarcated the region in 1737 and established a closed production district, which made it the first appellation controlée in the world. (Bencsik 2000) Due to the high demand for Tokaj wines, a significant working force migrated to the area in this period, which made it the most populated region of Hungary, with 52 inhabitants per square kilometer by the end of the 18th century. (Beluszky 2003 p. 70-73)

In the subsequent centuries, Tokaj-Hegyalja gradually lost its importance. This happened partly due to political reasons, such as the internal custom policy of the Habsburg empire. (Kosáry 1990 p. 147-175.) However, the most important factor was the growth of sugar consumption. Because imported cane sugar and, later on, beet sugar became widespread in Europe, the sweetness was no longer an exclusive and expensive taste. As a result, the wine region became impoverished in the 19th century. (Vancsik 2015) Also, in 1885, the phylloxera epidemic destroyed most of the vineyards in just a few years, which triggered an emigration wave to the United States (Bodó 1975 p. 305).

Even though the eventual replanting was successful due to governmental intervention, the region could not recover in the first half of the 20th century. Because of the dissolution of Austria-Hungary after World War I, Tokaj-Hegyalja lost the majority of its domestic markets. (Beluszky 2003. p. 192) However, the most damaging years were the 1940s and the 1950s, when local society lost many of its foundations. The Jewry of Tokaj, which played a significant role in the wine trade, was wiped out during World War II (Ungváry 2015), while the new Communist rule abolished aristocracy and the middle class. (Romsics 2010. 203-215).

1.1.2 COMMUNISM IN HUNGARY 1949-1989

During the years of Communism, the wineries were nationalized and concentrated into a single state-owned enterprise (Tokaj Wine Works), which had a legal monopoly on wine production, bottling, and distribution. Local growers were only allowed to own and cultivate a maximum of two hectares (21,500 square feet) and, from the yield of these vineyards, they were restricted to produce wine for their own consumption only. However, they could sell the grapes, or the must, to the Wine Works. The aim of this system was to serve the undemanding Soviet market effectively with a large amount of standardized, low-quality sweet wines (Tompa 2016a).

The lack of competition and the priority for quantity resulted in a severe quality drop. Besides that, the wine region was isolated from the world market during this period; thus, Tokaj wine became absent

from the world's elegant dining tables for decades. It also failed to follow the international trends of winemaking regarding technology and preferred wine style; hence, the traditional assortment, style and production methods were outlived. As a consequence, the wine region lost its former international reputation and faced a serious challenge in 1991, when the artificial demand of the Soviet Union disappeared and the wine region had to look for alternative markets. (Tompa 2016b).

The competitive disadvantage can be easily understood when we compare the modern white wines of the late 20th century with traditional aszú wines. Today's fashionable high-quality whites are fruity, single varietal, dry or semi-dry, fermented and matured in a reductive environment, or large wooden barrels. Due to these features and yield reduction, they express the character of the grape variety and the terroir, which is the essence of the geographical, geological and climatic attributes of a particular territory. Such wines are, for instance, the Alsace Rieslings, Chardonnays from Burgundy, and Grüner Veltliners from the Wachau Valley. Traditional aszú wine stands in stark contrast to these. It is a sweet, oxidative cuvée, matured for several years in small oak barrels. It has a high level of residual sugar that overshadows both the terroir and the varietal characteristics.

1.1.3 YEARS OF THE REVIVAL 1989-2014

The primary focus of the research will be this period, the reason being that fundamental changes had taken place during these years, in at least two ways. On the one hand, the structure of the winemaking industry changed radically after the collapse of the Communist regime. New organization types emerged, which showed a great variety regarding size, ownership and winemaking technology. The large, state-owned winery of the region had been divided into parts and privatized, Western European investors established cellars and many small, family wineries were founded. (Tompa 2016b) On the other hand, due to the decentralization of wine production, competing schools of winemaking styles and philosophies emerged, whose aim was to overcome the crisis of the wine region. (Ripka 2014 p 13-19.) The two major renewal movements were the following.

The first attempt to modernize the Tokaj winemaking was carried out in the 1990s by those foreign estates that came into being during the privatization of the former state-owned Tokaj Wine Works. Their aim was to reform the concept of traditional sweet wine types in line with international wine trends. The first modern sweet wine, Disznókő's 1992 Aszú, was released in 1995. Besides the short maturing and the use of new, wooden barrels instead of old ones, the most prominent deviation

from the ordinary aszú was the fruitiness of it and the lack of oxidative taste. This wine was followed by similar aszús and other sweet wine types of the other foreign ventures; however, the style did not spread intensively, either among domestic large estates or family wineries. With a few exceptions, new entrants continued to follow the traditional path. A possible reason for this could be that, although expert feedback was positive, both internationally and in Hungary, the market success was moderate. Unfortunately, Tokaj's rebirth took place when sweet wines were rapidly losing their popularity (Henderson and Rex p. 15); hence, there was not a great demand for them, either on the domestic or the international market.

Still, modern aszús were sold at much higher prices and in larger quantities than the traditional ones, which should have attracted local winemakers. Instead of that, the most faithful traditionalists formed a counter-movement that questioned the legitimacy of the new type of aszús, against the matured oxidized aszús that ruled the wine region earlier. In spite of their lower market position, these producers remained the majority until the mid-2000s. All in all, the sweet wine reform of foreign estates could not fundamentally reshape the winemaking style in Tokaj-Hegyalja.

The second reform attempt was the introduction of Burgundian-style white terroir wines in the 2000s. These were dry, varietal vineyard selections made from the strictly reduced yield of old vines, fermented and aged in oak barrels. All the applied cultivation methods and winemaking technology aimed to express the characteristics of the terroir, which was a radical deviation from the traditional approach that primarily focused on wine style and winemaking technology. The first terroir wine was the 2000 Úrágya Furmint of Királyudvar winery, made by István Szepsy, who was the most respected winemaker of the region. Its release in 2002 proved to be a huge success, both regarding sales and reviews, and it attracted many followers later on. Most of these were new market entrants, such as small-scale family wineries that were inspired by Szepsy's new winemaking philosophy. As a result, in the 2010s, these types of organizations became the majority in the region, and Tokaj drys became widely accepted by customers both in Hungary and abroad. Moreover, terroir-focused winemakers began to dominate local associations and successfully achieved the modification of the Wine Act regarding the permitted traditional wine types in 2013.

The success of the dry terroir wines was not self-evident for several reasons. First, similarly to the modern sweet wines, these products also had to face the opposition of traditionalist winemakers. Second, the expectations of the broader audience went against the dry wine revolution. As the Hungarian National Anthem thanks God that he “dripped sweet nectar on the vines of Tokaj”, even

abstinents and schoolchildren know that Tokaj wine is sweet. Third, an earlier attempt to release Tokaj drys proved to be less successful. The first reductive dry wines of the region were produced by the foreign estates in the 1990s. At that time, the Hungarian wine world had no clear concept what a dry Furmint should mean, nor much experience in making it. Although these wines were also single varietal fruity reductive whites, they did not deliver the intensity of the single-vineyard Furmint of the 2000s. Besides that, they were the by-products of aszú. This type of reductive dry was not excluded from the assortments of foreign estates later, but they remained in a low price range and did not attract many other wine producers.

1.2 THE AIM OF THE RESEARCH AND EMPIRICAL RESEARCH QUESTIONS

The thesis has two aims. On the one hand, its goal is to explain the empirical puzzle, namely the unusual development of winemaking in Tokaj. This includes understanding why certain winemaking styles and organizational types became successful and why others failed to spread among producers. As the wineries themselves were active and initiative participants of the development process, their strategies also have to be evaluated in the light of the unfolded mechanisms, both in the past and the near future. On the other hand, the thesis aims to interpret these processes in an organizational ecology context. In order to do so, the research agenda includes the revision and interconnection of the existing theories, and their further development if necessary.

This chapter will formulate the empirical research questions which are the following:

1. Why did dry wine production break through in the 2000s?
2. What prevented the modernist sweet wine style from spreading during the 1990s?
3. Why did the traditional wine style remain dominant for so long?
4. What strategies of winery groups proved to be successful?

By answering these questions the research will hopefully contribute to the knowledge regarding the history of the Tokaj, and show new aspects of wine-related market mechanisms.

Theoretical research questions will be formulated after the review of the relevant organizational ecology literature in Chapter 2. Hypotheses and propositions will also be formulated in this part of the thesis after setting the theoretical foundations of the research and choosing the appropriate model.

CHAPTER 2

LITERATURE REVIEW

In this chapter, several theories of organization ecology literature will be reviewed, first those that appear to be relevant in the light of the empirical setting. This summary will include the two most important development models of organizational populations: density dependence and contrast dependence, as the analysis of Tokaj-Hegyalja, apparently requires an evolutionary approach. In addition, research regarding multiple category membership will shortly be summarized, as the traits of different winemaking philosophies suggest that there is an overlap between them concerning their followers. Second, the organization form emergence model will be looked at, as the groups of wineries may be seeds of organizational categories. Third, the review will determine the correct modeling of the winery population and identify theoretical research areas in which the study can contribute. Based on these the theoretical research question will be drawn up linked to the empirical ones followed by hypotheses and propositions. Fourth, such organizational research papers will be reviewed that are not directly connected to the theoretical framework but study winemaking. Finally, the last section will summarize those avenues of the study that were explored during the research, but not pursued.

2.1. RELEVANT THEORIES OF ORGANIZATIONAL ECOLOGY

2.1.1. DENSITY DEPENDENCE

The density dependence model formulated by Hannan (1986) is the best-known concept of organizational ecology. The theory posits a relationship between the density of a population (number of its members) and the vital rates within it (entry and exit of organizations), thereby predicting the general schemata of density changes during its lifetime. In other words, the theory describes and predicts how organizational populations rise and decline. The key mechanism is that the level of density affects two separate processes that are responsible for the dynamics of vital rates, thus ultimately for the development of the population regarding density: legitimation of the organization

form and the competition between members. Legitimation accounts for both entries and exits as forms that are taken for granted; they are more appealing to the audience and attract newcomers, and the existing members are less likely to fail. Competition drives exits, as the more organizations that compete for the resources, the higher the likelihood of failure. The level of density influences both of these aspects positively: with more organizations in the population, the audience will develop a consensus about the meaning of the form, but the competition will become more intense as well. In the early lifetime of the population, the increasing density will result in increasing legitimation. As a consequence, the exit rate decreases while the founding rate grows, thereby the density rises rapidly. Beyond a certain point, however, the scarcity of resources causes competition among the population members, which has an opposite effect on the vital rates. Because legitimation cannot exceed a finite ceiling, while competition rises at an increasing rate, density will decrease. As a result of this process, density graphs of organizational populations are inverted U-shape curves. The theory was first empirically tested by Hannan and Freeman by examining the historical evolution of American labor unions (1987, 1988). Since then, it has been applied to study various kinds of organizational forms (for a summary, see Carroll and Hannan 2000).

It is noteworthy that density dependence theory treats organizations as full members of a single population, with equal influence on its dynamics (Hannan 1986). Therefore, populations are crisp sets. As empirical evidence suggests the opposite, the initial model has been expanded by weighted densities according to age, size (Barron 1999), competitive experience (Barnett, Sorenson 2002) or geographical location (Carroll, Wade 1991; Baum, Mezias 1992). Considering the number of publications, none of these model expansions have been proven to be as effective as the later revision of the theory.

2.1.2 CONTRAST DEPENDENCE

The density dependence theory has been criticized in two ways. First, in spite of the theory expansions, the details of the legitimation process have remained unclear (Hannan, Pólos, Carroll 2007). Second, the balancing effect of legitimation and competition is not applicable for a late lifetime of the populations. As density decreases after the peak, the two processes ought to shift again, resulting in an increasing population (Baum and Powell 1995). These suggestions and the application of fuzzy category approach (Hannan, Pólos, Carroll 2007, p. 12) have led to the revision of the density dependence theory.

Hannan, Pólos and Carroll (2007, p.12) define organizational forms or categories as fuzzy sets, while organizations are partial members of them assigned with different values of grade of memberships (GoM) by the relevant audience. Audience is defined as the set of actors (customers, experts or even other members of the category) observe and create social categories, including organizational forms. As they also obtain the resources directly or indirectly (customers for instance), survival of the actors and the categories depends on their preference.

GoM takes a value between 0 and 1, which is estimated according to the extent that the organization fits into the audience's schemata regarding the category. This also means that boundaries of populations are fuzzy and set by the audience, being the opposite of the definition of the classical theory. For measuring fuzziness of populations, the authors defined contrast, which is the average grade of membership of organizations within the category. This follows that categories with high contrast have crisp boundaries and similar members (crisp categories), while populations with low contrast have fuzzy boundaries and relatively different members (lenient categories).

To overcome the limitations of density dependence, the contrast dependence theory offers two alternative models (Bogaert, Boone and Carroll 2006): fuzzy density dependence and contrast dependence. Both theories assume that density by itself does not increase the legitimation of the population. In fact, the fuzziness of populations or categories plays a more important role. While high contrast increases legitimation, low contrast hampers it, regardless of the density level. This also explains the paradox of the late lifetime of organizational populations. As these periods are typically characterized by low GoM members, legitimation of the category is low, which does not attract new entrants.

The difference between the two models lies in the calculation. Firstly, in the Fuzzy Density Dependence model, legitimation increases monotonically with the GoM-weighted density (equals the sum of the GoM of organizations). Secondly, in the Contrast dependence approach, it is driven by the contrast of the population (equals the average GoM of the members). Bogaert, Boone and Carroll (2006) have tested both models empirically by studying the exit rates of Dutch audit firms. According to the findings, both were applicable.

From Tokaj's perspective, the following aspects of the two evolutionary theories are interesting. First, by defining Tokaj winemaking as an organizational population or category, the estates engaged with different winemaking philosophies and styles can be considered as competing subsets of the population. Second, as the wineries were inevitably characterized by various combination traits, many

of them were perceived as partial members of the subsets. Consequently, these were perceived as fuzzy sets by the audience. According to the theory, fuzziness applies to all organization categories, which follows that the main winery population itself was perceived as a fuzzy set, due to multifunctionality, for instance. However, this would overcomplicate the model; thus, a crisp definition seems to be more pragmatic. Third, according to the theory level of fuzziness or category, contrast is the primary factor of evolutionary processes by influencing its legitimation and vital rates. Therefore, while designing the evolutionary model and identifying mechanisms that drove the development of winery subsets, the contrast has to play a central role.

In case the empirical setting proves to be suitable for contrast modeling, its analysis can contribute to the existing research regarding the contrast-based approach. On the one hand, by utilizing entry rates as the indicator of legitimation, it can supplement the study of Bogaert, Boone, and Carroll (2006). On the other hand, by testing contrast dependence on the sub-population level, it can corroborate the theory.

2.1.3 MULTIPLE CATEGORY MEMBERSHIP

A line of research that has been vitalized by the fuzzy set theory is the investigation of the effects of multiple category membership (also called category spanning). As the fuzzy concept assumes partial grade of a membership, it allows an organization to be the partial member of multiple categories (Hannan Pólos and Carrol 2007, p. 107). This means lower memberships in both categories, thus lower contrast and legitimation, which has a negative impact on members. Many empirical studies regarding category spanning have found evidence to this effect, a few of which will be listed below.

Hsu, Hannan and Kocak (2009) studied releases of the US film industry between 2002 and 2003. They found that movies with unclear genre classification or multiple genre membership were significantly less appealing to the audience and less successful financially. In the same paper, they also investigated the success rate of eBay auctions. The findings were similar: users selling in multiple product categories finished their auctions with less chances of success.

Another research with similar results was carried out by Negro, Hannan and Rao (2010), who investigated opposing winemaking movements and a hybrid style in the Piedmont wine region. They found that wines produced by cellars with broad niches (making wines in multiple styles) had lower critic ratings. The specialist wineries, however (producing wines in a single style), enjoyed an

advantage only in categories with high contrast (styles occupied by producers with high GoM).

A study by Boone, Declerck, Rao and Van den Buy (2012) on modernistic music performances in Brussels had a similar empirical challenge. They investigated the competition among two opposing and a hybrid music style. Besides other findings, they evinced that the hybrid style was less appealing for the mass audience.

Kovács and Hannan (2010) examined the style categorization and online reviews of restaurants and other food services in San Francisco. They also found that the multiple category membership (lower contrast) was less beneficial, as the specialist organizations received higher ratings. However, beyond a certain level of contrast, this positive effect on appeal fell. Similarly to Negro, Hannan and Rao (2010), they also investigated the contrast of the categories that the organizations occupy. The analysis showed that category spanning is less harmful in the case of low contrast categories (Kovács and Hannan 2010).

As is illustrated above, the negative effect of multiple category membership was proved by many studies. However, the explanations of the reasons are various. On the one hand, researchers argued that the category spanner organizations perform relatively weaker, because they have to disperse their resources and attention. Thus, the quality of their output is lower in each category (Hannan and Freeman 1989). Another explanation is that spanning categories cause confusion within the audience, as they don't know what to expect from such organizations (Kovács and Hannan 2010).

This line of research did not approach the legitimation question by examining organizations that were part of multiple categories, but by studying the offerings of them that occupy multiple market niches simultaneously. Despite the differences, such publications are important from an organizational point of view for several reasons. First, the model is similar: organizations are partial "members" of the realized niches that are defined as fuzzy sets (Hannan, Pólos and Carroll 2007, Chapter 8-9). Second, in many cases, the organizational form is reflected by the niche the organization occupies (Hannan, Pólos and Carroll 2007, p. 172). Finally, the patterns of the findings are similar: while the low contrast resulted in a higher exit rate by hampering legitimation of an organizational population (Bogaert, Boone and Carroll 2006), organizations occupying multiple niches with lower GoM (generalist organizations) suffer disadvantages (Hsu, Hannan and Kocak 2009).

As the winery sub-sets were fuzzy and part of the same population, they inevitably overlapped. Thus, they were potentially perceived as members of multiple sets. Findings regarding multiple category membership suggest that such positions have a negative effect on the members (see above

examples). Besides the above explanations, this can also be due to the lower contrast of overlapping categories, which negatively influences vital rates (Bogaert, Boone and Carroll 2006). This suggests that distance and overlap of winery subsets were important drivers of sub-population dynamics.

The design of the above studies was similar in two ways. They considered the product appeal as the indicator of the effects and examined it in a short period. In this sense, the analysis of the Tokaj winery sub-sets can also contribute to multiple category membership researches. By analyzing an environment of overlapping organizational subsets, we can test the implications of it regarding vital rates instead of the appeal. As the time frame of this research is longer than that of the above studies, it allows analyzing consequences of multiple category membership in an evolutionary context.

2.1.4. ORGANIZATIONAL FORM EMERGENCE

Part of the major theory reformulation of Hannan Pólos and Carrol (2007) was the new approach of organizational form emergence. It was defined as an audience-driven process, which consists of five sub-processes of legitimation: (1) similarity clustering of objects (2) creating class by labeling of clusters (3) creating a schemata to explain the understandings of labels (4) creating categories by coming to social agreement about the meanings of labels, and (5) constructing forms by taking it for granted that members of a category will satisfy the relevant schemata.

Regarding the Tokaj winery population, the relevant question is what stage of the legitimation process its sub-sets were during the studied period. Empirical evidence indicates that labeling barely occurred during the studied period. Moreover, its application was inconsistent and changed over time. The labels applied in this study such as 'modernist', 'traditionalist', 'terroir-focused small estate', 'family winery' are examples of those label fragments that are used here for the sake of clarity. In reality, the labeling was less consistent. This phenomenon follows that winery subsets were most likely similarity sub-clusters of the winery population that were at least attempted to be labeled. To ascertain whether this is the case, further characteristics of similarity clusters will be reviewed in the light of the organizational form emergence (Hannan Pólos and Carrol 2007, 41-47).

Similarity clusters are possible seeds of later categories, around which grouping might occur that can lead to the further stages of the legitimation process listed above. Audience members inspect organizations, notice similarities, try to interpret them by clustering and assigning labels to them. This process is based on pairwise similarity evaluation, which requires knowledge about the characteristics

of the domain and significant efforts, as the agent has to gather information and compare organizations and products. Therefore, this early stage of the process is carried out by particular segments of the audience enthusiasts. The clustering is a process that is based on a set of features of the producers and the products that enthusiasts take into account while evaluating similarities.

This follows that in case winemaker subsets are modeled as similarity clusters, the elements of the different winemaking philosophies and styles (applied cultivation methods, winemaking technologies and produced wine types, etc.) were these relevant features. If so, the model has to incorporate the dynamics of this set, as the continuous innovation in Tokaj often brought new traits to the fore. Regarding this possibility, the theory is less permissive. Hannan Pólos and Carroll assume that the observer will have great difficulty when new relevant dimensions appear, as the effort that needs to be taken for reclustering will grow exponentially; thus, the clustering system will collapse. Ultimately, this fragility of similarity clusters is what necessitates labeling and later schematization.

Upon first sight, this seems to rule out the possibility that the winery subsets are clusters. In fact, this is a confirmation. The inconsistent and time-varying labels in Tokaj indicate the reclustering attempts of the audience that followed the consecutive collapses caused by the new relevant feature values.

The last important point of the theory is that similarity clusters are fuzzy sets. According to the perceived features, the enthusiast can decide that some producers or products fit into the cluster entirely or partly; thus, organizations are assigned with memberships. Based on the average memberships, fuzziness of the cluster is greater or smaller, which determines to what extent the cluster stands out from its environment. Those that are distinct will be more likely labeled, but clusters with a contrast will not be. This follows that, if the similarity cluster state is persistent, which is the case in Tokaj-Hegyalja, the contrast consequences can be applied both on vital rates of the clusters and on members of them. Ultimately, this allows building an evolutionary model of Tokaj winemaking on sub-clusters.

2.2 THE ORGANIZATIONAL ECOLOGY MODEL OF THE POPULATION

In the light of the reviewed literature, the winery population of Tokaj and its development between 1989 and 2014 will be interpreted as follows:

1. The competing groups that were engaged with different winemaking philosophies were sub-sets of the main 'Tokaj winery' category.
2. The fact that these sub-sets were not consistently labeled by the audience indicates that they were in the early stage of the legitimation process. Thus, they were perceived as similarity clusters by the audience.
3. This follows that elements of the different winemaking philosophies and styles, organizational traits, applied cultivation methods, winemaking technologies and produced wine types were relevant or irrelevant features that the audience considered or ignored, while forming similarity clusters and assigning memberships to wineries in them.
4. As the wineries were inevitably characterized by different combinations of feature values, many of them were perceived as partial members of the clusters. Consequently, the clusters were fuzzy.
6. As a consequence, the general spread and success of winemaking philosophies depended on their legitimation, which is the function of contrast. Those clusters could attract many new entrants with a high grade of membership, whose contrast level was high.
7. Because the similarity clusters were fuzzy sub-sets of the same population and had the same relevant feature set applied to them, they overlapped. Thus, wineries were potentially perceived as members of multiple clusters.
8. This follows that contrast dynamics and legitimation of each cluster depended on the dynamics of the other clusters as well.

9. Due to the continuous innovations regarding winemaking, cultivation, wine style and wine types, certain feature values became relevant later than others. In other words, the relevant feature set was dynamic.

10. As the relevant feature set is the basis of the audience's judgment about similarity clusters, its dynamics influenced the relative position of sub-clusters within the winery category, in other words their overlap. Which means that changes of the relevant feature set affected the contrasts of sub-clusters; thus their legitimation and ultimately their emergence or failure.

The empirical aim of the research was to explain the recent development of Tokaj, which will happen in the above modeling context. Next, by developing the above theory further, those possible mechanisms will be identified that could drive the transition process. In later chapters will identify in the empirical data set.

2.3 CONTRAST MECHANISMS

With contrast being the main driver of cluster development, the mechanisms that influence its level will be discussed, in the light of the review above. The summary includes theorems that were covered and tested by existing research. However, by introducing a dynamic relevant features set it also suggests novel interactions.

I. Assuming a static set of relevant features, cluster contrasts can change due to the following mechanisms:

1. Considering a single cluster, its contrast depends on the similarity distance between its members:

A) By changing their positions in the feature space, an organization can gain or lose typicality in the cluster; thus, it can increase or decrease its membership, and modify contrast level.

B) Entering and exiting organizations can modify contrast levels, depending on their position in the feature space compared to other organizations.

2. Considering two or more clusters, their contrast depends on the extent of the overlap between them; in other words, on the number of organizations with multiple category membership. In this sense, the following mechanisms are possible:

A) By changing their positions in the feature space, organizations can increase or decrease their membership in another cluster as well, thus modify contrast level of multiple clusters.

B) The same applies to entering or exiting organizations with multiple cluster membership.

C) When significant numbers of organizations change their positions in the feature space in the same way, they can redefine the cluster center; thus increase or decrease memberships and contrast. This also follows that they can change the extent of overlap between clusters; thus impact contrasts of other clusters.

II. Assuming a dynamic set of relevant features, the following mechanisms can apply in addition to those above:

1. Considering a single cluster, its contrast also depends on the similarity distance between its members. As recognition or derecognition of a feature changes the similarity distance, the following scenarios are possible:

A) With the recognition of a new relevant feature, the cluster contrast will increase in cases where the members are similar regarding that feature; however, contrast will decrease in cases where members are dissimilar regarding that feature.

B) With the derecognition of a formerly relevant feature, the cluster contrast will decrease in cases where the members are similar regarding that feature, but contrast will increase where members are dissimilar regarding that feature.

2. Considering two or more clusters, their contrasts also depend on the extent of the overlap between them; in other words, on the multiple cluster members. As grade of membership is the function of similarity distance between the organization and the cluster center (or prototype), the possible extent of the multiple category membership depends on the similarity distance between cluster centers. As recognition or derecognition of features can change this distance, it also influences cluster overlap, thus contrasts.

A) With the recognition of a new relevant feature, the contrasts of two overlapping clusters increase in the case where the centers are dissimilar regarding the value of that feature, but contrasts decrease in the case where the centers are similar regarding the value of that feature.

B) With the derecognition of a relevant feature, the contrasts of two overlapping clusters will decrease in the case where the centers are dissimilar regarding the value of that feature, but contrasts will increase in the case where members are similar regarding the value of that feature.

This study assumes that evolution of the winery sub-clusters in Tokaj-Hegyalja was predominantly driven by the above process. Besides that, it argues that among these mechanisms those were the most influential that were induced by the changes of the relevant feature set. The reason is that by taking a new clustering aspects into the picture, these mechanisms affect the grade of membership of every organization in the population. Consequently, the empirical research questions can be answered by identifying and logically ordering the above processes in the empirical data. The mechanism descriptions suggest that the those played the most influential role among the mechanisms that involved relevant feature dynamics..

Proposition 1.: Contrast mechanisms driven by the dynamic relevant feature set were more influential

2.4 RESEARCH QUESTIONS AND HYPOTHESES REGARDING THE THEORY

The expected theoretical contribution is twofold. On the one hand, the theoretical aim is to support the existing contrast dependence theory with empirical evidence. There are many aspects of the above theories that a fuzzy sub-cluster model in a dynamically changing feature environment could address. This study will focus on a more general question regarding the contrast dependence theory. Although the idea is widely accepted among researchers, it was not tested on many empirical settings. Also, it was not tested on many types of population settings. Following the arguments of the literature review (Section 2.1.4), and considering the characteristics of the empirical setup, contrast dependence theory can be tested on two aspects of organizational forms: populations in early legitimation stages, and populations on the sub-category level.

Research Question 5.: Does contrast determine vital rates on the sub category level?

Research Question 6.: Does contrast determine vital rates of similarity clusters?

The answer to Research Question 5 is most likely yes. Organizational populations are often embedded in each other. It depends on the audience's perception which level is considered to be the main population.

Hypothesis 1.: Contrast dependence takes effect on the sub-category level.

Research Question 6 addresses, a more complicated issue. On the one hand, the theory defines the stages of legitimation as a continuous process where the different stages can overlap. This also suggests that the contrast effect applies. On the other hand, legitimation of the winery sub-populations can not be described in the classical way as they are identified by the audience as the part of an already legitimated category. Consequently, Hypothesis 2. will only address the possibility of contrast dependence in early stages of legitimation.

Hypothesis 2. Contrast dependence can take effect in early stages of legitimation already.

2.5 WINE-RELATED ORGANIZATIONAL RESEARCH

This section will discuss four organizational research papers that studied winemaking. These are not directly connected to the applied theory, but played an important role in formulating the suspended status-based approach of the research, which will be discussed later. Below, their empirical setup and main findings of will be summarized. The review does not contain the Piedmont study of Negro, Hannan and Rao (2010) which was already discussed among the multiple category membership related papers.

One of the most known organizational sociology paper that studies winemaking is the work of Benjamin and Podolny (1999). The paper studied the effect of status on price and product quality in the wine regions of California and also investigated the impact of both past performance and affiliations on it. The findings show that high-status wineries can charge more for the same quality and are able to afford high-quality production. It was also demonstrated that both affiliations and past performance affect status.

Negro Hannan and Fassiotto (2014) studied the effect of quality signaling. The empirical challenge is the biodynamic winemaking in Alsace. Biodynamic winemaking is a strictly regulated and costly organic production method which became very popular both among customers and producers despite its seemingly meaningless esoteric nature. They compared the market success of biodynamic wines to another environmentally friendly category: organic wines. Analysis showed that biodynamic wines do not perform better during blind tastings than organic wines, but receive higher notes when the producer is known. Negro and colleagues argue that biodynamic production predominantly serves as a quality signaling method, that only high-status producers can afford; thus they can differentiate themselves from low-status wineries, and enjoy the benefits of the high-status position.

Scott Morton and Podolny (2002) studied the effect of winery ownership on status in California. They found that owners of private firms were likely to focus on maximizing utility rather than profits. This means that instead of optimizing their operation on the price they maximized quality and produced high-end wines. In the same time, profit-maximizing corporate owners tended to follow the opposite strategy. As a result, private owned wineries occupied the high-status category, while corporate wineries the lower segments. The idea was empirically tested on Tokaj, but the same phenomenon was not explored, as the majority of the owners were families in all status segments.

2.6 ALTERNATIVE RESEARCH AVENUES

During the research process, multiple theoretical arguments were developed in order to explain the empirical puzzle. None of these proved to be as coherent and complex as the final one, but they brought forward the theory development in some sense. In this section, these attempts will be summarized, including the discussion of the theoretical foundation, development of that theory if applicable, the interpretation of the empirical challenge in the light of them and the reason why these attempts were suspended.

2.6.1 A COMMUNITY ECOLOGY APPROACH

The first attempt to build a theoretical framework that explains the development of Tokaj was to model the evolution of the different winery sub-groups of the winery as crisp sets that interact both with each other and other organizational categories. In this setup, vital rates of winery sub-groups were assumed to be dependent on the vital rates of other populations. This attempt followed an early research line of organization studies: community ecology.

This theory is based on density dependence (which was discussed earlier), but includes external effects as well, namely another organizational populations. Astley (1985) defined communities as functionally integrated systems of populations. Even though this definition denotes complete sets, in later papers community also referred to any research above population level, including multi-population studies and interactions between a population and its socio-economic environment. In this review, the first group of literature will be discussed, such papers that study communities or pairs of interdependent populations by applying the measures of density dependence.

Freeman and Audia (2006) argues that the reason of interaction between organizational populations is the common occupancy of resource space, socio-demographic space, technology space or ideology space. Depending on the commonly occupied space, the relationship is either mutualistic or competitive, which affects vital rates either positively or negatively. While a mutualistic relationship increases entries and decreases exits, a competitive linkage results in opposite outcomes. Freeman and Audia (2006) also summarizes past research in this sense. A few of these papers will be summarized below.

Socio-demographic space. Studies of Baum and Singh (1994) and Sorensen (2004) show evidence for the negative effect of competitive relationship. Baum and Singh examined day care centers in Toronto according to the range of the age of the children the organizations enroll. They found that centers with a large overlap in terms of the target audience have a higher mortality rate. Similar results were found by Sorensen, who studied the labor market of 84 Danish industries between 1981 and 1990. According to him, the founding rate of organizations was lower in crowded locations of the overall labor market.

Technology space. Podolny et al. (1996) found competitive effects in shared technological spaces. According to them, crowded technological niches have a negative impact on the vital rates of the populations that occupy them. On the other hand, researchers found the opposite effect in such cases, when size specialized populations shared technology spaces. For instance, studies on short and long railroad lines (Dobbin 1994) and on mutual and commercial telephone companies (Barnett, Carroll 1987) showed a symbiotic relationship.

Ideology and Resource space. Ingram and Simons (2000, 2004) investigated a community of four populations in Israel that had overlaps both in terms of resources and ideology: moshavim, kibbutzes, credit co-operatives and credit corporations. Moshavim and kibbutzes were both agricultural co-operatives that had a similar ideology but used common resources (land, working power, capital and technology). Credit co-operatives shared ideologies with both agricultural co-operatives, but relied on different resources, while corporations did not share either ideologies or resources with the agricultural cooperatives. According to their findings, there was a mutualistic relationship between the credit co-operatives and both agricultural co-operative groups, which manifested in a positive correlation between their vital rates. On the contrary, a competitive relationship was found between corporations and both agricultural organization forms as they were ideologically dissimilar.

Ruef's (2004) findings on American plantations are similar: organizations with competing ideologies harmed each other's vitality rates. In another study, Barnett and Woywode (2004) investigated the competition effect among political newspapers during the interwar period in Vienna. They found that the competition effect decreased as the ideological distance between the newspapers increased. Namely, the competition between far-right and far-left newspapers was lower than between radical and moderate ones. In conclusion, the literature suggests that sharing an ideological space results in a mutualistic relationship, while sharing resource space, technology space or socio-demographic space generally triggers competition.

From Tokaj's point of view, ideological and resource space overlap seemed to be relevant. Wineries were competing both in terms of resources (land, capital and customers) and ideology (wine styles). The idea was to include other local services in the model and test whether mutualistic relations affected the development patterns of winemaking. Such population was local restaurants that rely on different resources but share the ideology with either winery group. Empirical evidence suggested that similarly to winemakers, local chefs were also ideologically divided. A more prominent group preferred the traditional cuisine, while a smaller group tried to follow contemporary trends. Even wine cards of restaurants suggested a mutualistic relationship.

However, the further empirical investigation revealed that the causal link was the opposite: changes in gastronomy seemed to be triggered by reform attempts of winemaking; therefore, this research design was not suitable to explain the original empirical puzzle. Moreover, this path was not so promising in terms of theory development either. On the one hand, possible findings regarding community ecology theory did not seem novel. On the other hand, crisp category approach is no longer in focus of the organizational ecology research agenda. Due to these factors and the insufficient amount of available data regarding gastronomy, this avenue of research was suspended.

2.6.2 A STATUS-BASED APPROACH

The second attempt explained the empirical puzzle within the domain of social status. This avenue was developed further than the community ecology approach both in terms of theory building and data collection. Its main shortcoming was that it did not cover the whole empirical challenge, it focused on the dry wine revolution only. In addition, data problems arised; thus, this line of research could not be statistically tested.

Status in organizational sociology is understood as the position of the given organization in a social hierarchy, that is rooted in the accumulation of deference. It has a dual foundation in past performance and an actor's affiliation. It is involved in a market exchange, and its possession carries numerous benefits in terms of organizational outcomes (Podolny and Philips 1996, Benjamin and Podolny 1999). As a result of that, status is an important concept in understanding market mechanisms (Podolny 1993).

The occupied position of organizations in the status hierarchy has various consequences. On the one hand, high-status has a reported positive influence on costs, revenues, access to financial capital and ultimately on the survival chances of organizations (Sauder, Lynn, Podolny 2012, Chen et al. 2012). On the other hand, research showed that status also determines to what extent organizations have to take the common rules into account. Phillips and Zuckerman's work on middle-status conformity (2001) demonstrated that middle-status organizations are more tied to performance norms than organizations on either end of the hierarchy, as they are at risk of being punished when they violate them. In other words, there is a curvilinear relationship between status and conformity. However, the reason of freedom is different on the two peripheries: while high-status organizations can deviate from these norms because of the greater sense of security they enjoy, low-status organizations are not able to avoid the punishment, but they have little or no legitimation, no status, so not much to lose.

In the light of the above theory, the dry wine revolution in Tokaj can be interpreted as follows. As the norms and rules of wine making in the region were definite, presumably middle-status conformity applied. It follows, that attempts to deviate from the norms could only appear on either end of the status hierarchy. More specifically, following the market needs, and producing dry wines was such deviation from the norms that either high-status or low-status wineries could attempt only. However, the production method required large investments (yield limitation, cultivation of steep parcels, selective harvesting) which low-status winemakers could not afford. Thus, the only possible norm breakers could be high-status producers. Accordingly, the first vineyard-selected high-quality dry wine was released in 2001 by István Szepsy who was the most acknowledged winemaker of Tokaj-Hegyalja.

Szepsy's furmint turned out to be a blockbuster; therefore other high-status organizations have fallen into line with him: according to the data, until 2005 the few winemakers of the high-status segment have transformed their assortment. This is in accordance with the theory, similarly to the behavior of middle-status category members that refused to follow the dry wine movement that time. All in all, events seemed to justify the theory of middle-status conformity: the deviance had emerged on one of the peripheries of the social hierarchy, then it became generic in that status segment, but was not able to spread among middle-status actors.

In a long run however, producing parcel-selected varietal wines has become a general practice in Tokaj-Hegyalja. Nowadays also dozens of middle-status wineries are releasing their dry Furmint

year by year, which contradicts middle-status conformity theory. By examining the data more precisely however, it turns out that middle-status firms that refused to follow the new winemaking methods of the high-status actors around 2005 have not changed their strategy fundamentally since. In fact, most dry wine producers were such organizations that entered the market after or shortly before 2005. This suggests that for some reason middle-status conformity has not applied to new entrants of the market.

How could these wineries gain enough status to enter the middle-status segment? What was the source of protection that allowed them to keep this status level and deviate from the norms despite the conformity pressure? According to the theory, the sources of status are past performance and affiliation (Podolny and Philips 1996). As these organizations were relatively new, only the second could play a role. Somehow the modernist newcomers had to be associated with high-status organizations which provided them a higher status. Because status leaks through relations (Podolny 2010 p. 10-22), this part of the research focused on exploring such relationships in the wine region that could play a role in this transfer process. As a result of extensive fieldwork, the following mechanisms were identified:

Winemakers transfer status. Presumably, exchanging status is also possible among organizations and their managers or other emblematic members. On the one hand, managers can gain status from the organizations they are working for, on the other hand, organizations can increase their status by employing high-status leaders, or associate with them otherwise. By studying the social networks and the employment histories of vintners, viticulturists and oenologists of the wine region, it became clear that there are strong ties between the new entrants and the high-status reformers.

First, winemakers of larger estates often cultivated their own few hectare family vineyards as well. Usually, there was an agreement with their employer, so they did not release their own wines. However, after these estates had reached a certain status level, their winemakers felt tempted to bottle wines under their name, both because of professional challenge and profitability. Therefore, they brought the family business to life and either resigned or renegotiated the conditions with their employer. Many of the newly founded wineries were such sleeping businesses of well-known winemakers. As they were associated with their owners and indirectly with the owner's professional past, status leak occurred.

Second, The success of the first dry Furmint attracted non-professional investors and hobby winemakers as well. Because these newcomers lacked local knowledge and often competence as well,

they employed high-status winemakers as consultants. Besides the know-how, such cooperation provided better visibility, marketability and higher status for new entrants, as the professional audience has associated them with the high-status consultants.

Winemaker societies transfer status. Progressive winemakers formed local societies, sort of voluntary “wine-judging committees”. These associations aimed to develop, propagate and control the norms of the modern style wine making. They also organized public wine tastings and common vintage premiers every year, where the newly formed members had a chance to present themselves to a broader audience, and benefit from the status of other members.

The role of location. The dry wine revolution started in Mád, which is the hometown of István Szepsy. First followers of him also cultivated their vines in that area or in the neighboring settlements. Later on, the style mainly spread in the southern areas of the wine region both due to newcomers and converters. However, the northern areas got involved in the recent years only.

In case we consider status as the main driver, this phenomenon can be interpreted in two ways. On the one hand, we can assume that location of wineries transfer status. High-status wineries were associated with their town of operation; thus, they enhanced the status of other local organizations. Modernist newcomers were also the beneficiary of this process which provided them a middle status position in spite of their deviant behavior.

On the other hand, it is possible that the conformity mechanism predominantly takes effect on the settlement level. Even though a general agreement exists regarding the traits of „tokajness” on the wine region level, norms can be revised locally. Moreover, enforcement of these norms depends on the local community. Consequently, a low number of organizations can establish an alternative norm system and spread it in the middle-status segment, as long as they are geographically concentrated.

Such interactions allowed new entrants to gain enough status to compensate the potential loss caused by the conformity pressure. These generous acts however, do not seem to be rational from the high-status actors' point of view. Status theory suggests that as high-status actors are the main beneficiaries of the status structure, it is to the interest of them to maintain it. Due to their position they can access more resources, which allows them to consolidate the hierarchy. (Ridgeway and Correll 2004). For instance, biodynamic winemaking in Alsace is such a separation method according to

Negro, Hannan and Fassiotto (2012): as only high-status actors can afford the prescribed expensive cultivation practices, being biodynamic secures a high position in the hierarchy.

High-status winemakers of Tokaj-Hegyalja did exactly the opposite, as they did not take any measures to prevent themselves from those types of status transfers that happened automatically (role of location). Moreover, they actively participated in a status leak (winemaker associations, counseling services) deliberately spread their successful viticultural and oenological methods and philosophy. This way they threatened their market positions and risked a drop in their own status (Podolny 2010). The aim of these benevolent acts was the fact that their agenda was not purely driven by economic considerations. Szepsy and his followers strongly believed that the greatness of Tokaj lies in its terroir, which can be and has to be expressed by dry wines. They aimed to restore the fame of the whole wine region which requires a collective action.

As a consequence of the status transfer process described above, modern wine making gained a foothold in Tokaj-Hegyalja. After this point, the development trajectory of the wine region can be described as follows.

1. After the modernist approach had become widespread in the middle-status segment, it served as an alternative norm system for future modernists entrants to conform without losing status.
2. This dual norm system also allowed traditionalists struggling with sales problem to follow market needs and broaden their portfolio with modern style dry wines. The wine region was in this state in 2016.
3. As a consequence, the prominence of the traditionalist group will drop and step by step, modernist norms will become dominant in the middle-status segment. Thus, formal re-codification of the norms will begin.
5. Middle-status conformity turns: the remaining members of the Ancien Régime will become norm-breakers. Therefore, they will either have to conform or leave the middle-status category, as deviance from the norms is allowed on the peripheries of the status hierarchy only (Philips and Zuckerman 2001). With the consolidation of the middle-status segment, the transition will finish.

With statistical evidence about the above process, the research could demonstrate that there are such development patterns of organizational populations that allow the transition of norms in spite of the well-known middle-status conformity mechanism. Still, this research took another path due to several reasons.

First, the status-based explanation does not cover the whole empirical puzzle. The theory development regarding status transfer mechanisms elucidate the dry wine revolution of the 2000s but can not explain the failure of the sweet wine reform of the 1990s.

Second, retrospective modeling of the status hierarchy was unsuccessful. On the one hand, direct status data has been collected in 2008 and 2013, by interviewing 20 wine experts, journalists and wine merchants. (The 2008 data collection was performed by Professor László Pólos and colleagues as the part of another research project.) They were asked to rank unspecified wines of the given wineries. Interviewees always divided wineries into groups first and made the actual ranking within the groups. Respondents usually formed 3 main clusters (high- middle- and low-status), which resembles the tombstone advertisements, which Podolny and Philips (1996) used for modeling deference ordering among investment banks.

The collected status data gave insight into the status hierarchy of 2013 and 2008 only; thus, another method was required to reconstruct the whole history of it between 1989 and 2014. In order to fill the gap, wine label data was collected. By examining labels it becomes apparent that they communicate the status of their producer. The position of the hierarchy is not represented by the information printed on them but the hierarchy of it. The assumption was that depending on what a producer highlights (name of the winery, wine region, place of origin, sweetness, grape variety or wine type), it signals its membership in either status group.

The planned analysis aimed to find a correlation between the label structures and the recorded status positions in 2008 and 2013, and by applying the recognized regularities, reconstruct the status hierarchy retrospectively. Unfortunately, the results were dissatisfying. It turned out that label structure correlates with status positions in some sense, but certain features of labeling habits make them inadequate for the modeling of the past hierarchy.

First of all, it was difficult to ascertain, whether a winery communicated its actual or desired status position. Most likely customers evaluated the signals and even provided a grace period for the newcomers, but this was a phenomenon that was hard to incorporate into the analysis. A similar problem was signal faking. Again, customers possibly punished this behavior, but certainly with a

delay, which made the modeling complicated. Moreover, even if labeling was honest and realistic, label design did not follow the volatility of status. Both winemakers and customers are conservative in this sense; thus labels did not change often.

Another set of problems was related to heterogeneity. On the one hand, many winemakers positioned their wine types differently in terms of status and used different labels. This created many possibilities regarding the calculation method. Moreover, there were wine type-specific status signals which made winery comparison difficult in case the portfolio structure differed significantly. Finally, the signaling set has changed during the studied period. Those label information that indicated a high position in the 1990s were rather middle-status signals in the late 2000s. Besides that, certain information types disappeared from the labels while others were introduced.

As a result of these challenges, the wine label analysis failed to provide status data which also undermined the continuation of the status based research approach.

2.6.3 A SUB-CATEGORY EMERGENCE APPROACH

The last theory development attempt interconnected several lines of organizational ecology research: age dependence, which studies why older organizations are less capable of changing their operation conforming environmental changes (Freeman, Carroll and Hannan 1983, Hannan 1998, Fleming and Sorenson 2001, Le Mens, Hannan and Pólos 2011), the delayed perception of de-alio entrants' membership in their new category (Hsu, Hannan and Pólos 2009) and the theory of contrast based legitimation (Hannan, Pólos and Carroll 2007). It defined the two wine style reform attempts as organizational sub-form emergence processes, and explained their success or failure on a common theoretical basis. The theory was as follows.

One way to model environmental drift is through entries of new competitors to a market, who introduce new strategies, technologies, or products that are more appealing to the audience. This decreases the intrinsic appeal of the incumbent organizations and ultimately increase their mortality hazard unless they are capable adopting these new features. (Le Mens, Hannan and Pólos 2011)

The audience may perceive new entrants as members of a novel sub-category. Examining the effects of this type of environmental change the attempt of organizations to conform with the new codes can be considered as an intended change of perception that might lead to membership in a new category to replace membership in an old one. Organizations that can not or do not intend to conform

to the new codes entirely are hybrids: they maintain some grade of membership (GoM) in their initial category while adopting feature values of the new category. Both of these moves impact category contrasts thus legitimation and vital rates, which again changes entry and exit rates. Therefore, such a category based model of the phenomenon allows us to give predictions about the emergence of sub-categories.

In the model, two contrast related mechanisms are incorporated. First, migrating organizations are de-alio entrants in the new sub-category (such organizations that existed before entering the category), which implies that the audience assigns lower GoM in the new sub-category. (Hsu, Hannan and Pólos 2009). This also suggests that for a certain period after the entry they are considered as members in the incumbent sub-category as well, even if their perceived feature values do not meet all the expectations attached to it anymore. Later on, as the audience perceives the new feature values and forms a new consensus about the membership, de-alio entrants will gradually gain full GoM in the new category while losing membership in the incumbent category. Consequently, migration of an actor among categories decreases the contrast both sides at least temporarily. A similar effect is expected if an organization does not adopt all feature values of the new category thus maintain a partial membership in both categories. Unequal perception of GoM also appears in the case of multiple category memberships due to the de-alio effect: audience members will temporarily overestimate membership in the incumbent category and underestimate membership in the novel category.

Second, the intensity of this effect depends on the density of the particular category before the event. It follows from a simple calculation of contrast (Hannan, Pólos and Carroll 2007) that an additional entrant, which has a lower perceived grade of membership than the category average has a stronger effect on category contrast if the density of the targeted category is low and it tends to zero as density grows. The same applies for a category where a member's GoM drops. Figure 2.1 shows the effect of a new entrant with 0.5 perceived GoM on a hypothetical crisp category's contrast. The pattern is similar in case a member loses membership in a crisp category.

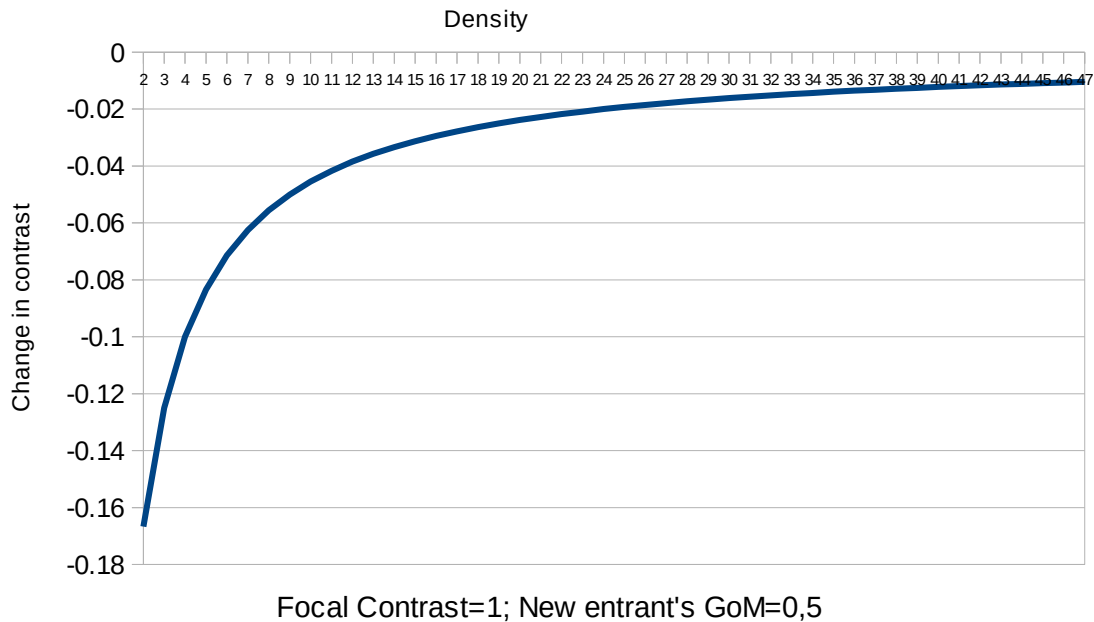


Figure 2.1: Contrast loss of a crisp category after a low membership entry

We argue that effects of these mechanisms are important in our model but slightly different for the various entry types. These differences will be discussed below.

De-alio entrants.

GoM of de-alio entrants will be temporarily overestimated in the new category while underestimated in the incumbent category, thus both category’s contrast will be lower, which harms their legitimation and vital rates. The strength of this effect depends on density: categories with few members are strongly influenced, while categories with numerous members barely. However, if the new category’s contrast is relatively low (because of the lower perceived membership of former de-alio entrants for instance) this does not hold. Regardless the density, the contrast will remain stable. Low membership entry into a category with high contrast and low density result in a contrast sensitivity. Because for a certain period audience perceives de-alio entrants as members of their incumbent category as well, the migration also decreases the contrast of that category, thus its legitimation and vital rates deteriorate. Again, this effect is also classical density (and contrast) dependent.

The dynamics of this GoM assignment are also important. As the audience gradually develops

consensus about the new category memberships, the set of perceived feature values of de-alio entrants will approximate to the „real” set. In other words, their GoM in the incumbent category will gradually decrease, while it will increase in the new category.

Thus, as time passes the legitimation reducing the effect of former de-alio entrants will get weaker in the new category but get stronger in the incumbent category. (Depending on category densities and contrasts of course.) At the point when the audience recognizes de-alio entrants as members of the new category exclusively, the effect disappears.

Hybrid members.

Those organizations that cannot adopt all the feature values of the new category or do not intend to do so experience the same effect as de-alio entrants: the audience will assign unjustly high grade of membership in the incumbent category and unjustly low grade of membership in the novel one, which decreases both category’s contrast and legitimation temporarily. Again the relative contrast loss depends on the category contrasts and classical densities prior to the entry into the novel category. Dynamics are also similar to the de-alio entry case, the only difference is that such organizations remain members of both categories, thus lowering their perceived contrast for a longer period of time.

De-novo entries.

De-novo entries are such category members that were newly founded. On the one hand, contrast based legitimation drives entry rates thus de-novo entries as well. On the other hand, it follows from the initial condition (the new feature values are more appealing to the audience) that the new category will attract the majority of potential de-novo entrants. In addition, we presume that such entrants have a high GoM in their category.¹ New entrants do not have to deal with the lower perceived membership as the audience can form a clear consensus faster. Thus unlike de-alio and hybrid entrants, de-novos do not decrease the contrast of their category. In fact, they might enhance it and by increasing the category density they also decrease contrast sensitivity analysis.

1 Certainly there are hybrid entrants as well. In their case the de-alio mechanism prevails without the temporarily mistaken GoM evaluation of the audience.

Sub-Category emergence model.

So far we discussed the effects of single entrants/migrants but not yet the more interesting population level dynamics. We analyzed the intensity of the effects under different values of contrast and (classical) density of both the incumbent and novel category. These values however, vary over time as a result of migration and entry dynamics, which impacts the vital rates. By linking the above arguments and consider the possibility of multiple entries, a simple model of environmental drift driven sub-category emergence can be drawn.

For the sake of simplicity, we need a number of assumptions.

- (1) Multiple category members hold equal membership in both categories.
- (2) De-novo entrants have a high GoM.
- (3) The focal category has a high density while the new category has only a few members in the beginning.
- (4) Both categories have relatively high contrast initially.

In the short run, the effect of persistent hybrid category members as well as de-alio entrants will decrease the contrast of both categories. The effect is stronger for the new category if the migration starts before a moderate density is achieved, while in the incumbent category the effect is weaker. As legitimation of the new category drops entry rate decreases and exit rate increases while in the incumbent category in this period this effect is weak.

The legitimation of new category with low contrast is low, so it will not attract many de-novo entrants until audience adjusts the membership of de-alio entrants which increases the contrast again. Similarly, hybrid members temporarily keep the new category's contrast low for a while. Later the effect weakens as perceived membership approximates "just" membership, and the number of multiple category members decreases due to their higher mortality rate.

The low contrast phase may well be long. In case the number of migrants and the few de-novo entrants exceed the number of organizations exiting the density of the new category will grow gradually. The contrast becomes more robust. As audience develops consensus about former de-alio entrants' membership, and the number of possible migrants drops the sensitivity of the contrast declines. Ultimately, if the new category survives the hard times, at this point it can develop a high contrast again, thus become legitimate, attract more de-novo entrants and follow the classical path of category emergence.

If migration continues more de-alio entrants lose membership in the incumbent category. The density of this category drops, what in turn increases the sensitivity of the contrast. Later migrants will increasingly undermine the incumbent category's legitimation and elevate its mortality rate. This process can easily escalate due to the positive feedback loop. Finally, few obsolete organizations may survive, those who were not able to change their feature values but could cope with competition. In this terminal phase, the incumbent category will have high contrast.

The speed of the emergence of a new sub-category depends on whether it can develop sufficient classical density before migration begins. It helps if gatekeepers of the new category can take measures to hamstring multiple category membership by developing an oppositional identity, name and shame de-alio members. In addition to these, certain exogenous processes can enhance de-novo entry rate and support the new category to overcome the challenging low contrast period.

Applying this model to Tokaj's case the two reform attempts can be explained as follows. The reason why the modern sweet wine reform failed was that the few early innovators could not develop a high enough density to prevent the high category contrast from the de-alio entrants and new hybrid organizations. This way the entry rate of this category remained low. In other words, the modern sweet wine production could not spread. On the other hand, the dry wine producer category in the 2000s could find a way to develop high enough density to face this challenge. It was not clear at the time when this explanation was developed. how this happened but eventually speculation about the possible reasons and further development of the idea has led to the final theory. Consequently, the above model was not tested statistically.

The thesis argues that success and proliferation of the different winery sub-clusters were predominantly dependent on their contrast level. It also suggests that besides the known mechanisms relevant feature dynamics trigger contrast changes thus it has to be incorporated in an evolutionary model. In the following chapters, the proposed organizational ecology model of Tokaj winemaking will be built up gradually to test these three hypotheses. The structure of the document will be as follows:

First, the data set and the applied methods will be outlined in Chapter 3.

Second, the winery population will be defined and delineated in Chapter 4. This will also include basic descriptive analysis of the main population.

Third, the yearly sets of relevant features will be modeled. This will include the audience based determination of the relevant features and their annual weight, discussion of the detected features values and their operationalization in Chapter 5.

Fourth, the same chapter includes the coding of winery feature values, based on the yearly relevant feature set and collected data.

Fifth, as the last step of the modeling, yearly fuzzy cluster analysis will be performed on the coded feature vector data, which will determine the optimal number of similarity clusters, their centers, contrast levels, and the grade of memberships of organizations in them. In addition to that, Chapter 6 will contain the last two steps of the analysis which are the hypothesis tests.

On the one-hand, Hypothesis 1 and 2 will be tested by applying a negative binomial model that investigates the effect of contrast on the birth rates of the clusters. On the other hand, results of the fuzzy analysis will be interpreted in the light of the proposed contrast mechanisms. Development trajectories of clusters will be drawn up regarding contrast density and vital rates. Interpreting these in the light of the proposed mechanisms will allow testing Proposition 1.

CHAPTER 3

DATA

The aim of the data collection was to fulfill the needs of the analysis. It required an event history data set of the Tokaj winery population between 1989 and 2014, and yearly data regarding the feature values of the wineries for the same period. The second included yearly assortments, winemaking techniques, cultivation methods and many other winery characteristics that were detected as relevant for the audience. Besides that, data that referred to potentially relevant features in specific publications was collected, which was used for determining the yearly relevant feature sets. While event history data was quantitative, feature values were partly quantitative (for instance, assortment data), but predominantly qualitative. Part of the analysis was to quantify feature value data, which was ultimately coded as a binary-like data set (Chapter 4). This section will review the sources of data and the collection methods. Detailed discussion of both data and methods will be provided in each analysis chapter.

3.1.1 ATTEMPTS AT COLLECTING SECONDARY DATA

The initial goal of the research was to collect primary data about released wines. This did not seem impossible, as every wine that a winemaker intends to sell has to go through a licensing process. In Hungary, this is conducted by the National Food Chain Safety Office (NÉBIH in Hungarian). Permits are recorded; thus, the register of NÉBIH is a retrospective database of all wines permitted in the past. Besides that, licenses contain a great deal of information about the wine and the producer, which is most useful for a feature value database, and also applicable for determining vital events of winemaking organizations. Unfortunately, NÉBIH did not allow access to any data without the permission of the producers of the wines, including those that are no longer existing. It also refused to provide the list of organizations whose permission was sought. This policy therefore necessitated a different method of data collection. The second possible source of secondary data was the Hegyközség of Tokaj-Hegyalja, which is the local self-governing body of winemakers. Besides other tasks, its function is to certify that a particular wine was produced from locally grown grapes. This certification is required for the wine licensing process and, apart from issuing it, the Hegyközség also keeps copies

for statistical purposes. However, only summarized annual data was provided, which did not serve the purpose of the analysis. Therefore, the only solution was to collect primary data.

3.2 PRIMARY DATA SOURCES

Because the secondary data collection was unsuccessful, primary data was collected. Due to the time range of the study (25 years), the high number of relevant features (21) and the size of winery population (145 organizations), this required an extensive collection process, including various types of sources. In this section, these will be introduced by discussing the types of sources, the type of data they provided and the specific data sources listed.

Although the end of the study's time range is 2014, the data collection also included sources that were released after that year. One of the reasons for this was to cover such estates and products that were already existing in 2014, but did not yet appear on the market; thus, foundation events of these wineries could be included in the event data set. In addition, retrospective publications were released after 2014. Next, data sources will be introduced. Features of them and the type of data they provided will be discussed. The specific data sources are listed in Appendix 1.

Wine guides

Hungarian wine guides were annual publications of wine experts that discussed the trends of winemaking in each wine region, introduced wineries, and commented on and rated their wines. Among the printed sources, they gave the widest spectrum of winemakers but provided relatively limited information about them. Winery descriptions typically contained the year of foundation, ownership, winemaker, vineyard size, cultivated parcels, cultivation method and winemaking technology. The amount and type of the provided information varied according to the estate. Tasting notes either covered the whole available assortment, or representative wines only, depending on the importance of the winery. Besides wine characteristics, they also sometimes contained information about winemaking and cultivation methods specific for that product, and gave a score rating. Besides regularly released guides, the category also included one-off publications or books that otherwise followed a similar structure and contained the same kind of information. Wine guides were also the source of relevant feature data, whose collection will be discussed in Chapter 5.

Wine magazines

Wine magazines were newspapers focusing on winemaking. The most important difference between them and wine guides was that they published longer articles and interviews and provided more in-depth and detailed information about wineries. Therefore, they were typical sources of less obvious feature values. Moreover, as they returned to the same organizations again and again, changes in features could be recorded. Another advantage was that they were published more often than wine guides (typically monthly or quarterly), so they reported about more wines, including new releases, which helped to track changes in the assortment. The downside was that they covered fewer wineries, as they did not give a systematic overview of the wine region, but showed promoted winemakers producing the best quality or the most innovative wines. On the other hand, they regularly contained a comprehensive overview of wine types or variety, which also included products of less famous winemakers. Besides being a very valuable source of wine data, these publications were useful regarding feature values as well. Such articles started with a personal introduction to the aspects that the authors considered as important, this way revealing feature value relevance.

Other printed materials

These were such publications that entirely focused either on winemaking or Tokaj itself, but did not follow the wine guide form: either books about the wine region or specific winemakers, and estates or promotional booklets of winemaker associations. Every type of data could be found in sources both about features and vital rates.

Wine blogs and online wine press

Wine blogs were very similar to wine magazines regarding topics, the main differences being that they put a bigger emphasis on tasting notes and based their winery descriptions on cellar visits. Reports about these contained very detailed information about the estate, including plans of the winemaker, as well as facts and comprehensive tasting notes about the whole assortment (both marketed wines and barrel samples). As blogs were not limited by publication, their reports were very thorough and detailed, thus were an excellent source of feature value data. In addition to that, blog entries were dated, thus changes in features could be tracked very well. The downside is that they did not cover early periods, and focused on popular estates. The online wine press, being the other type of this category, was similar to printed wine magazines regarding topics, article types, as well as available data.

Winery homepages

A primary sources of data about wineries were their homepages and Facebook sites. These contained information about all the feature values, or about almost nothing, depending on the estate's online activity. Facebook timelines were particularly useful because the published information was time-related, which made collecting past feature values easy. The same was possible in the case of winery homepages by browsing former states of them in Internet archives, such as waybackmachine.org. Even with this method, collectible data was limited, as online winery sources cover the 2000s and 2010s only. Depending on their availability, both homepages and Facebook sites were processed during data collection for each winery.

Settlement homepages

Homepages of villages often presented a list of local wineries to promote wine tourism. These usually did not contain any further information about the winery but were useful for building up the estate database, as the lists also contained less-known organizations. With the Internet archive, these sources were also browsed retrospectively.

Wine association homepages

Wine association homepages listed their members and gave a short description about them, which usually contained basic facts about the estate, such as size, technology, year of foundation and sometimes assortment data as well. However, the more relevant information involved the conditions of membership, which was usually feature-related. These could be some degree of yield limitation, assortment restrictions, maturing time or even domestic ownership. As these had to apply to all members, such homepages were a practical source of a particular feature data. Again, archived versions of these sites allowed data collection retrospectively.

Online wine retailers

Internet wine shops were mainly a source of assortment data. Both present and past information was collected with the help of Internet archives. Also, many online retailers presented tasting notes and winery descriptions, which were sources of the feature value database.

Wine competition results

Wine contest results were the source of assortment data; however, by finding wines of formerly unknown estates, it also expanded the winery population data. Tokaj estates nominated their wines in a wide range of wine competitions, both in Hungary and abroad. However, by looking at the attendants, it seems that there was a clustering phenomenon: known and prestigious estates sent their wines to international events or the most regarded national contests, while unknown and low-status organizations sent their wines to smaller, local competitions. For the data set, the second was more interesting. The reason for this is that data about prominent wineries was collectible from other sources as well, while wines of peripheral estates were less visible. Wine competition data was gathered from an online archive of contest results (www.borverseny.hu).

Other online sources

This category consists of such homepages that do not focus on winemaking. Still, these sometimes contained news about Tokaj, reports about estates and interviews with winemakers, which all contained useful information for the study, predominantly regarding feature value data. Unlike the sources discussed so far, these articles were not found as a result of consequent screening, but by searching for winemakers and wineries on the Internet. Therefore, such data sources will not be listed in Appendix 1.

Broadcasted programs

Besides printed and online materials, there were also broadcasted programs that specialized in wine. The most relevant parts of these were interviews with winemakers as they allowed feature value data collection.

Company register

The company register of the Ministry of Justice (<https://www.e-cegjegyzek.hu>) was used to determine founding and termination year of wineries, whose vital events could not be specified otherwise. As will be discussed later, the legal existence was only one of the conditions being considered as part of the winery population in this study, but it was a necessary one. Unfortunately, this database was not suitable for browsing by economic activity. Thus, it could not be used for gathering the complete population data of wineries.

Wine collections

Aszús are frequently collected as they can be aged in bottles for decades, or even for centuries. Most of the collections are private, but the public ones contain old vintages as well. One of these is the Curia Wine Museum in Vác (www.curia.hu), which possesses 900 aszús. Data was gathered from the collection register, which was available earlier on the museum's homepage. Despite the fact that most of these wines were produced before 1989, the collection still proved to be useful for the assortment database.

Private wine label collections

Collecting wine labels is not a widespread hobby in Hungary as there are only a few senior enthusiasts in the country. However, these collections were enormous and covered a long period, including the 1990s, which most of the other data sources did not. Besides that, wine label collections proved to be very useful in a several ways. First, they provided a better overview on small and peripheral estates. The reason for this was that collectors usually asked estates for labels by mail, and small, less popular estates were more likely to answer. Second, collections included complete assortments of vintages, as collectors received all the available labels in case of a successful request. Third, wine back labels contained the date of certification, which gives a hint about the release of the wine. With the owner's permission, the collections of the following collectors were digitized: Dr. Lajos Gáncs, András Füredi, and Dr. Mihály Fülöp. These gentlemen were most helpful by allowing access to their collections, and also by giving a lot of information about the past regarding Hungarian winemaking.

Wine expert interviews

To gain insight into the main trends of the present and the past, informal interviews were conducted with wine experts. These occasions proved to be most helpful, especially regarding database expansion. On the one hand, such experts that formerly published specifically about Tokaj could provide reliable feature value information about the past of both existing and terminated estates, which helped to fill in the gaps in the data. On the other hand, as they had systematically studied the wine region, they were aware of the existence and traits of the less-known peripheral wineries.

Winemaker interviews

These interviews were conducted by the author with winemakers mostly by visiting their wineries. The category does not include printed, online or broadcast interviews, which were also used for data collection purposes. These meetings were informal conversations that were not recorded. Besides gaining some insight into the winemaking processes and debated topics of the region, these conversations served data collection purposes also, as the most straightforward data sources were the winemakers themselves. Unfortunately, most of them were not open to providing information without a personal visit, which would have been time-consuming. Therefore, interviews were seen as the last resort to collect data, focusing either on organizations with missing data or key actors of the wine region. Such meetings were also a practical way to expand the winery database, as winemakers knew each other locally. Information could be gathered even about just-established or planned wineries in the village. Besides this, winemakers were aware of each other's assortment, winemaking technology and cultivation methods; thus, they could provide feature value data about other organizations as well.

Wine trader interviews

These interviews were very similar to those interviews made with wine experts; the main difference lay in the attitude of the respondents, as they focused strongly on the marketability of wines. Apart from that, their knowledge about winery features was different, as they had more detailed information about the wineries whose product they sold. Thus, feature data of these wineries were gathered from them.

Wine tasting events

Wine tasting events also provided an opportunity to approach winemakers or other colleagues of the estate. Such sessions were not suitable for conducting long, in-depth interviews, but questions about specific winery features could be raised.

Local information

A significant part of the data collection took place in the wine region. During this time, interaction with locals also helped to build up the data set. Tokaj-Hegyalja is a rural region mainly focusing on viticulture; thus, it was most likely that locals knew at least one person who was working in the winemaking industry. As a result, by conversing with them, one could easily obtain both information and recommendations. The second turned out to be very useful as it allowed the author to

contact such winemakers that were otherwise reluctant to respond. The local information did not necessarily mean collectible data, but facts and hints that gave a better understanding regarding specific wineries and winemakers. Such information included: carrier path of winemakers, circumstances of foundation and cessation of estates, family connections, local embeddedness and succession problems of family businesses. The locals could also provide feature data. Except for a few types, these were not included in the data set unless other sources confirmed them. The types of data which were considered as reliable were existence of the winery, ownership type and non-wine related businesses.

CONCLUSION

Despite the above efforts, the database is far from complete. On the one hand, some organizations were surely not observed. On the contrary, a sufficient amount of data about certain wineries was not collectible, either regarding vital rates or feature values; thus, they had to be excluded from the data set. The data availability was problematic for the early period, specifically regarding the initial 1990s, as online sources were not available and printed publications were also rarely published. However, this was less problematic for various reasons. First, the population was small in the beginning, and the real growth started later. Thus, from these years, the number of potentially uncovered organizations was low. Second, the number of relevant features was low in the early years, which made the modeling of feature vectors easier, despite scarce data availability. On the other hand, later periods are covered very well. Online sources, especially the Internet archives, allowed the author to explore the traits of the population in greater detail after 2000. All in all, despite its deficiencies, the collected data will most likely be suitable for analysis.

Chapter 4

DELINEATION OF THE WINERY POPULATION

In this chapter the population of Tokaj wineries shall be defined. It will be considered as crisp set where memberships are binary and dependent on predetermined conditions. On the other hand, its sub-clusters which will be discussed in a later chapter, are considered as fuzzy sets, where membership of organizations in different sub-clusters are partial and dependant on audience perception.

Firstly, the time frame of the study will be set, followed by the specification of the main population. Secondly, vital events of its members and their operationalization will be defined followed by the discussion of sources and methods which serve as the basis of data collection regarding membership in the main winery population. Finally, basic descriptive statistics about the population will be presented.

4.1 TIME FRAME OF THE STUDY

The time frame of the analysis is from 1989 to 2014. The starting point of the study is self-evident for several reasons. First, 1989 is the year when communism ended in Hungary, which resulted in a major socio-economic transition. In terms of Tokaj, this facilitated the emergence of different organizational forms and the inflow of foreign capital. Second, it can be considered as the (re)starting point of the evolution of the winery population, as before that year only two companies were allowed to operate in the region. Tokaj Wine Works and Hungarovin were the exclusive wine producers and distributors and integrated local vine growers by buying grapes and must from them. Third, this was the starting point of the redefinition of Tokaj-Hegyalja by innovative newcomers regarding technology, cultivation methods, wine style and wine types. Or from the theory's point of view the beginning of transformation of the category's relevant feature vector. The research would have allowed a later endpoint, but 2014 was optimal for data collection. The reason is that there was usually a gap between the establishment of wineries and market entry. Thus, on the one hand organizations founded in 2014 were detectable and their real feature values of that year were also visible.

All data in this research was collected or calculated on a yearly basis. This is mainly due to the cyclicity of the wine industry. Wines are released annually and most features are directly connected to them (wine characteristics, assortment related features). Most of the other features also serve winemaking (technological traits, cultivation methods) thus they do not change within a year. Besides that available data was also annual which makes continuous modeling impossible.

4.2 CONDITIONS OF MEMBERSHIP

The current study focuses on the wine producing population of Tokaj-Hegyalja and the sub-clusters of the population form the primary subject of this study. The Tokaj brand, particularly refers to wine, which is produced exclusively from grapes harvested from specific wine region. In addition, owing to a recent amendment, only wine that produced locally can be segregated in this category. Therefore, any organization that produces Tokaj wines, can be considered to be a member of the winery population. It is important to point out that, it is not necessary for wine production companies to have their own vineyard, as grapes can also be procured in the wine region. Similarly, a wine production company can use winemaking technology from other production companies and take cellars on rent for storage. However, it has been observed that except for a few instances, the winemakers in Tokaj typically own vineyards and have a more or less complete wine production and storage set-up in-house.

The studied population has been identified based on certain criteria and therefore the population is limited to a specific category. Thus, specifically, those organizations that produce bottled wines have been included in the study sample. The organizations, which have been excluded from the study, are mass producers of cheap bulk wine that is sold to pubs or other wineries, and non-professional smallholders that sell their wines from barrels, often without permission. The primary reason of their exclusion is that as they often hide their identity, they would be difficult to track and will hinder study analysis. Also, the analysis is based on the surmise that since these producers compete in a different market segment than bottling producers, so that omitting them from the model possibly would not cause misleading results, thereby limiting any bias. In addition, the study focuses on wineries with marketed products, regardless of the sales and distribution channel. Besides the traceability problem, the reason of this exclusion is that organizations that are not selling wines are barely visible to the audience and consequently, not relevant in terms of category legitimation. However, these organizations can be considered as part of the population, in case they enter the market in a later year.

Interpretation of such types will be discussed later.

Alternatively, it is noteworthy that the delimitation is also inclusive. Multifunctional organizations can also be included as members of the population as long as they produce and sell bottled wines, even if winemaking is not their primary function. Typical joint business, of such organizations is either wine tourism or agriculture related. Therefore, this implies multiple-category membership, at both the main category level and the sub-cluster level. However, during the study analysis, the non-winemaking functions of organizations, were not coded as memberships in another categories on either level. On the contrary, these non-wine making functions, were considered as a potentially relevant feature, thus impacting clustering at the sub-cluster level. Publications of wine experts showed that this multifunctionality has been indeed considered as a relevant feature. Although, the same does not apply on the estates operating in other wine regions as well either in Hungary or abroad. In such cases, starting year of operation in Tokaj was coded as foundation year, but winemaking activity elsewhere was not included in the model otherwise. This simplification of the population was also based on pragmatic considerations, as the multiple-category membership approach would require inclusion of further organizational populations, thus leading to a vast extension of the model.

In conclusion the winery population was defined a crisp category with non-arbitrarily defined boundaries that are based on logical and pragmatic considerations including a specific part of the wine producers of the region..On the sub-population level however, the model was fuzzy where both the cluster boundaries and memberships were determined by the audience.

4.3 VITAL EVENTS

With the membership definition in hand, we know what the conditions are of being part of the Tokaj winery population. The next step is to determine the starting point and endpoint of this membership. Entry and exit events are important variables of the analysis for three reasons. First, they define the time frame that organizations spend in the population, thereby allowing the calculation of the yearly density of the population. Second, they serve as indicators of category legitimation; thus, they are dependent variables for later analysis. Third, they designate the years an organization is perceived by the audience, thus the period when it influences its categories' contrast.

For most organizational populations, establishment and market entry occur in the same year;

thus vital events define the above periods. But this does not apply to Tokaj wineries. Even if a newly established estate has the required plantations and technology, allowing it to start operating immediately, the wines of its first vintage can be launched in the following year at the earliest. (In Tokaj, this gap is usually longer, due to the prescribed maturing period of wine specialties.) As a result of the delayed market entry, newly founded organizations do not become immediately visible to the audience; thus they do not influence the density and contrast of their cluster during the first period of their existence. From the cluster's point of view, the effect of its contrast on vital rates becomes visible with a delay. On the other hand, their establishment time, rather than the time of their market entry, has to be taken into account as a legitimation indicator. As a consequence, establishment and market entry events have to be defined and recorded separately.

Before proceeding, two things should be noted, regarding entry events. First, the delay pattern does not apply to every single organization; in fact, there are instances when wineries enter the market in the year of their establishment. On the one hand, many of them had previously operated as 'non-professional' cellars, without self-distribution permits before their formal foundation, so they already had stocks to sell in the first year of their operation. On the other hand, estates founded via the acquisition of another winery's assets and wine stocks can also enter the market in the same year, by selling the products they have inherited. Second, the above approach assumes that the audience is not aware of the existence of wineries before their market entry. In Tokaj, this applies for the broader audience and in most cases for the wine experts as well. Still, there are estates—usually large new ventures or new family businesses of high status winemakers—that are mentioned in publications even before their market launch. However, these are usually short reports, with limited or no information about the future wines or the estate itself, suggesting that despite their visibility, these were not categorized by the audience before their market entry due to a lack of information. Thus, they do not influence cluster contrasts either.

4.3.1 MARKET ENTRY EVENT

The aim of market entry operationalization is to detect visibility. As wineries are represented by their wines, market entry is defined as the year in which an estate releases its first bottled wine(s). The model assumes that at this point in time the audience already perceives the features of an organization; thereby, it influences cluster contrasts and densities. This is definitely a simplification as in most cases neither immediate recognition nor rapid gain of comprehensive knowledge about features of the winery

is likely. A more feasible model would be a gradual process in which the pace depends on the size of the estate size, marketing strategy, success of the wines and many other variables. However, this is difficult to realize in reality; thus this simplified solution is still an acceptable approximation.

4.3.2 FOUNDING EVENT

A founding event occurs, when an organization fulfills the membership requirements in the main population, defined above. These are operation in the wine region as a legal entity and production of wines that will be bottled and sold. The use of the future tense is important because of the delay between production and release of wines. The aim of operationalization is to detect the year of production of wines that will eventually be bottled and released. It is also important to emphasize that all membership requirements were necessary conditions. This is due to the fact many new organizations in the winemaking population were not founded in a straightforward way but were successors of another form. To give a better understanding hypothetical examples will be given for winery establishment types.

The standard type is a company that was founded in 2000 in Tokaj-Hegyalja to produce wines. It bottled wines from the same vintage, and placed them on the market in 2002. In this case, the foundation event was in 2000 when all the conditions were fulfilled, while the market entry was in 2002. Examples of these modifications, each of which focuses on one membership condition, are listed below.

Winemaking. If the same company was founded in 1995, but continued to sell its yield as grapes until 2000, then the foundation and market entry events would still be in 2000 and 2002.

Operation in the wine region. If the same winery functioned in another wine region before establishing its additional Tokaj operation in 2000, the foundation and market entry events would be the same.

Operation as legal entity. If the same winery were a hobby estate, whose winemaker had produced bottled wine since 1995 for his/her own consumption before the 2000 foundation of the company, despite the past operation, the two events would be the same as above.

Selling. If the same company had already bottled products from 2000, but firstly sold wines from the 2003 vintage in 2005, the foundation event would be in 2003 while the market entry would be 2005.

Bottling. If the same company had sold its wines from barrel until 2005, but that year bottled and sold wines from multiple vintages, both foundation and market entry event would be in 2005.

4.3.3 EXIT EVENT

Following the definition of the main population exit event occur when a winery permanently gives up any of the necessary conditions of the membership. These are: operating in the region, producing bottled wine, and selling it. In case of estates that operate in multiple wine regions, giving up any of these in Tokaj only is a sufficient condition of exit event. Important to note that exit requires giving up permanently any of the above conditions. It is common that wineries does not produce or bottle wines from bad vintages which of course does not imply termination of the business.

Time of exit is defined as the year when the winery releases its last bottled wines. As was discussed earlier for the sake of simplicity the model does not define a separate market exit event, which means that the last year when an organization contributes to contrast and density is also the year when the last bottled wine is released.

The main shortcoming of the model is that it excludes such wineries that had failed before entering the market. Foundation of these companies were most likely also influenced by cluster contrasts, thus their exclusion may distort the results of analysis. On the other hand as they do not release wines they have no influence on cluster contrasts. The problem is, that these attempts are hard to record as they do not appear on the market. Besides that it is easy to confuse them with such vine growing businesses that produced wines that they never intended to sell. One solution would be to also include the vine grower population in the model as most of these early failed wineries eventually sell their yield as grape. This would be also useful as many vine growing businesses became wineries later, therefor this category can be considered as one of the risk pool of the entry events. However, no data is available regarding this population, only those winegrowers are visible that became wineries eventually.

4.4 DATA SOURCES AND COLLECTION METHOD

The aim was to analyze the complete winery population of Tokaj-Hegyalja between 1989 and 2014, thus to collect data about founding, market entry and exit events for all the organizations that met the requirements of membership: operation in Tokaj, production, bottling, and sale of wines.

These are all wine related, thus the easiest way to gather data which contains information about all the above would have been to request information from the state registers. As was discussed earlier this was not possible thus, primary data was collected both about estates and wines.

In short, the method was the following: collecting names of as many existing or former Tokaj estates as possible, determining whether they met the membership requirements in any years and in case they did, gathering data about their vital events. Mostly winery descriptions of publications or other forms of estate related information were sufficient to determine both membership and the vital rates. There were instances, however, when the time of vital events could not be revealed this way. In these cases, the wine data, namely release and production of the first and last vintage were the decisive factors. Besides the collection of these specific products of estates, all available Tokaj wine data was registered. On the one hand, wines of unknown organizations were found during this process which allowed the winery data set to be expanded. On the other hand data set of later analysis required complete yearly assortment data.

Table 4.1 summarizes data sources, and pairs them with the collected data types, It is noteworthy, that the summary does not indicate availability of data, but collection of it. There were sources that provided information about certain data types, but as long as they were not entirely verifiable they were not used for collection of that data type. For instance, locals were a very rich source of every sort of information regarding wineries that eventually were not included without confirmation. During collection, the same type of data was gathered from different sources depending on the availability. Similarly, the same type of data for a single organization was also collected from different sources in many cases.

Table 4.1: Data sources of membership conditions and vital rates

	DATA SOURCES																			
	Wine guides	Wine magazines	Other printed sources	Wine blogs	Winery homepages	Municipal homepages	Wine association homepages	Online wine shops	Wine competition results	Other online sources	Broadcasted programs	Company register	Wine collections	Wine label collections	Wine expert interviews	Winemaker interviews	Wine trader interviews	Wine tasting events	Local information	
Existence of the winery	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Wine production	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Wine bottling	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	
Wine sale	X	X	X	X	X			X			X		X		X	X	X	X	X	
Multifunctionality	X	X	X	X	X					X	X				X	X				
Operation in another wine region	X	X		X	X		X				X				X	X	X	X	X	
Founding event	X	X		X	X		X				X	X				X	X	X	X	
Market entry event	X	X		X	X											X	X	X	X	
Exit event	X	X		X								X				X	X			
Assortment data	X	X	X	X	X		X	X	X	X	X		X	X		X	X	X	X	

4.5 CHARACTERISTICS OF THE WINERY POPULATION

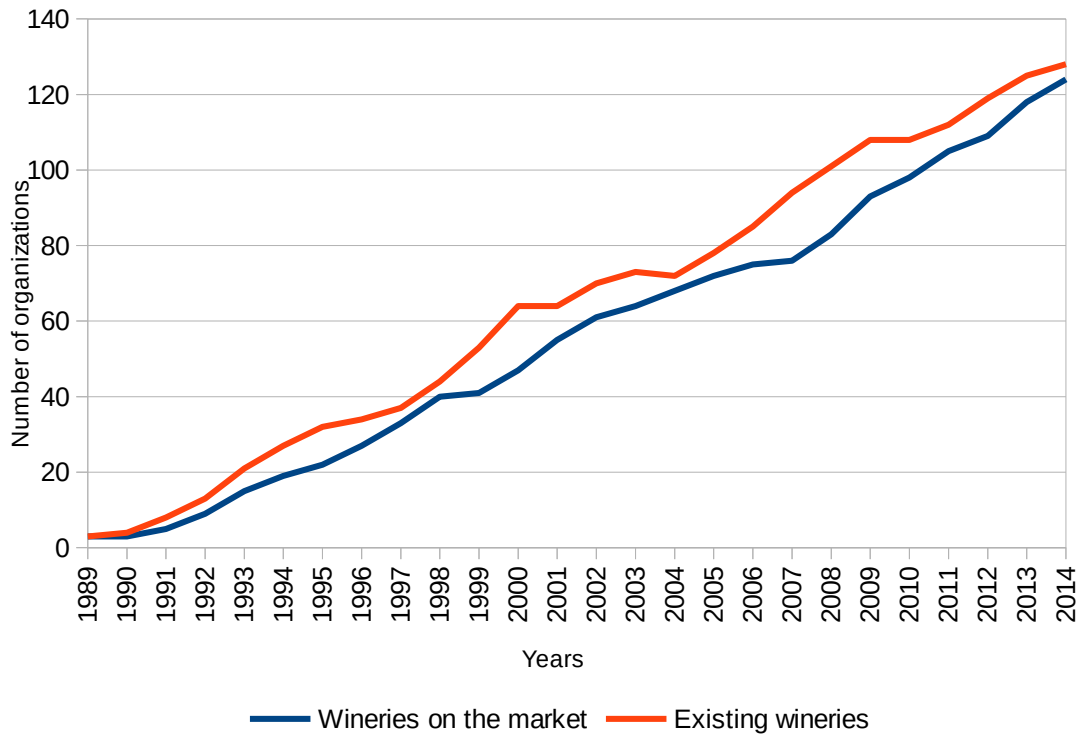


Figure 4.1: Winery population density 1989-2014

Altogether 145 wineries were included in the data set. Two of those were established before 1989 while 142 during the studied period. The two pioneer estates entered the market before 1989 and there were four organizations that were established before 2014 but released its wines after that year. Number of exit events was 16, which is very low in comparison to the entries. One of the reasons is that due to the traceability problem the analysis did not include those wineries that failed to market their products. Another explanation is that joint businesses such as tourism and mainly the possibility of selling the grapes to the state-owned cooperative allowed organizations to maintain winemaking even if it was not profitable. Survival of these estates makes exit rate unsuitable for indicating legitimation. However their market presence influenced the audience's perception regarding the cluster space; hence they had an impact on their cluster's contrast. Because sub-cluster dynamics is the main focus of the study and entry rate as an alternative legitimation indicator is available, the database was suitable for analysis in spite of its shortcomings.

Regarding density dynamics, a monotonic growth was observable, which is due to the low number of exit events (Figure 4.1). In turn, foundation events fluctuated: the mid-1990s, the millennium and the late 2000s were characterized by high entry rate, which was followed by high market entry periods (Figure 4.2). Although the population-level vital rates and density are important indicators, for the analysis a breakdown by clusters is much more relevant. These descriptive statistics will be included in Chapter 4.

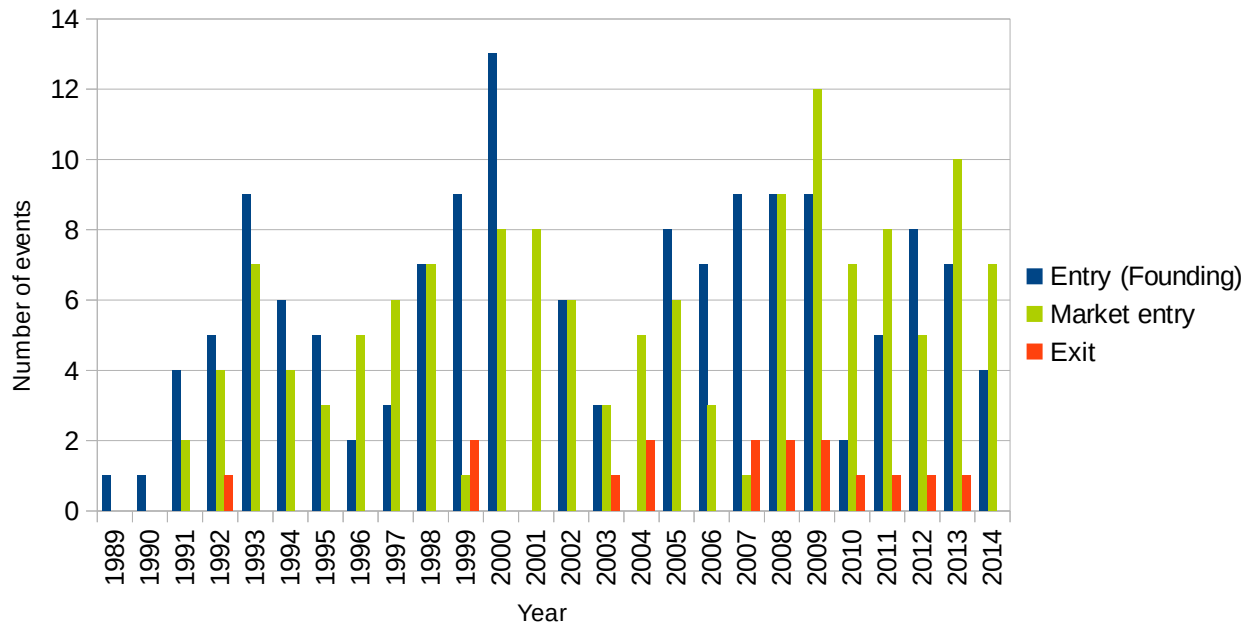


Figure 4.2 Vital events of the winery population 1989-2014

CONCLUSION

This chapter defined the population of Tokaj wineries as a crisp set. It specified its boundaries based on logical and pragmatic considerations and determined the vital events of its members. Due to the delayed market release of wines, two kinds of entry events were distinguished: foundation and market entry. The chapter also included the description of the data collection process regarding the population and a short discussion of density dynamics.

In the following chapters, the analysis will switch to the sub-population level and focus on the fuzzy similarity clusters within the winery population. In the next chapter, the yearly relevant feature set will be determined and the features discussed. This will allow coding yearly feature vectors for each organization which indicates their positions in the feature space. The final step of modeling will be the cluster analysis which will identify the dynamic clusters and unfold their development.

CHAPTER 5

THE RELEVANT FEATURE SET

This chapter aims to model the relevant set, which represent those traits of wineries that the audience considered as relevant in a specific period; thus serving as the basis for their similarity clustering. With the yearly set known, annual feature vectors of wineries can be computed based on the collected data. These will allow to determination and analysis of winery sub-clusters. which was is the main objective of the study.

The chapter is organized as follows. First, the most important aspects of the dynamic modeling will be discussed. Second, the modeling method will be shown. Third, the modeled feature sets will be presented and reviewed regarding both dynamics and the fulfillment of the prior modeling aspects. Fourth, in four sections the detected features will be discussed in more details. Finally, coding of the winery feature vectors will be shown.

5.1 ASPECTS OF MODELING

Collecting data on fuzzy category memberships directly from the audience was not possible in the case of Tokaj-Hegyalja. On the one hand, there were no labeled sub-categories, only sub-clusters. On the other hand, as the research covers a longer period, the collection of past membership data from the audience would be required. Thus, this research had to take a different path.

Theory suggests that in the early stage of category legitimation, members of the audience compare organizations according to a set of features that they consider relevant. According to these, they make similarity judgments and form similarity clusters, which can later become a labeled category and finally a legitimate organizational form (Hannan, Pólos and Carrol 2007). This suggests that even if cluster memberships cannot be collected in the present nor in the past, perceivable clusters and the memberships of organizations in them can be modeled retrospectively when the relevant feature set is known, and the data about feature values are collectible. The Tokaj winery population fulfills these requirements. On the one hand, relevant features were indirectly documented in wine experts' publications where they characterized wineries and their products by discussing those traits that they considered to be important. Even if they did not specifically highlight similarity clusters, they certainly

perceived them, and most likely formed them according to the features they focused on in the wine guides. On the other hand, rich feature data were collectible about both wines and producers.

The aim of this thesis was to apply a changing relevant feature set to the modeling, which would result in a dynamic cluster space. The empirical investigation of Tokaj-Hegyalja has shown that this dynamism has multiple aspects that have to be considered in the model. First of all, the set of relevant features is dynamic. As time passes, the audience can either recognize new features as relevant or dismiss old ones as irrelevant. This can be true even for legitimate categories, but most likely applies to the sub-clusters of the Tokaj winery population, which were not recognized as organizational forms by the audience. For instance, organic cultivation was not taken as a relevant trait in the 1990s in Tokaj, but since the late 2000s, it has become a hot topic. Second, the level of relevance varies. Certain features play a more important role in the categorization than others, and this also changes over time. In other words, relevant feature values have to be dynamically weighted in the model. Third, the meaning of the features may be dynamic, for which a Tokaj example is the wine style feature. In the 1990s, when the majority of the products were intentionally oxidized, winemakers who did not overemphasize oxidative notes were considered to be followers of a new style. In the 2010s, when the reductive aszú style was dominant, the same wines would have been considered to be old-style oxidative aszús.

In addition, it has to be considered that the innovation of a new feature will not necessarily be followed by immediate recognition of it by the audience, as there could be a gap between its birth and the time it becomes relevant. Data collection showed that this applied to many of the relevant features. Although no research has been conducted regarding this phenomenon, assumptions can be made about the reasons behind it. First of all, the audience has to develop a consensus about the relevance of new features, which may take time. This is possibly connected with the spread, thus the visibility, of the feature among organizations. Secondly, it might be the case that certain traits became relevant with the innovation of other features. In Tokaj, the cultivation of old vineyards is an example of this phenomenon. Although István Szepsy started to harvest and produce wines from such parcels in the 1990s, this practice only became relevant in 2003, after which it began to spread rapidly after another innovation of his, the terroir focused dry Furmint, became popular. The reason being that old vines have a deeper root system, thus wines made from their yield are more likely to express the characteristics of the parcel. As long as the terroir expression was not a relevant feature, the audience did not recognize the cultivation of the old vineyards. These aspects were taken into account in the model design, which will be discussed next.

5.2 MODELING METHOD

By definition, the relevant feature values are determined by the audience, and this study relies on a small but important part of it: wine experts. There are three reasons why this segment was chosen. On the one hand, experts are opinion shapers. They have a major effect both on the broader audience and the winemaking community. On the other hand, their views can be tracked retrospectively as they published them in books or newspapers. But most importantly this is in accordance with the organizational form emergence theory which suggests that the clustering is carried out by knowledgeable enthusiasts (Pólos, Hannan and Carroll 2007, p. 41-47). Therefore, audience, audience perception and the audience's opinion in the Tokaj context refers directly to the community of wine experts and wine journalists whose judgment fundamentally influences the opinion of the broader audience.

The method of tracking the changes in the relevance of features was the following: all winery descriptions, tasting notes and wine type related articles from the selected wine guides and wine magazines were reviewed. Any mention of the features was registered and summarized, yearly for each data source. If a feature appeared in a publication, it was coded as relevant for the author, regardless of the frequency.

Therefore, there is the question as to why the relevance was not weighted according to the frequency of mentions. The reason was that winery descriptions are not checklists of all the possible features, but short chunks of text that aim to attract the attention of the reader. There does not seem to be any patterns as to why certain traits of wineries were mentioned in a particular year and why others were not. Some clear patterns were observable, but they did not seem to be connected with the level of relevance. First, it was typical that wineries that were better known or had a history were discussed in less detail than new entrants. Second, extreme values or features were more likely to be highlighted, regardless of whether they were evaluated positively, negatively or neutrally, by the author. Third, changes in feature values were often mentioned. As none of these correlated with the importance of the features, weighting by frequency would not have resulted in more accurate results. The same does not apply to in-depth reports in wine magazines, which are more or less systematic regarding features, but these articles were available only about a limited number of estates. Thus frequency measurement was not applicable. Still, features were weighted, based on the number of experts that considered them as

relevant. As the model could include two publications in most of the years, the level of relevance could take three values in the model depending on how many experts mentioned them in the same year: 0, 0.5, and 1. In the years when only one source was available, the value was either 1 or 0.

Publications by four Hungarian wine experts served as the basis for modeling the relevant feature dynamics in Tokaj-Hegyalja between 1989 and 2014: Gábor Rohály, László Alkonyi, Gergely Ripka and Dániel Kézdy. Kézdy and Ripka were less important from the analysis point of view as they released books in 2014 only. These were added to cover the 2010s when Alkonyi and Rohály, whose books and magazines were the core material of the analysis, did not publish anymore. For most years of the period, however, only these two authors were included because they have been the most recognized wine writers for decades. Both of them witnessed the whole of the studied period, and their writings cover it mostly. Besides that, their publications were concisely edited and they reviewed a significant number of Tokaj wineries year by year, which, most importantly, are traits that do not apply to the majority of the other available sources and authors. Moreover, the availability of the alternatives was not constant during the studied period: while many wine related books and newspapers were released from the late 2000s onwards, there were none from the 1990s. However, these were still very useful sources for feature value data collection, as discussed earlier.

Gábor Rohály was the author of the Wine Guide Hungary books, which were published yearly between 1994 and 2012. These publications reviewed and rated the wines that were on the market in the given year. The format of these books was as follows: the wine regions of Hungary were discussed in separate chapters. Each of these sections started with a general introduction that discussed the history and significance of the region, its main traits, and the most significant trends regarding winemaking. Next, estates were reviewed, which contained a general winery description and a list of wines with tasting notes and often information about production and cultivation methods. Besides the winery reviews, some of the guides also contained a sub-chapter that gave a deeper analysis of an important product type. In the case of Tokaj-Hegyalja, its topic was either the Aszú or dry Furmint or sparkling wine. In Rohály's wine guides, all of these sections were the targets of the feature value collection, but the winery descriptions and tasting notes were the primary sources.

Two types of László Alkonyi's publications were included in the relevant feature set analysis. On the one hand, there was the 2009 Tokaj Compass, which was a comprehensive guide to the Tokaj estates, edited in a similar form to the Rohály books. On the other hand, there was the Borbarát magazine, which was released quarterly between 1996 and 2010. Although Borbarát was classified as a

newspaper, its format and the depth of its articles meant it was similar to a regularly published book series. What makes it different from Rohály's guides, and also from the 2009 compass, is that it reviewed fewer estates in more detail. The winery descriptions were longer and more elaborate, and the magazine also contained interviews with winemakers and estate owners. Another difference was that tasting notes were generally not attached to the winery descriptions but discussed in separate articles focusing on a particular wine type. Most releases of Borbarát were thematic in this sense, following a seasonal pattern. These reports provided a more in-depth understanding of the wine type, and due to containing a comparative analysis in terms of technology and cultivation methods, they were an excellent source of relevant features, in addition to the winery descriptions, interviews and tasting notes. All in all, while Alkonyi's Borbarát's writing was more detailed, more subjective and had a stronger Tokaj focus, Rohály's guides reviewed a broader range of estates in a more systematic way. From the analysis point of view, they were both equally valuable as sources as they contained the features that were important for the authors in the years of publication.

Table 5.1: Summary of feature mentions in wine experts' publications

MENTIONED FEATURES	PUBLICATIONS OF EXPERTS																			
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2014	
Family winery / company	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Domestic / foreign ownership	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Non-wine related activities										X	X	X	X	X	X	X	X	X	X	X
Size of estate	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Sweet / dry focus											X	X	X	X	X	X	X	X	X	X
Sweet wine ratio									X	X	X	X	X	X	X	X	X	X	X	X
Traditional wine type ratio			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Small bottled amounts								X	X	X	X	X	X	X	X	X	X	X	X	X
Non-local varieties									X	X	X	X	X	X	X	X	X	X	X	X
Winemaking style		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Age of barrels		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Length of maturation		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fermentation method										X	X	X	X	X	X	X	X	X	X	X
Maceration method						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Winemaking technology	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Technology/terroir focus							X	X	X	X	X	X	X	X	X	X	X	X	X	X
Grape purchase							X	X	X	X	X	X	X	X	X	X	X	X	X	X
Yield limitation		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Old plantations										X	X	X	X	X	X	X	X	X	X	X
Organic cultivation													X	X	X	X	X	X	X	X
Mechanized cultivation											X	X	X	X	X	X	X	X	X	X

Both Alkonyi and Rohály stopped publishing in the early 2010s; thus, later wine guides were included to cover the missing period. Books by Kézdy (2014) and Ripka (2014) focused on Tokaj-Hegyalja and introduced local wineries. While Ripka's Tokaj guide aimed to help visitors to the wine region by containing a lot of facts and practical information about each estate, Kézdy's book targeted Tokaj enthusiasts with more in-depth information about local winemakers. In addition, they both covered a broad range of organizations and were rich in relevant features. Summary of the sources and the discovered features can be seen in Table 5.1.

5.3 RESULTS

As publications were not available for the whole period, there were years when the relevant feature value set had to be determined indirectly. On the one hand, in spite of the inclusion of the two 2014 wine guides, 2012 and 2013 remained uncovered. The assumption was that the relevant set did not change during this period because Kézdy and Ripka mention the same features in 2014 that Rohály did in 2011 and Alkonyi did in 2010. Thus, the set was coded accordingly. Another uncovered period was the years before 1994. In 1994 the number of relevant features was very small, and it is unlikely that additional ones existed in the previous uncovered years when several organizations existed, the wine style and technology were still unified and the “renaissance” of Tokaj had only just started. In the case of the four features that were mentioned in 1994, their first introduction to the market was coded as the start of the year of relevance. In case of the 'Family winery or company' feature, it was 1991 when the first family estate released its wines. Similarly, 'Domestic or foreign ownership' was considered as relevant to the model since 1992 when Royal Tokaji, the pioneer foreign investment company, entered the market. The remaining two features, 'Size of the estate' and 'Winemaking technology', were assumed to be relevant for the whole period as organizations with different values were already present in the wine region in 1989.

Table 5.2 summarizes the development of the relevant feature set and the yearly weight of each feature. Altogether, 21 relevant features were detected in the publications and were either related to winemaking, cultivation, the assortment or the organization itself. In general, a continuous growth in the relevant set can be seen until 2006, after which it stagnates. The growth stages of the set indicated the two most important reformation attempts: the introduction of modern sweet wines in the mid-1990s

and the dry wine revolution in the 2000s. (Figure 5.1)

One possible explanation for the main pattern is as follows: the early relevant set was unusually small because of the low number of estates and the unified wine style. Natural growth of the winery population resulted in the proliferation of trends and strategies, and thus relevant features. The increase in the set also indicated the transition process that the wine region went through. Innovation and introduction of new wine types, winemaking and cultivation methods resulted in different values for formerly irrelevant or axiomatic features, which ultimately became relevant for the audience. As these new codes coexisted with the old norms, the relevant feature vector remained large, but it is likely that it will decrease in the future, as winemaking philosophies outcompete each other.

Table 5.2: Yearly relevant features sets of the winery population 1989-2014

FEATURES	YEARS																									
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Family winery / company	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Domestic / foreign ownership	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-wine related activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	1	1	1	1
Size of estate	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sweet / dry focus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1
Sweet wine ratio	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Traditional wine type ratio	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Small bottled amounts	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-local varieties	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
Winemaking style	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Age of barrels	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Length of maturation	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fermentation method	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
Maceration method	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Winemaking technology	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technology/terroir focus	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1
Grape purchase	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	1	1	1	1	1	1	1	1	1	1	1	1	1
Yield limitation	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Old plantations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	1	1	1	1	1	1	1	1	1	1	1
Organic cultivation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	0.5	1	1	1	1	1	1
Mechanized cultivation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	1	1	1	1	1	1	1	1	1

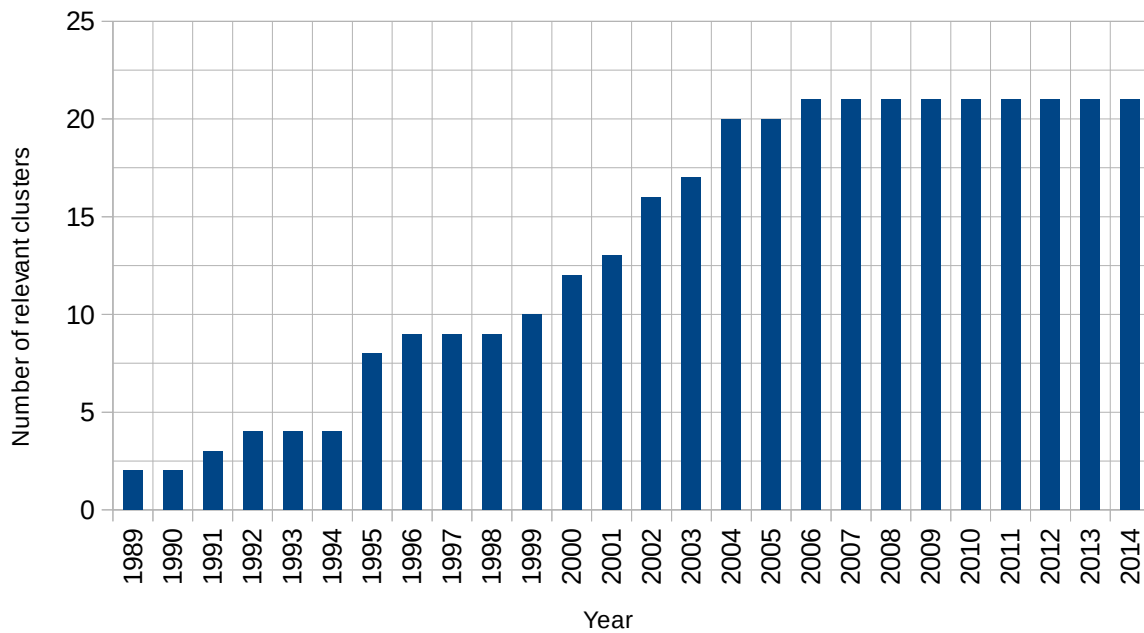


Figure 5.1: Yearly number of observed relevant features regarding the winery population 1989-2014

Finally, the applied method for the relevant feature set modeling was evaluated in light of the aspects discussed at the beginning of this section.

Dynamism of the relevant set. This aspect is the core of the model. A yearly collection of relevant features resulted in a dynamic set and cluster space.

Weighting relevance. On the one hand, the model weights relevance by including the opinion of two wine experts in most of the years, which does not always overlap. On the other hand, it does not consider that audience members prioritize between relevant features. The reason being that retrospective data collection about this kind of audience preferences was problematic. All in all, this condition is only partially fulfilled by the model.

Changes in feature meaning. This was also an aspect that the model only partly incorporated. On the one hand, the operationalization of feature values aimed to be objective. For instance 'Size of the estate' was not coded in categories but rather as a continuous scale, thus from the model point of view it did not matter what size was considered to be large or small by the audience in different years. However, there were qualitative features that could not be coded this way. For instance 'Winemaking style', which

has already been discussed. The method in these cases was to gather data from the corresponding time interval. Regarding 'Winemaking style', this means that retrospective tasting notes were excluded from the data collection.

Time gap between feature introduction and audience's recognition. The model deals with this phenomenon, as the basis of relevance is not the appearance in the market but through the audience's perception. Exceptions were the years between 1989 and 1993 when the introduction of features was coded as the first year of relevance, due to a lack of publications. However, in the case of these features, the two events most likely occurred at the same time in reality.

In conclusion, the applied model meets two of the conditions partly and two entirely; therefore, there is hope that it will be suitable for the further steps in the analysis. With the relevant feature sets in hand, the yearly feature vectors of the organizations could be created, which served as the basis for determining the clusters and their yearly contrast. In the following sections relevant features and their operationalization will be discussed individually in more detail.

5.4 PRINCIPLES OF OPERATIONALIZATION

Before proceeding to the discussion of meaning and operationalization of the detected relevant features, a few points have to be made. First, the aim was to code features as binary variables. On the one hand, it served the simplicity of the model, on the other hand, it was in line with the exclusion of feature weighting that was discussed earlier. Despite the binary setting the model allowed the 0.5 value for wineries in transition or where none or both values of the feature characterized the estate. Some features however, had to be coded as continuous variables, those that indicate the ratio of certain types of wines in the assortment ('Traditional wine type ratio' and 'Sweet wine ratio') and 'Size of the estate'. In these cases, the aim was to remain within the (0;1) range, or close to it to avoid overweighting of the features.

Second, the model contains two types of the feature vector for each organization in every year. The first is the visible feature vector, which was coded according to the traits that are visible for the

audience. Its function will be to model the perceived similarity between clusters and their contrast. In terms of the assortment features, the rule was that they are coded according to the wines being on the market in the given year. The second was the real feature vector, which contained the actual traits of the winery in the same year. Its function will be to model the desired grade of membership at the entry event and to track the intended feature changes. Regarding the assortment features, the rule was that they are coded according to the wines being produced in that particular vintage. The same applies to those features that were wine related, such as 'Wine style' and 'Yield limitation'. However, features that were not wine dependent such as 'Estate size' and 'Non-wine related activities' had the same value in both vectors.

The reason for the distinction was that actions of organizations, in our case changes in feature values typically became visible for the audience with a delay. This is because wines are released at the earliest a half year after the harvest in February, but in the case of Tokaj, this gap can be several years long. From the model's point of view the consequence of this phenomenon was that while visible feature vectors were the accurate tool for modeling audience perception by calculating contrasts and memberships, by definition they failed to indicate the desired membership of new entrants. Consequently, they are not suitable for coding entry rates of clusters. The purpose of real feature values was to fulfill this role. As a result, each winery was assigned with both types of vectors in the years when it is on the market while with the real feature value only in the years between foundation and market entry. Regarding operationalization, another aspect that had to be considered was the state of transition. It is possible that as a result of feature value change wines with different values were simultaneously visible for the audience in particular years. In these cases, visible feature value was coded as 0.5.

Accurately understanding the meaning of features was important for data collection. Wine related publications that were the source of the relevant feature set did not cover the whole population, thus data about the omitted wineries had to be collected from other sources. For most features, this was not problematic, but values of qualitative features were expressed differently in certain data sources. Due to this necessity and the high number of relevant features, the next sections will be long and detailed.

The next four sections will contain the detailed discussion of the detected relevant features. For a better overview a categorization will be applied (organizational features, assortment features, winemaking features and cultivation features) but these will not play any role in the analysis. The

structure of feature discussions will be as follows. Each will start with quotes from winemakers or wine experts regarding the specific feature that will point out the significance or the controversy of it. This will be followed by the definition of it and examples of mention of the feature in tasting notes or winery descriptions. After that, characteristics of the feature will be discussed specifically for the wine region. Finally, the operationalization method will be discussed and the period will be shown in which the feature was considered as relevant by the audience. If there is any time gap between the first appearance and audience recognition, its possible reasons will be highlighted.

5.5 ORGANIZATIONAL FEATURES

5.5.1 FAMILY WINERY OR COMPANY

”In the communism, the situation was different as Tokaj Wine Works was the exclusive distributor. The wine we made at home as small producers, we drank with our friends.”

Miklós Prácser, director of Gróf Degenfeld Winery 2008

”In 1994 the French managers of Disznókő came over to see what I was doing in my cellar at home. I showed my wines – not one of them was bottled. One of the heads of the Wine Spectator was with the group. He asked me how many bottles I have. I told him ‘I have half a barrel.’ ‘But why?’ he asked. I told them that I did not have money to bottle the wine, and there was no demand for it anyway. There wasn't indeed. But the fact that they had asked the question was enough to get me thinking.”

János Árvay former chief winemaker of Disznókő about starting his family winery 2004 Borbarát

”I accepted the offer to work with an investor, but I also kept my family estate.”

István Szepsy 2009

”Large foreign investments had a very positive impact on Tokaj-Hegyalja but similarly invigorating was the establishment of small family owned estates. [...] Faith and diligence of small-scale family wineries are a strong driving force in the winemaking community of Tokaj. Individual commitment is a

very important factor of development, which does not depend on technology exclusively, but on the recognition and apprehension of those phenomena that are only explorable if the winemaker is present permanently.”

István Szepsy, 2006 www.tokaj.hu

Definition and appearance in publications

This feature indicates the relationship between the winemaking and ownership. Family wineries were defined as organizations whose owner or a family member manages winemaking. It is not related to the legal form of companies; there were family wineries in Tokaj that operated as a sole venture, limited partnership, and limited liability company. The category is not size dependent either; in the 2010s Szepsy family winery cultivated more vineyards than Hétszőlő which is owned by a French insurance company. Finally, the level of freedom which an employed winemaker enjoys did not play any role by the categorization. Even though András Bacsó, winemaker of Oremus has had absolute freedom since the foundation of the winery, it is considered as a company similarly to Sauska winery where the owner had a significant role in decision making. Wine experts always pointed out this feature in their publication, either directly by labeling a winery family venture or investment, or indirectly by describing the owner-winemaker relationship. Examples are the following:

”A sizeable family venture with eight full-time employees.”

“After breaking up with long-time partner Krisztián Sauska, Árvay is now building his own estate in Rátka.”

“Owned by András Tombor, [...]. The winemaker Gabriella Kovács shapes the wines in a very good state.”

“Endre Demeter a highly qualified lawyer now manages the affairs of his Mád estate himself with a winemaker's diploma in his hand.”

”The owner is Miklós Prácser's wife, and their daughter Hajnalka Prácser is the winemaker and at

once director of the winery.”

”The winery is owned by investors [...].”

Characteristics of the feature in Tokaj-Hegyalja

Between 1949 and 1989 family businesses did not exist. In the last years of the communist rule, only two state-owned companies operated in the wine region: Hungarovin and Tokaj Wine Works which was the dominant estate. The model was that these two wineries integrated 90% of the vineyards either by cultivating them or buying their yield from local vine growers. These estates had a monopoly on both producing and distributing wine. Besides vine growing locals were allowed to produce wine for personal consumption only. These growers mostly remained in the grape selling business after the fall of communism, but a few of them established family wineries as early as 1991. Their number grew in following years of the decade but capped in the 2000s. The dry wine turn gave a push to family winery market entries again which have not seemed to slow down until the end of the studied period.

The quote above from János Árvay illustrates a few reasons why family owned wineries started to emerge relatively slow. First, it shows that most locals did not have capital to start a family business. Second, there was a lack of entrepreneurship, even if they had the possibility to learn certain skills at the foreign-owned and managed ventures as Árvay did. Third, it also indicates that many of the best winemakers were employed by the big companies. Thus the potential entrepreneurs could not or did not want to start their businesses. On the other hand, it also shows that despite all the above factors they gained know-how, international network and overview of wine trends during the years of service at these foreign estates. Thus, the delayed start of their family businesses gave them advantages as well.

Family wineries emerged from three different backgrounds. The first and most typical type was the one discussed above: estates established by winemakers formerly employed by large foreign companies. The majority of them entered the market in the middle and late 1990s (István Szepsy, János Árvay, László Babits, Sándor Simkó, and Zoltán Demeter) but there were examples after 2000 as well (Sarloita Bárdos, Stephanie Berecz, Károly Áts). Many of them did not leave their former positions or were reemployed by another estate as a consultant, but in the long term as their business has grown they typically gave up these part-time jobs. The second was local vine growers or former employees of the Wine Works, who started their own business without previous employment at a large foreign (or later domestic) company. They were the few pioneers of the early 90`s (József Monyók, János Király).

Important to note that both types were locals; thus they or their families already owned vineyards and cellars in the region or got them back from the state after 1989 as compensation. Many of them also owned wine stocks produced earlier in the communist times for their own consumption; thus they could sell immediately after establishment. The third type was the group of outsiders, either geographically, professionally or in both senses. Local embeddedness apparently played an important role; thus organizations with such background have not appeared until the end of the decade (Karádi-Beger, Lenkey). Possibly the erratic sale of sweet wines was not appealing for potential newcomers. The latter factor changed after the success of dry Furmint, which attracted many new entrants of all three types: outsiders (TR Művek. Zoltán Asztalos, László Alkonyi, Rémusz Dávid, Attila Orsolyák. István Balassa, Gábor Firmánszky), locals formerly focusing on vine growing (Dénes Szarka, László Kvaszinger, Ákos Ferdinánd Bihari, András Várkonyi, János Kiss) and winemakers of larger estates (Károly Áts, Judit Bodó, Edit Bai).

Among companies four main types could be differentiated. The first was large corporations with a foreign background. Not counting the state-owned enterprises, they were the first wave of investments in Tokaj. Except for Royal Tokaji and Királyudvar which both started as joint ventures, most were established by the privatization of Tokaj Wine Works (Hétszőlő, Disznókő. Oremus, Bodrog-Várhegy, Pajzos-Megyer, Degenfeld) or by acquisition (Hungarovin). Most of the investors were owners of another winery in Western Europe which was a significant advantage both regarding professional development and sales. On the other hand, this limited them as well in two ways. First, as the owners came with preliminary ideas based on the experience of their other wineries, less possibility remained for experiments. Second, assortments were designed to match those of the sister estates. It did not have much influence as long as Tokaj had focused entirely on sweet wine but limited them after full bodied wines came to the forefront. This might be one of the reasons why foreign estates did not participate in the dry wine revolution.

The second type of companies was large estates with a domestic background. The majority were established later, in the late 1990s and the 2000s. Unlike in the case of the foreign wineries, these investors were not involved in winemaking before, except Promontorbor and Hilltop that operated in other Hungarian wine regions as well and their Tokaj estate played a minor role in their portfolio. Owners of the rest were Hungarian businessmen who gained their wealth in other industries either abroad (Sauska, Patricius) or in Hungary (Béres, Pannon Tokaj, Palota).

Third, there were also small-scale firms. They operated very similarly to family wineries as the

winemaker was responsible for most of the tasks. The only difference was the ownership and the owner's role in strategic decision making. Part of these estates was established when the owner who lived far from the region, inherited some land and preferred to keep it and produce wine, but due to lack of qualification and time, a winemaker had to be hired. (Jakab, Budaházy, Zombory). Others bought vineyard or a winery with the aim of establishing an estate, and only scale and the levels of delegation makes them different from other larger firms (Barta, Pelle, Obzidián, Szent Benedek). Wine experts strongly associated these small scale companies with their vintners whose role was often labeled in publications not as winemaker or director but helper or consultant. There were cases when they indeed only helped out the owner who lived far away but had the ambition to participate in winemaking and learn the necessary skills in order to take over the leading role one day. This way, such companies often transformed to a family business (Demetervin, Vissy).

Regarding this type, the effect of this consultancy system on the spread of winemaking methods and styles is noteworthy. "Helpers" were usually acknowledged in the region, because owners preferred to employ winemakers with both expertise and status. They were usually running their small family businesses which allowed them to undertake part-time consultancy in multiple wineries simultaneously. This way innovative winemakers "multiplied" their feature set, also, they shaped and tested their cultivation and winemaking methods on more terroirs. In other words, the consultancy system accelerated the development, spread, and legitimation of norm systems.

Even though small-scale firms existed in the 1990s already (Tokaj Classic, Dobogó), it became widespread after the dry wine turn. This is possibly due to the fact, that production of terroir focused drys was a more suitable model for small scale operation. On the other hand, Tokaj dry wines attracted many Hungarian wine enthusiasts and prompted them to buy vineyards and participate in the discovery of terroirs. The fourth type was mid-sized companies (Gundel, Füleky), predominantly estates with domestic background that cultivated approximately 15-20 hectares. Such companies required permanent employees; thus while these wineries were closer to the small scale firms regarding size, their operation was more similar to large estates.

Operationalization and relevance

The coding was based on the above definition. Value of family wineries was set to 1 while in the case of other types to 0. This feature became relevant in 1991 when the first family venture Király Winery entered the market.

5.5.2 DOMESTIC OR FOREIGN OWNERSHIP

“People see the foreign owners as aliens, pure and simple. Sometimes they come up with the most absurd accusations. For instance, that aging Aszú for a shorter period is just a way for the foreigners to get rich quicker and injure Tokaj's good name.”

László Alkonyi 2001, Borbarát Magazine

“I think the single most important thing that the foreign investors have given Tokaj is that they have introduced it to the Grand Cru Society. Both the way it is priced and promoted, it is treated like a grand, classic wine. Without the help of foreign investors, it would have taken Tokaj at least 15 to 20 years longer to get the level of recognition it now enjoys.”

Aymar de Beillenx, founder of Hétszőlő winery 2002

Definition and appearance in publications

The feature indicates the owner's nationality. After the fall of communism, Tokaj-Hegyalja attracted many foreign investments. These ventures employed international staff, drew in experts to the wine region, led to a more modernized winemaking technology and a reformed traditional portfolio and winemaking style. Although the presence of these investors was viewed with suspicion, they played a key role in the renaissance of Tokaj.

Wine experts usually point out this feature of such wineries that are foreign investments. In the case of family-owned wineries named after the winemaker, a Hungarian origin is apparent, but Hungarian-owned corporations rarely get a domestic label. One can usually determine these differences when reading the opening sentence of winery descriptions.

“Hungarian-owned venture founded in 2000.”

“This gentleman from France acquired superb sites and had his own ideas about what Tokaj should be all about.”

“Tibor Kovács has been at the helm of this leading French-owned estate from the very beginning.”

Characteristics of the feature in Tokaj-Hegyalja

The pioneer foreign estate Royal Tokaji was founded in 1989, after the fall of communism, by Hugh Johnson, the well-known British wine expert. It was followed by many such after the Hungarian government decided to split into parts the state-owned integrated Tokaj Wine Works, and privatize them to foreign investors. First among these wineries were Hétszőlő in 1991, followed by Disznókő, Pajzos-Megyer, Oremus, Bodrog-Várhegy, and finally, Gróf Degenfeld Winery. Hungarovin, the other Tokaj-Hegyalja state-owned estate, was acquired by Henkel in 1992. Many lashed out against the idea of “selling out the national treasure” for international capital, and their antipathy only increased after these estates released their first wines which turned out to be quite different from the traditional wine style. Public concerns proved to be false, and the wine style that was introduced not only became accepted but was also adapted by several estates in the '90s. Till now, however, a considerable group of winemakers still view them with suspicion.

The 1994 Land Act restricted the purchase of land for non-Hungarian citizens or companies, which in turn ended the early wave of foreign investments. Since Hungary joined the European Union, the regulation has not applied for ventures and individuals from European countries, but Hungarian government could repeatedly prolong the restrictions until 2014. Although the form of joint domestic-foreign ownership remained a workaround (Királyudvar winery), there was no longer a high demand.

As a result of the numerous early foreign investments coupled with the lack of domestic capital, these companies dominated both the large-scale sector and the export markets. Hungarian-owned wineries were predominantly small family businesses at the time. This structure changed in the late '90s and early 2000s when several large or mid-size estates were established by Hungarian investors such as Béres, Patricius, Árvay és társa, Tokajicum, and Pannon Tokaj. On the other hand, the small estates typically remained under the ownership of Hungarians. Exceptions to this reality were family wineries that were established by French individuals who were former employees of international establishments and had decided to settle in the region (Samuel Tinon and Stephanie Berecz).

The importance of foreign capital in Tokaj cannot be overstated. Besides the modernization of winemaking technology, renewal of vineyards, introduction of Western cultivation methods and work culture, investment in restoring the faded reputation of the wine region, they wittingly or unwittingly trained a group of innovative winemakers who later brought about the dry wine revolution. While the

modernization of Tokaj sweet wine was mainly due to the commitment of the foreign companies, a recognition of the importance of terroir and the potential of dry wine was an achievement of their “children”.

Operationalization and relevance

With regard to method, the coding was straightforward: foreign ventures or family estates with foreign winemakers got a feature value of 0, while domestic-owned wineries got 1. There were also borderline cases. Examples of such are the family estates owned by foreign winemakers or the investments by those Hungarians who had emigrated during the period of socialism and who lived (at least partly) abroad. In these cases, the coding was based on the publications. It would appear that, according to their logic, to classify as domestic required Hungarian socialization. Thus, foreign-owned family wineries were coded as foreign. The wineries owned by emigrants were more interesting. Owners who had grown up in Hungary (such as Barta or Sauska) were considered to be domestic investors, while second or third generation (e.g. Degenfeld and Holdvölgy) were classified as foreign. The classification was as such despite the fact that the owners of Holdvölgy speak Hungarian and their family originated from Tokaj, a similar case as the aristocratic Degenfeld family.

This feature has been relevant since 1993, the year in which the audience was first made aware of the foreign enterprise thanks to the release of its wine on the Hungarian market. The wine referred to here was a vintage 1989 Royal Tokaji Aszú, which was not yet revolutionarily different from the traditional Aszú style but sought to be of a higher quality than its Hungarian counterparts. In time, Royal Tokaji restructured its winemaking style, but it has nonetheless remained the most traditional foreign venture. Despite that, the winery was not viewed by locals with less suspicion than its reformist sisters. The case of Royal Tokaji is important because it illustrates that the modern-traditionalist and domestic-foreign distinctions do not coincide, both in the eyes of local winemakers and wine experts.

5.5.3 NON-WINE-RELATED ACTIVITIES

“Péter Vásárhelyi is running a mixed business of winemaking and wine trade, which provides him a greater financial stability. On the other hand, it necessarily splits his attention. Maybe this is the reason why the estate made a step back regarding innovation, even though its wines are pure and fair.”

László Akonyi about Hímesudvar winery, 2009 Tokaj Compass

“Unlike other investors, Degenfeld family does not have any background in winemaking or wine trade. We had to start the sales from scratch. [...] This is why we invested heavily in tourism, we opened a hotel and restaurant. It is also a way to promote and sell our wines.”

Miklós Prácsér, director of Gróf Degenfeld Winery 2008

Definition and appearance in publications

The feature indicated those activities of wineries that were not closely linked to winemaking. Practically, this means such businesses that wine experts pointed out in their publications regarding the wineries, and are typically related to the agriculture, food, or tourism industries. Other features such as catering or wine selling were not mentioned, and so not included. Similar to most of the relevant features, the non-wine related activities are referred to in the general description of estates.

”[The Gundel Winery is in] close cooperation with the Gundel Restaurant of Budapest.”

“[László Pelle] and his family makes pálinka that reaches the highest standards of this special Hungarian spirit. [...] They recently bought some nice plots around Mád and established a winery.”

”On the top of the wine, the group established what is probably the most dynamic restaurant in the entire wine region. Next to the cellar they own a wine-house and are planning to add a hotel and a wine vault.”

Characteristics of the feature in Tokaj-Hegyalja

Running an additional non-wine related business was common in Tokaj, both among the small and large estates. The reasons behind this were diverse, but two main ones can be identified and discussed. On the one hand, family-run wineries ran them compulsively. Due to the instability of the socialist economy, Hungarians were driven to always diversify in order to secure a living. This diversification skill became even more useful in the chaotic years of the early 1990s, particularly in impoverished regions such as Northern Hungary. The tendency for small family wineries in Tokaj to have secondary businesses is possibly rooted in this, but the owners were also motivated by the weather. The latter was due to the unpredictability of wine-making and the moderate demand for sweet wines. Typical additional businesses were either agriculture or tourism related, including lodging, catering, event management, or the running of a wine store.

By contrast, the larger ventures that were not under financial pressure simply made decisions for their own good. A wine region seeking to produce expensive quality wines and attract wine enthusiasts from around the world had to be able to host and entertain them at high standards. After the fall of Communism, Tokaj-Hegyalja had neither the capabilities nor the capital to do so (and in fact, still does not). As a result, pioneer foreign estates decided to create these for themselves. Such investments included restaurants, hotels, and wine stores. This phenomenon of diversification is still ongoing, as large estates that were established later also followed this strategy. Another type of diversification can be seen when a company extends its existing winemaking portfolio. Such ventures came from the sectors listed above (such as agriculture, running hotels or restaurants). The result is the same kind of mixed business except that in the second case, winemaking typically has a subordinate role.

Operationalization and relevance

Activities related to winemaking included: wine tasting, basic catering, and sales of the estate's wines. Everything above these such as event management, running a restaurant, tavern, wine-shop or lodging services were considered as non-wine related, including agricultural machinery services and any types of crop cultivation apart from vine growing. Apparently, animal husbandry also belonged to the above category with one exception. Wineries that recultivated abandoned or partly forested vineyards kept

goats to accelerate and cheapen the process. A similar borderline case was cooperage. In case an estate produced barrels for itself (Oremus), it was not considered as non-wine-related activity, but when barrels were sold, or coopers produced wines, it was (Matyisák-Vízkeleti and Portius). Those estates that were running any non-wine-related activities in the particular year were assigned the value of 1, otherwise it was set to 0. Coding did not consider whether winemaking was the primary activity of the venture.

Although the running of mixed businesses (typically winemaking and lodging) was evident in the wine region early in the '90s, it did not appear in the publications until 2002. This is possibly related to quality concerns, as the opening quote of this chapter suggests, but as long as such large estates represented the high end of the wine region that typically run multiple businesses, experts did not consider the feature as important. It is likely that the emergence and success of “specialized” estates, such as the wineries of István Szepsy and János Árvay, made the idea relevant in their eyes. In other words, it was not the existence of non-wine-related activities that brought about the relevance, but the exclusive focus on winemaking.

5.5.4 SIZE OF ESTATE

“On the one hand, there are the big ones, whose professionalism, capital strength and social capital go together with high quality. On the contrary individuality, initiating capability and naturality of the small ones help us to understand Tokaj-Hegyalja even better.”

István Szepsy, 2006 www.tokaj.hu

“At the beginning, I thought that I do not want to be bigger than 15 hectares. However, I saw that I have to produce more to be interesting for the world, to be present at the relevant markets, in the most famous restaurants and so on. [...] To do that we need at least 50 hectares.”

István Szepsy, 2009

Definition and appearance in publications

Size of the estate was defined as the area of cultivated vineyards, including rented territories as well. The value of this feature ought to reflect the scale of operation, but in some instances, it was not a perfect indicator. On the one hand, it did not take purchased grape and wine into account, which for

some wineries was a larger quantity than the yield of cultivated vineyards. The same applied for selling grapes, but in this case, distortion was reverse. Second, yield limitation and average plantation density varied estate by estate; thus production volume of two wineries with the same estate size can differ. On the other hand, part of these were included in the model: 'Yield limitation' and 'Grape purchase' were both relevant features.

There were alternative size measurements as wine cellar capacity and bottled amount. Why cultivated area was selected has several reasons. Most importantly, it was the one mentioned in the reviewed publications. Besides that, its data availability was better. As the cultivated area was less volatile than the produced volume of wines, missing data in certain years could be easily deduced. Primary data collection was also easier; every winemaker knew when they bought or started to cultivate a specific vineyard even if it happened decades earlier, but most of them did not remember the exact bottled volume three vintages back. Cellar capacity does not change often, but it is only highlighted for large estates. Finally, the other two winemaking related measurements failed to indicate the scale of operation. Yearly produced volume fluctuated depending on the weather conditions of the specific vintage. Changes in assortment structure also influenced it as production of the sweet wine specialties require a greater amount of grapes. Thus, its volatility makes it an unsuitable measurement. Besides data availability problems, cellar capacity is short on indicating the scale of operation especially in the case of large estates. Many of these have a larger cellar capacity than their need and serve as processing base of smaller wineries (Degenfeld in Erdőbénye and Patrícus in Bodrogkeresztúr). This also follows that certain smaller estates produced more wine than their capacity suggests. Another source of distortion is the longer prescribed maturation of sweet wine specialties (2 or 3 years). Wineries focusing on these products require a larger cellar and more barrels than the ones producing wine types with no prescribed barrel aging even if they bottle the same amount. Considering all these aspects cultivated area remained the best measurement of the scale of operation.

In publications, size of estate was listed on the winery fact sheets or mentioned in the general winery descriptions. Usually, integrated vineyards were mentioned as well besides owned and rented territories.

“This is a family cultivating a total of 22.5 hectares.”

“Stephanie and Zsolt Berecz expanded their estate to 4.5 hectares.”

“A real boutique winery with 1.65 ha.”

Characteristics of the feature in Tokaj-Hegyalja

As was discussed earlier, until 1989 two large state-owned estates had operated in the wine region: the dominant Tokaj Wine Works and somewhat smaller Hungarovin (60 hectares). In 1989 with the fall of communism Promontorbor (24 hectares) was established followed by the first foreign investment Royal Tokaji in 1990 (60 hectares at that time). As was discussed above privatization of the Wine Works resulted in the foundation of further large estates in the early 1990s (Gundel 24 hectares, Hétszőlő 36 hectares, Disznókő 108 hectares, Oremus 114 hectares and Pajzos-Megyer 138 hectares), but this was the period when the first small-scale family wineries (typically below 10 hectares) entered the market. The duality remained, but while the number of large estates did not grow rapidly further in the late 1990s, the small-scale sector proliferated. The growth slowed down in the early 2000s but increased again in the second part of the decade possibly due to the successful dry wine turn, which also attracted several mid-sized entrants. Unlike the emergence of small wineries in the 1990s this second wave did not consist of family wineries only but many small scale companies followed the terroir oriented model.

It is important to look at scale dynamics as well, which suggests that estate sizes were relatively stable during the studied period. Large estates did not expand their vineyard portfolio except a few such as Royal Tokaji. On the other hand, small-scale wineries did so, but it did not mean major changes in scale. For instance, when a boutique winery doubled its territories from 3 to 6 hectares it was a significant change from the estate's point of view but it remained in the small-scale category. The only family winery that grew big was the Szepsy family winery which is cultivating more than 60 hectares today.

Operationalization and relevance

Operationalization of this feature aimed to avoid two potential distortions. First, binary coding would have been problematic as there is no definite borderline between "small" and "big" estate size. Second, a proper scaling of the available data was necessary to avoid overweighting of the feature in the relevant set. Cultivated area was measured in hectares (10000 m²). The size of the smallest estates was around 1 hectare, while the largest ones exceeded 100 hectares. The highest value in the data was 420 hectares which was the size of Tokaj Wineworks before its privatization, without integrated territories.

To keep feature values close to the [0,1] interval, the following scaling method was applied. The average size of estates including every winery in every year was 29.3 hectares. A rounded value 30 hectares was set to the 0.5 value while 0 hectares to 0. Other estates were scaled proportionally (Table 5.3). This way feature values of wineries with a larger territory than 60 hectares exceeded 1, which still results in minor overweighting but the operationalization had two advantages. On the one hand, it allows to include larger estates in future analysis. On the one hand impact of size differences between smaller organizations that the population mainly consisted of was greater.

This feature is relevant from the very beginning as it is mentioned even in the earliest publications for each winery. Even though no data was available before 1994 estate size was most likely considered as relevant from 1989.

Table 5.3: Operationalization of 'Size of estate' feature

WINERY	YEAR	SIZE (ha)	FEATURE VALUE
Budaházy	2006	1.1	0.02
Monyók	1991	6.3	0.11
Heidrich	2012	10	0.17
Árvay	2014	20	0.33
Olze-vin	2002	24	0.40
Béres	2008	45	0.75
Oremus	1998	78	1.30
Pajzos-Megyer	2005	135	2.25

5.6. ASSORTMENT FEATURES

5.6.1 SWEET WINE RATIO; SWEET OR DRY FOCUS

“The chance of Tokaj for breakout can only be the dry wine. Interestingly it seems that nature sensed this, recently there has been less Aszú friendly vintages.”

Attila Homonna winemaker of Homonna winery, 2013 origo.hu

“This idea [that dry wines mean everything] accounts for only a narrow band of Tokaj experts within the Hungarian market. In terms of world demand, we can see various trends and expectations concerning Tokaj, and for us, Tokaji Aszú remains the most important wine type. We spend as much time and energy on it as we possibly can. Aszú is undoubtedly the most special great wine in the world, and Disznókő vineyard has been one of the best birthplaces of Aszú wines for centuries. Therefore, the biggest challenge is to refine our style and be as successful in each market as possible.”

László Mészáros, director of Disznókő winery Tokaj Kalauz 2014

“I think that in Tokaj both dry wines and sweet wines have always been made. On the other hand, I believe that sweet wine is what made Tokaj world famous once, thus the Aszú has to be the leading product of Tokaj.”

Miklós Prácsér, director of Gróf Degenfeld winery 2008.

“Tokaj does not have to forget sweet wine and does not have to deny itself. It just has to recognize finally that it has two traditions: among sweetness and the natural uniqueness, now the second has to be cultivated more. Tokaj's greatest value is not sweetness but its richness which allows it to remain valuable at all times, without denying itself.”

Zoltán Alkonyi, 2015 www.gaultmillau.hu

“The nineties were the beginning, the period of recognition when we could understand the historical qualities, especially the case of sweet wines and Aszú. [...] From the 1999 vintage, superb wines were produced regarding sweet wines and Aszú. [...] The noughties were the period of recognition and frustration when we found that interest in elaborated, refined sweet wine qualities were not as intense

as we had expected. Tokaj could not regain its centuries-old leading position in the wine world. The market and the consumers did not welcome enthusiastically the return of Tokaji sweet wines. It was a very sobering period from the late nineties, but as a consequence, the dry wine program of the 2000s gave a new push, a new chance and another spectacular “incandescence” to the wine region, which is still going on today. That decade passed with the recognition of the importance of dry wine concentration and single vineyards.”

Zoltán Demeter 2016 www.demeterzoltan.hu

Definition and appearance in publications

One of the main debates in Tokaj today is whether it has to focus on sweet wines, which made it famous in the past and are still associated with it worldwide, or on dry wines, whose market prospects seem better. Whichever strategy a winery prefers it is expressed by its wine assortment on the market. In this model, two features will code the portfolio regarding sweetness. On the one hand, “Sweet wine ratio” shows the proportion of sweet and dry wines. On the other hand, “Sweet or dry focus” indicates which type of wine is on the top of the assortment. In other words, while the first codes composition, the second hierarchy of the assortment. For better understanding, the two features will be discussed together.

Sweet wine ratio can be deduced from the tasting notes of publications. Alternatively, authors also give a summary about the assortment in winery descriptions:

“Oremus wines can be divided into three groups: dry wines sweet wines and Aszús.”

Sweet or dry focus can often be observed in the winery description.

“They will not make dry wines unless they have harvested grapes truly ideal for the purpose.”

“Pajzos offers a somewhat more refined range of wines in the sweet category only.”

“This is a typical Aszú-oriented estate.”

“His philosophy concentrates mainly on single vineyard dry wines.”

“Füleky stands out mainly for its really nice Aszú wines.”

Another way to determine an estate's focus is to look at tasting notes. On the one hand, the order of the rated wines gives a hint about the hierarchy; on the other hand, sometimes wines are labeled as the leading product or top product.

Characteristics of the feature in Tokaj-Hegyalja

Tokaj-Hegyalja is a traditional wine region famous for producing sweet wines. This is rooted in the unique climate of the region, resulting in the botrytization of grapes in late autumn, which concentrates the sugar content of the berries. This allows the production of natural sweet wines with uniquely high residual sugar content. The traditional Tokaj assortment is based on sweet fortified cuvées, which are the following: Esszencia, the five types of Aszús (from Aszúesszencia to 3 puttonyos Aszú) Sweet and Dry Szamorodnis, Máslás and Fordítás (kind of “secondary” Aszús). Besides those, half sweet varietal wines were produced. From these, the dry version of Szamorodni is the only dry wine, although dry Furmint was occasionally produced; thus this kind of portfolio is predominantly sweet. Regarding hierarchy, the sweetest wines, 6 puttonyos Aszú and Aszúesszencia, are on the top accompanied by the rare Esszencia, which is not even wine in the classical sense due to its low alcohol content. These are followed by the rest of the sweet wines, whose rank depends on their residual sugar content, while the bottom line is the category of half sweet varietal wines. In other words, the focus of Tokaj was sweet.

During the wine region's documented history, two attempts were made to modify or partly modify this orientation. First, in the early '90s, large foreign estates (Disznókő, Oremus, Pajzos-Megyer and Hétszőlő) started to produce reductive wines, predominantly furmint and hárslevelűs, but some of them also made wines of international varieties (Oremus and Pajzos-Megyer). They intended to create a light reductive style wine similar to the popular new world chardonnays and sauvignon blancs. The release of these wines were inspired by two recognitions. On the one hand, market trends suggested that in general there is a larger demand for dry wines than sweet wines. On the other hand, the amount of base wine or must required for aszú production is not entirely predictable. To be on the safe side, large scale wineries tend to produce more of it, but the surplus can be massive in case the botrytization is weak in the vintage. The most obvious utilization of this was dry wine production. In other words reductive dry wines in this model were by-products of aszú. Accordingly, these wines were positioned at the bottom of the assortment and did not play a major role in it in numbers, as the majority of their assortment still predominantly consisted of the traditional sweet wine specialties. This attempt was not successful either regarding sales prices or expert reviews. Even so, large wineries kept reductive dry

wines in their assortment, but this wine style has not attracted many followers since.

The second attempt was made in the 2000s, by István Szepsy and Zoltán Demeter, director and viticulturist and winemaker of Királyudvar Winery. The epoch-making wine was the 2000 Úrágya Furmint, a single vineyard selection, which aimed to be the commodity of a sweet cuvée, but it fermented naturally to a dry wine. This accident opened the eyes of the winemakers to the potential of a dry Tokaj dry Furmint both in terms of quality and terroir expression, which became extremely successful both on the market and among wine experts. Despite this, the co-owner of Királyudvar did not support bringing dry vineyard selections to the fore, thus Szepsy accomplished his dry wine focused model at his family winery, and later left the estate.

Again, the dry wine turn was motivated by the limited market for sweets. As the quote from Zoltán Demeter shows, top winemakers realized this at the millennium when sweet wines reached the highest standard quality-wise, but sales revenues did not seem to grow. A dry wine focus was a possible way out of this situation, also for smallholders, as dry wine production is cheaper than sweet wine making and the return on the capital is faster because maturing time is not prescribed. Accordingly, Szepsy's success resulted in the establishment of numerous wineries following his dry wine focused model, and there were also already existing estates that converted. Thus, participants in the dry wine revolution were predominantly small wineries, but after 2010 large estates also made such steps.

After 2000, three processes enhanced the ratio of dry wines in assortments. First was the inclusion of grape varieties besides Furmint. In the early 2000s, there was a consensus that Furmint has to be the variety of the full bodied Tokaj drys. There were attempts with international varieties by János Árvay and later the Sauska winery, but not many estates followed them. On the other hand, single vineyard Hárslevelűs (first produced by Stephanie Berecz and Zoltán Demeter) became successful and spread rapidly. In turn, there were wineries such as Bott that paid less attention to varietal homogeneity and released dry single vineyard selection “cuvées” made of both furmint and hárslevelű. This was partly because their old vineyards were small and mixed plantations, but they also argued that terroir characteristics have to play a major role anyway. Second, while the range of dry wines broadened gradually, that of the sweet wines narrowed down. Some wine types were going out of fashion, thus were barely produced (Dry Szamorodni, Máslás, Fordítás), but there were also legal reductions of producible Tokaj wine specialties: in 2008 Aszúesszencia was terminated, which was followed by Máslás, Fordítás, and the Aszús below 5 puttony in 2013. The last was the production of sparkling wines, which were mainly in the Brut or Brut Nature category. Zoltán Demeter started to experiment

with these in 2009, which inspired many other winemakers. Whether this wine type will gain a foothold is to be seen, but as long as it is produced, it will decrease the importance of sweet wines in the region.

Operationalization and relevance

a) Sweet wine ratio

In the model all wines above the half-dry category were considered as sweet, which includes every wine having more than 12 g/l residual sugar. The reason was that dry wines that were fermented spontaneously tended to have some residual sugar content and in certain vintages; thus they fall into the semi-dry category. The value of the feature was the number of sweet wine types produced by the company or being on the market, divided by the number of wines in the portfolio.

For coding, the following rules applied.

1. Sweet wine ratio was the number of sweet wine types produced or distributed in a specific year divided by all the wine that were types produced or distributed. Production applied to the real feature values while distribution to the visible ones.
2. In the calculation, each wine type was weighted equally regardless of the number of produced bottles. This was based on the assumption that even though quantity likely increased visibility, there were also other factors that did so but were hard to measure, such as prestige, price or the type of the wine itself. Thus, for the sake of simplicity, the above method was applied.
3. If there were multiple kinds of wines of the same type in the assortment, they were included separately in the calculation. Such cases were multiple varieties of dry or late harvest wines, more than one single vineyard selections or the range of Aszú wines.
4. If different vintages of the same wine were on the market in the same year, they did not count as separate wine categories. This only applied to the values of the visible feature vector.

Below examples are given for the coding process of both visible and real values of the feature. (Table 5.4 and 5.5)

5.4 Calculation of the visible value of 'Sweet wine ratio' feature, Szepsy winery 2012

Winery	Vintage	Wine name	Bottled quantity	Residual sugar	Sweet=1
Szepsy	2009	Furmint	12600	1.8	0
Szepsy	2008	Furmint	12712	1.4	
Szepsy	2011	Betsek Furmint	932	0	0
Szepsy	2011	Birsalmás Furmint	1402	4.5	0
Szepsy	2011	Dorgó Furmint	560	3.2	0
Szepsy	2008	Király Hárslevelű	6292	0.8	0
Szepsy	2011	Liliom Furmint	1200	24.1	1
Szepsy	2011	Nyulászó Furmint	3800	2.1	0
Szepsy	2011	Úrágya Furmint	5973	2.7	0
Szepsy	2008	Sweet Szamorodni	10852	147	1
Szepsy	2007	Cuvée Sweet	5282	142	1
Szepsy	2006	Aszú 6 puttonyos	6800	240	1
Sweet wines					4
Total wines					11
Sweet wine ratio					0.36

5.5 Calculation of the real value of 'Sweet wine ratio' feature, Béres winery 2007

Winery	Vintage	Wine name	Bottled quantity	Residual sugar	Sweet=1
Béres	2007	Aszú 3 Puttonyos	15000	85.7	1
Béres	2007	Aszú 5 Puttonyos	11500	138	1
Béres	2007	Aszú 6 Puttonyos	8500	168	1
Béres	2007	Sweet Szamorodni	15000	78.3	1
Béres	2007	Magita Cuvée	14400	107	1
Béres	2007	Hárslevelű Late Harvest	6000	44	1
Béres	2007	Lőcse Furmint	3500	1.5	0
Béres	2007	Omlás Furmint	8400	2	0
Béres	2007	Hárslevelű Dry	12000	0	0
Béres	2007	Sárgamuskotály Dry	11000	1.9	0
Béres	2007	Furmint Dry	14500	6	0
Béres	2007	Naparany Cuvée	10050	2.9	0
Béres	2007	Holdezüst Cuvée	12200	9.3	0
Sweet wines					6
Total wines					13
Sweet wine ratio					0.46

b) Sweet or dry focus

Focus regarding sweetness depended on what kind of wine was on the top of the assortment. Leading product in the sweet range was almost always an Aszú with a high puttony number while among the dry wines it was a single vineyard selection. In case an estate had only one of those in its assortment, or it contained both but one of them was produced in certain vintages only in small quantities, the focus was clear. If both or neither were permanent in the assortment which was less common there were still ways to decide. One could look at the credo of the winery either on its homepage or in interviews and other publications as in the dry-sweet debate everybody had an opinion. Dual focus also existed in the wine region, either as a temporary state or a long term strategy. Feature value of sweet focused estates was set to 1, dry focused wineries were coded as 0, and dual focused ones as 0.5.

According to the model, features become relevant in the year when they are first mentioned in publications. This was applicable for the sweet or dry focus feature which gained relevance in 2004. Sweet wine ratio is a more difficult case in this sense. As dry wines were produced already by foreign estates and they appeared in tasting and assortment of early publications as well, the first year of relevance would have been 1993. As both features aimed to address the winery's attitude towards sweetness it seems more justifiable to define the borderline for the year in which the "Dry or sweet?" arisen. This is 2002 when István Szepsy's first single vineyard dry the Királyudvar 2000 Úrágya Furmint was released.

5.6.2 TRADITIONAL WINE TYPE RATIO

"I was taught to respect traditions. For instance tradition of Máslás and Fordítás has to be preserved, even if these wines are hard to explain to customers."

Kata Zsirai, Zsirai Winery vinoport.hu 2016

"In the '90s it was difficult to get permission for the Aszú and Szamorodni wines in the style that we imagined, because members of National Wine Tasting Committee who tasted and permitted the wines thought that the Hungarian Tokaj sweet wine has to be first of all oxidized, as they studied this in the

'60s '70s '80s. So I sold my first vintages without permission. Then I changed the style to get permitted, which was not as good. As I started to export it was too dangerous to sell without permit; thus I decided to do something that is not limited in the taste and this was the Late Harvest wine. We put our Szamorodni into green bottles and got permission immediately. We sold it in the late harvest category on a much higher price than anybody else's Aszú or Aszúesszencia."

István Szepsy 2008

"My cuvée was the first at the tasting. Hugh Johnson [the owner of Royal Tokaji] jumped up „I do not understand István why to do that? This is not traditional." he said. "Is it good?" I asked. " Yes, it is excellent, a wonderful new face of Tokaj. However, people will go after it and the traditional categories will go down." he said."

István Szepsy 2008

Definition and appearance in publications

This feature measured the ratio of traditional wine types in the portfolio. Although it seems similar to the sweet wine ratio as almost all the traditional wines are sweet, the two features did not overlap because of the traditional Dry Szamorodni and the nontraditional sweet wine types. It did not necessarily correlate with 'Sweet or dry focus' either, as not all the sweet focused estates put traditional wines on the top of their assortment. Even if they did so, the majority of their wines could be still non-traditional. On the other hand, similarly to the 'Sweet wine ratio', this feature also indicated the winemaker's attitude towards traditions, but towards a different aspect of them.

Similarly to the sweet wine ratio this feature could be deduced from the list of tasting notes. Besides that winery descriptions also gave a hint about the attitude towards traditional wine types, and the structure of the assortment.

"They focus on the sweet style familiar to Austria and Germany which is a much more marketable position in the new world [than the Aszú wines]."

"As for the sweet wines, the entry point is the lighter Látomás Cuvée. Above it you can find 5 and 6 puttonyos Aszú with the same purity [...]."

“In addition, they prefer tank method sparkling wine and traditional method sparkling wine as well besides late-harvest wine or Aszú”

“Their story started with the launch of the 5 puttonyos Aszú from 1993, but since the millennium they have also bottled some lighter and some more substantial dry and off-dry Furmint, Hárslevelűs and yellow muscats.”

“Degenfeld also prefers different puttony numbers for their Aszú wines.”

Characteristics of the feature in Tokaj-Hegyalja

The Hungarian Wine Act contains specific regulations regarding Tokaj-Hegyalja. It names and defines the Tokaj wine specialties, which are the historically produced wine types of the region. It also prescribes their production method and certain properties of them, such as residual sugar, dry extract or alcohol content. In this model these wines and semi-sweet varietal wines will be considered as traditional wine types. This section focuses on the operationalization and portfolio development process. Wine types of both categories will be listed and discussed in detail in Appendix 2.

By looking at the list of traditional and non-traditional wine types of the region, two conclusions can be made. First, there was a correlation between sweet type ratio and traditional wine type ratio, as traditional wine types of the region are predominantly sweet. Second, the proportion of traditional wine types was determined both by changes of the legally allowed wine specialties and the introduction of new nontraditional wine types. As the first group narrowed during the studied period, while the second broadened, the possible assortments contained less traditional and more nontraditional wines. Therefore, the ratio of traditional wines presumably decreased over time. The following paragraphs will look at this development in more details.

Before 1989 the standard portfolio contained the whole range of traditional wine specialties. Besides that varietal sweet and half-sweet wines and sometimes dry Furmint were released. The new foreign estates did not modify that in any significant extent, but they both shortened and extended this assortment. On the one hand, they gave up production of some less common traditional wine types: typically Fordítás or Máslás. On the other hand, they extended the range of varietal wines, but apart from non-local varieties, these fall into an already existing category. As was discussed above regarding wine style, these estates deviated from the former standards, but these aspects are in the scope of other relevant features. Another group that shortened the traditional portfolio were few family wineries that

focused on producing high-status wine specialties only (Szepsy, Gergely Vince, Dobogó). These were mostly 6 puttonyos Aszú wines and also Esszencia in certain vintages. Other family wineries preferred the traditional portfolio and aimed to have as wide a range of wine specialties as possible (Monyók, Király).

The most important innovation in the second part of the 1990s was the late harvest category. In the beginning they were also labeled as "sweet cuvée", but the category names "late harvest cuvée" or "late harvest varietal wine" became general. As the quote from Szepsy on page 91 reveals this type was created as a workaround by winemakers whose Aszús and Szamorodni were refused by the National Wine Tasting Committee due to stylistic reasons. Later on, as it was not strictly specified the late harvest category became the collection site of every sort of sweet wines covering a broad range regarding sweetness, technological methods, and stylistic traits. Although it took until the late 2000s to develop consensus about the wine category, it was a stable element of the nontraditional assortments in the second part of 1990s already.

The 2000s was the decade of dry wines in Tokaj. Following the successful model of Szepsy, many small scale wineries were established that chose to focus on the terroir by producing dry single vineyard selections. As a result, also the role of dry varietal wines became more important in the assortments of both new and old estates. These were full bodied varietal wines as well but estate wines, which means that the grape used for production is harvested from multiple vineyards of the winery. Another process of these years was varietal wine production from the minor varieties of the region which had been mainly used in Aszú production before. Varietal late harvest wines were made from kövérszőlő and zéta (Puklus) while dry wines from kabar (Dereszla and Erzsébet). Besides that full-bodied dry wines were also produced from international varieties such as chardonnay, sauvignon blanc and pinot noir (Árvay and Dobogó). Despite these attempts, Furmint remained the dominant dry wine followed by Hárslevelű. However, the increasing number of used varieties decreased the ratio of traditional wine types in assortments.

In the first part of the 2010s, sparkling wine gained a foothold as a new non-traditional type. Besides that, the main phenomenon was that low-status traditional wines became more and more insignificant. On the one hand, dry focused small-scale wineries have produced only limited types of wine specialties, typically one Aszús with a high puttony number and maybe Sweet Szamorodni. On the other hand, large-scale wineries stopped producing most of these old types. Only a group of family wineries adhered to the complete traditional assortment, but they also had to give up the many types in

2013 when the new Wine Act outlawed Fordítás, Máslás and the Aszús with a low puttony number. For a better understanding Table 5.6 shows changes in three different estate's assortment. Hétszőlő is a typical early foreign investment, cultivating 60 hectares. Monyók winery is a traditionalist family winery preferring the old wine style. Szepsy started as an Aszú specialist and became the prototype of dry focused wineries. The figure shows the number of wines produced in each wine type in the specific year. This is not identical with the range of wines being on the market in these years.

Table 5.6: Examples of development of winery assortments, Hétszőlő, Szepsy and Monyók 1993-2011

WINERY NAME	YEAR	WINE TYPES															
		TRADITIONAL											NONTRADITIONAL				
		Esszencia	Aszúesszencia	Aszú 6P	Aszú 5P	Aszú 4P	Aszú 3P	Sweet Szamorodni	Dry Szamorodni	Fordítás	Máslás	Semi sweet wine	Dry varietal or cuvée	Single Vineyard Selection	Late Harvest wine	Sparkling wine	Other product
Hétszőlő	1993	1	1	1	1	1	1	1	1	1	0	3	3	0	0	0	0
Hétszőlő	1999	1	1	4	1	1	1	1	1	1	0	1	3	0	3	0	0
Hétszőlő	2005	0	0	1	1	0	1	1	1	1	0	0	4	0	3	0	0
Hétszőlő	2011	0	0	1	1	0	0	0	0	0	0	0	5	0	4	0	0
Szepsy	1993	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Szepsy	1999	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Szepsy	2005	0	0	1	0	0	0	0	0	0	0	1	3	1	0	0	0
Szepsy	2011	0	0	1	0	0	0	0	0	0	0	1	6	1	0	0	0
Monyók	1993	0	1	1	1	1	1	1	1	1	0	3	0	0	0	0	0
Monyók	1999	0	1	1	1	1	1	1	1	1	0	3	3	0	0	0	0
Monyók	2005	0	0	1	1	1	1	1	1	0	0	3	2	0	3	0	0
Monyók	2011	0	0	1	1	1	1	1	1	0	0	3	2	0	3	0	0

Operationalization and relevance

Operationalization of this feature was identical with that of sweet wine ratio, except that wines were categorized regarding traditionality. Examples of both visible and real feature value coding are presented below. (Tables 5.7 and 5.8)

Table 5.7: Calculation of the visible value of 'Traditional wine type ratio' feature, Szepsy winery 2012

WINES ON MARKET IN 2013						
Winery		Wine name	Bottled quantity	Wine Type		
Szepsy	2009	Furmint	12600	Varieral dry	0	
Szepsy	2010	Furmint	12712	Varieral dry		
Szepsy	2011	Betsek Furmint	932	Single vinyard selection	0	
Szepsy	2011	Birsalmás Furmint	1402	Single vinyard selection	0	
Szepsy	2011	Dorgó Furmint	560	Single vinyard selection	0	
Szepsy	2008	Király Hárslevelű	6292	Single vinyard selection	0	
Szepsy	2011	Liliom Furmint	1200	Single vinyard selection	0	
Szepsy	2011	Nyulászó Furmint	3800	Single vinyard selection	0	
Szepsy	2011	Úrágya Furmint	5973	Single vinyard selection	0	
Szepsy	2008	Sweet Szamorodni	10852	Sweet Szamorodni	1	
Szepsy	2007	Cuvée Sweet	5282	Sweet Cuvee	0	
Szepsy	2006	Aszú 6 puttonyos	6800	Aszú	1	
					Traditional wines	2
					Total wines	11
						0.18

Table 5.8: Calculation of the real value of 'Traditional wine type ratio' feature, Béres winery 2007

Winery	Vintage	Wine name	Bottled quantity	Wine Type	Traditional=1		
Béres	2007	Aszú 3 Puttonyos	15000	Aszú	1		
Béres	2007	Aszú 5 Puttonyos	11500	Aszú	1		
Béres	2007	Aszú 6 Puttonyos	8500	Aszú	1		
Béres	2007	Sweet Szamorodni	15000	Sweet Szamorodni	1		
Béres	2007	Magita Cuvée	14400	Sweet Cuvee	0	The ratio of	
Béres	2007	Hárslevelű Late Harvest	6000	Varietal sweet	0		
Béres	2007	Lőcse Furmint	3500	Single vinyard sele	0		
Béres	2007	Omlás Furmint	8400	Single vinyard sele	0		
Béres	2007	Hárslevelű Dry	12000	Varieral dry	0		
Béres	2007	Sárgamuskotály Dry	11000	Varieral dry	0		
Béres	2007	Furmint Dry	14500	Varieral dry	0		
Béres	2007	Naparany Cuvvee	10050	Dry cuvee	0		
Béres	2007	Holdezüst Cuvvee	12200	Dry cuvee	0		
					Traditional wines		4
					Total wines		13
					Traditional wine ty		0.31

traditional wines became relevant in 1996 when foreign investors started to experiment with non-traditional sweet wines. It is interesting that even though reductive dry wines and even wines of non-local varieties were released earlier, they did not cause a real outcry. The difference may be that producing other sweet wines than the traditional types meant questioning the eligibility of the Aszú.

5.6.3 SMALL BOTTLED AMOUNT

“We do not keep aloof from parcel selection, but we do not look at it as a marketing tool. We bottle them when showing something unique.”

Péter Molnár, director of Patricius 2016 MR1 Radio

Definition and appearance in publications

This feature indicated whether a winery released wines in a lower amount than 1500 bottles. The borderline is based on the observation that rarity is typically emphasized in publications below this number. Low bottled amounts can indicate two things in the audience eyes: intense terroir focus, and intended exclusivity, which are the typical traits of small boutique wineries. On the other hand, the feature was not scale dependent. There were small wineries that produced a few wines types only but in relatively big quantities (AZ Nektár), and also large estates that released limited single vineyard selections besides their regular wines that were bottled in large quantities (Szent Tamás).

Publications pointed out if wines were released in low quantity but the opposite is rarely mentioned. Bottled amount was often listed in tasting notes as general information or as an emphasis on the wine's rarity. Besides that winery descriptions also contained reference to the produced quantity.

“[Besides the other wines also] an authentic Szamorodni type wine is being created deep in the cellar together with many other limited and exciting barrel experiments.”

“It can be a challenge to chart the progress of his wines due to the small size of the estate and correspondingly strictly limited output of around 3000 bottles yearly.”

“Offering limited bottling of dry and sweet wines in a still-evolving style, [...]”

“Sadly limited production (approx. 1300 bottles made).”

Characteristics of the feature in Tokaj-Hegyalja

Besides Aszús in vintages when botrytization is weak, typically single vineyard dry wines were produced in low amounts. Their purpose was to show the characteristics of a small unique terroir sometimes just a part of a parcel which differs from the rest of the vineyard. Thus, the phenomenon of releasing limited editions started in the second half of the 2000s when production of terroir focused dry wines became widespread.

Although this feature was typical for small boutique wineries, some larger estates also released wines in a small bottled amount. This was not conflicting their winemaking philosophy, which did not differ in many senses from the approach of boutique wineries. Those larger estates that focused on quality winemaking also put emphasis on parcel differences. They had territory specific cultivation methods, harvested and fermented or even matured small amounts of wines from different parcels separately. Normally the purpose of this was to learn about terroirs as much as possible, thus ultimately they blended these items into an estate selection.

Operationalization and relevance

To those estates, that released any wine with a bottled amount lower than 1500, a value of 1 was assigned. Otherwise, feature value was set to 0. The reason of low bottled amount can also be bad weather conditions in the vintage. This especially applied for Aszú and Esszencia of small wineries. Thus, the feature disregards these wine types.

The feature was first mentioned in 2002 which is the year when 2000 Úrágya Furmint was released. This is in accordance with the assumption that similar to many other features, this one was also related to the terroir-focused dry wine revolution.

5.6.4 NON-LOCAL VARIETIES

“Tokaj's traditions concerning grape varieties and winemaking methods that have been turning out supreme wine for centuries. You could make wonderful Tokaj wine from other grape types too, but the character is now defined by Furmint, Hárslevelű, and the others.”

Dominique Arangoits, former director of Disznókő, 2004 Borbarát magazine interview

“Imagine a wine dinner here, apparently with Tokaj wines only. It is possible to make it, but it is a bit constrained. So I think that it is still better to have chardonnays or sauvignon blancs as well, even if we can not label them as Tokaj wines. Another wine regions also have lighter wines that are easy to drink.”

János Árvay, 2008

“Pinot Noir is my favorite [red wine], I would go further with it. Maybe one day I will. So far I have not wanted to do it because it would require a lot of attention and take the emphasis away.”

István Szepsy 2012 mandiner.hu

“I still maintain that wine regions with fewer varieties have a stronger identity.”

László Alkonyi wine expert and winemaker of Kaláka cellar 2015 gaultmillau.hu

Definition and appearance in publications

This feature indicated whether a vintner released wines made of non-local varieties. It is important to note that the list of locally authorized grape types changed during the studied period, thus the feature definition is dynamic. In publications, it was either observable in the listed assortment or in the winery description section, where unusual varieties were usually highlighted.

“[the family is cultivating] several new lots of Kövérszőlő grape in addition to the usual varieties.”

“The cultivated grapes include the rare Zéta.”

“Izabella Zwack and her team always come up with something new – this time a Pinot Noir.”

“Megyer aims for the value-conscious market with impeccable dry and sweet wines, often – surprisingly- made from Chardonnay.”

“[...] the company is on a quest to discover a totally new direction in Dry Tokaji wines by blending Hungarian varieties (furmint, hárslevelű and sárgamuskotály) with chardonnay.”

Characteristics of the feature in Tokaj-Hegyalja

It is commonly known in Hungary that Tokaj-Hegyalja is a white wine district exclusively where traditionally three grape varieties are allowed to grow: Furmint, Hárslevelű, and Sárgamuskotály (yellow muscat). Indeed, these are the most common ones, the vast majority of vineyards were planted

with either of these, but historically the picture is more complicated.

In the 17th and 18th century the growing popularity of the Aszú encouraged vintners to select varieties that yield more botrytized and better quality grapes. Such varieties were Furmint which became predominant in Tokaj-Hegyalja and Hárslevelű which is the second most popular even today. Both are noted as grapes contracting botrytis well, and developing a rich, harmonious concentration upon contact with it. In the 19th century, 80 different varieties were present, but most of them were grown on a very small scale, except sárgamuskotály kövérszőlő and gohér.

The phylloxera epidemic in 1885 resulted in a major change: the replanting did not pay much attention for the minor varieties but focused on Furmint and Hárslevelű. They have remained dominant ever since, nowadays these two varieties are planted in 95 percent of the vineyards, while the rest is mainly Yellow Muscat. Besides these, another three varieties are permitted for the Tokaj appellation: Kövérszőlő on the one hand, which is one of the 80 varieties survived phylloxera, Zéta and Kabar on the other hand which were authorized in 1990 and 2006.

Apart from these, also international varieties were planted in small scales, such as chardonnay, sauvignon blanc, tramini and pinot noir. These were mostly experimental plantations of the former Tokaj Wine Works. Wines made from these varieties played a minor role, as apart from a few estates winemakers did not experiment with them. The first wave of their producers were the large foreign estates in the 1990s that acquired the experimental plantations privatization (Oremus and Pajzos-Megyer). They released reductive dry varietal wines in several vintages but later on it was excluded from their assortment. The second wave of attempts happened during the dry wine revolution of the early 2000s. The pioneer was Árvay Winery producing full-bodied Chardonnays and Sauvignon Blancs matured in new oak. Árvay's idea was that the local varieties which were selected in the past because of their ability to receive botrytis are not the only and not necessarily the best grape types for producing terroir wines. Even though his aim was somewhat hindered by the fact that wines made from non-local varieties could not hold the "Tokaji" label and the vineyard name either, his wines became successful. Árvay's wines were followed by pinot noirs of Dobogó, sauvignon blancs of Dereszla and a few other estates later on. Although the second wave of such wines proved to be more successful than the first, the majority of winemakers still refused to work with international varieties. Traditions were only one of the counterarguments. Many argued that the unique varieties of Tokaj have better chances on the market, and it is more advantageous if attention and resources are focused on them.

Operationalization and relevance

Estates that released wines made from non-local grapes in a specific year were coded as 1. Otherwise, the feature value was set to 0. The emphasis was not on cultivating vines or producing wine but on market release. Multiple estates experimented with international grape varieties in a small scale, but the majority of them did not sell those wines; thus it was not visible to the broader audience.

Important to note again that the list of permitted Tokaj varieties changed over time. Thus, the coding was based on the legal regulations of the actual year. This follows that the same product could be a non-local wine in one year and become Tokaj wine in the year after. Consequently, the value of the feature could alter without any change made in the assortment.

Despite the fact that dry Chardonnays and Sauvignon Blancs were released by large foreign estates in the 1990s, the earliest mention of this feature can be observed in 2003. The reason might be that these wines were mainly exported. It seems more likely however, that success of full-bodied dry wines was the key which brought varietal wines to the fore, thus international varieties as well.

5.7 WINEMAKING FEATURES

5.7.1 WINEMAKING STYLE

“The Soviet government wanted ten times more sweet wine than would have been possible to produce naturally. As the grapes were terrible due to mass production we had to oxidize the wine otherwise there was no flavor in it. And these people [members of the National Tasting Committee] learned the profession this time. Thus, in the new era we did not get permission to sell our 100 percent natural wines.”

István Szepsy 2005

„Many traditional wineries confuse aging a wine with letting it get old and tired by oxidization.”

László Alkonyi, Borbarát magazine 2002

Definition and appearance in publications

This feature indicated whether the estate produced its wines in oxidative or reductive style. Oxidative and reductive are technological terms in winemaking, referring to the use of wooden barrels or steel tanks for fermentation and maturing. In Tokaj and also in this model these expressions were related to wine making style. The feature considers whether notes of oxidative fermentation and maturing were emphasized in wines, which are considered the main elements of the traditional winemaking style. Oxidized notes appear when they have intense oxygen exposure. These notes fade fruity flavors and give nutty and sherry like aromas.

Oxidative and reductive winemaking in this technological sense was also included by the 'Winemaking technology' feature. Its values were traditional (oxidative technology) and modern (reductive technology). Important to note that winemaking technology and style were related in Tokaj but they did not go hand in hand with each other. Even vintners of the reductive party did not see eye to eye when it came to fermenting or maturing wines in steel tanks or in wooden barrels, there were examples of both. But they had consensus on avoiding strong oxidation. Similarly not all faithful oxidativists were committed to the traditional technology. Examples of all four variations are given in Table 5.9

Table 5.9: Examples of 'Winemaking technology' – 'Winemaking style feature combinations'

		WINEMAKING TECHNOLOGY	
		Traditional (1)	Modern (0)
WINEMAKING STYLE	Reductive (0)	HOMONNA 2002	DERESZLA 2002
	Oxidative (1)	EVINOR 2002	ANGYAL 2002

On the wine level, the most straightforward way to recognize the value of this feature in publications is to look at tasting notes, as they indicated reductive or oxidative aromatic traits. These were sherry, bread crust, chocolate, and coffee, while reductive notes were citrus, tropical fruits, exotic fruits, flowers and blossoms.

“With its citrus aromas, this Aszú meant a radical departure from the coffee, bread crust and nutty aromas for which we had recognized a Tokaji.”

“Honeyed but still fruity in the nose, [...]”

“It is a personality in its own right, with plenty of citrus fruit and delicate linden aromas.”

“Sherry-style wine.”

“An oxidized-style wine. coffee and chocolate on the palate.”

“Bread crust, pilsner beer, sherry.”

Besides these critics often indicated elements of wine making style in the general description of wineries as well.

“His wines are made in both reductive and traditional styles.”

“Winemaker Péter Molnár has given us reliable wines of consistently fine quality for years, including reductive dry Furmint and classic Aszús.”

“Finally the modern style cellar continued the story under the name of Sauska winery.”

“They even profess that they are making their wines on the border of the new and old schools.”

“[The winery] refuted the belief that an Aszú cannot be worthy unless it is oxidized”

Characteristics of the feature in Tokaj-Hegyalja

Until the 1990s, one thought of Aszú as deep gold colored wine with oxidative aromas of apple and bread crust and flavors of long maturation, such as chocolate, coffee and walnuts. This Aszú style was labeled as traditional, but according to Alkonyi (2000. p. 168), these traditions were in fact not old, but evolved in the socialist era. The style is the result of three needs of that period: mass production, standardization of the product and accelerated maturation. Even though this resulted in a low-quality wine, it became what many customers still consider as the proper Aszú because for 50 years this was the kind of sweet wine that people in Hungary grew up with, both producers and customers.

This uniform image of Aszús was challenged in the '90s by newly formed foreign wineries. These aimed to give a special character to their wines which necessarily had to be based on vineyard characteristics and the quality of their grapes. As oxidation masks these attributes, hence one of the key things they concentrated early on was to allow the wine to develop without letting it become oxidized. Therefore, they used new barrels, closed processing facilities, avoided storing the Aszú berries before maceration, and handled them as little as possible. The result was extreme fruitiness in the wine and lack of the notes which were considered as Tokajness at that time. This inevitably caused outcry and resistance among winemakers being fond of the traditional Aszú. Not on the customer side though: in average, the new Aszús could be sold at a considerably higher price level.

Regarding the distinction between reductive and oxidative style it is important to note that as first Aszús of the "revolvers" had become more than 20 years old, experts concluded that even "modern" Aszús have deeper, earthy notes after long bottle aging. This means that these wines also develop oxidative notes by time. Which follows that the so-called traditionalist methods were only accelerating maturation to reach the taste of old Aszú wines. Traditionalists did not consider this aspect they rather just followed in their father's footsteps to produce "proper" Aszú. This suggests that regardless of its origin oxidative style became a norm by time.

Although sweet wine specialties first of all the Aszús were the focal point of the initial oxidative-reductive debate of the '90s, other wine types of the estates were produced in line with the leading product of that time. Traditionalist wineries strongly oxidized their varietal wines and sweet cuvées as well, while the modernist newcomers produced reductive varietal wines. In other words, assortments were homogeneous regarding oxidization. After the 2002 breakthrough of full-bodied Furmint however many oxidativists followed the trend partially: While they kept producing their oxidative sweet wine specialties, they reconsidered the non-traditionalist part of their assortment or

introduced reductive drys and sweet cuvées as well. There were also winemakers switching sides entirely.

It is easy to understand why the dry wine turn favored reductive style. Overemphasized oxidation masked both terroir and varietal characteristics, which were the main traits of the successful full-bodied single vineyard Furmint. Not surprisingly new entrants after the early 2000s put emphasis rather on dry wines also preferred reductive style winemaking. As a result, in 2014 the oxidative style was already a peripheral phenomenon regarding the number of organizations. On the other hand, its most prominent representative had been the largest producer the Tokaj trading house until it changed its orientation in 2013.

Operationalization and relevance

Most accurate operationalization of the feature would be a ratio variable, similarly to 'Ratio of sweet wines' and 'Ratio of traditional wine types'. However, wine style data was hard to reproduce from historical assortments. Type of the wine was indicated in the wine name, its sweetness level was determined by wine category, but the only source of winemaking style were tasting notes which covered a small part of released wines only.

What still made modeling possible was that assortments were mostly homogenous in terms of winemaking style. In case they were not the dividing line was either between traditional and non-traditional wines or between dry and sweet wines. Therefore with a few yearly tasting notes for each winery in hand, a somewhat simplified binary modeling on the winery level was possible. It also supported this method that winemaking style did not change often and the direction exclusively from oxidative to reductive.

The coding was the following: values of estates that were predominantly engaged with oxidative style in a specific year was set to 1 while that of preferring reductive winemaking to 0. Estates with mixed portfolio got the feature value of 0.5. Visible feature value of wineries that switched sides but both their old and new style wines were on the market in the specific year were coded similarly.

The feature became relevant in 1995 when the first modern non-oxidative Aszú, the Disznókő 6 puttonyos from 1992 was released. Even though reductive winemaking not only gained foothold but has become the major style in the 2010s, oxidativist estates were still present in 2014 thus 'winemaking style' remained in the relevant set.

5.7.2 AGE OF BARRELS

“New wood used to be a common practice [before the war], though the term ‘barrique’ has never been used here. But I am sure that the best wines were always aged in new oak.”

János Árvay 2001 Borbarát Magazine

“Wooden barrel is necessary for full-bodied wines, but only new one.”

Szepesy 2012 wine-searcher.com interview

“There are many smallholders in the region with a strong belief about what tradition means. They use old barrels that they do not fill entirely; they do everything exactly the same way as their fathers and grandfathers did. Convincing them that this is a dead-end is impossible, because it works. Someone will drink that wine even from that barrel. People are not the same. However on the market, especially abroad it is out of question that the new style is preferred.”

Attila Homonna, 2013 origo.hu

Definition and appearance in publications

As its name suggests, the feature indicated the age of the barrel that was used for maturation and fermenting. In the majority of wine regions, this feature would differentiate among brand new and several years old barrels. Unused oak barrels have a stronger impact on the taste of the wine resulting in notes of caramel, cream, and smoke. Many consumers like these aromas but maturing in new oak overshadows varietal and terroir characteristics. Tokaj's case was somewhat different. Although there were wineries that matured wines deliberately in new barrels because of the above tastes, the major borderline was between barrels older than six years and younger ones. Similarly to brand new barrels the very old ones have an impact on the taste of the wine (tobacco aroma), which was considered as a major trait of traditional Tokaj wine style similarly to the oxidative notes. Its effect on the varietal and terroir characteristics is similar to oxidation, thus winemakers that preferred to emphasize them used newer casks. The barrel age question was initially part of the Aszú debate, but it influenced dry wine styles also.

Due to the aromatic effects of old barrels the feature was easily observable in the tasting notes.

Tobacco flavor indicated old barrels, while vanilla, oak, smoke, and butter newer ones. The second however was highlighted when the maturation was long, or the barrels were brand new. Besides, winery descriptions highlighted the typical age of barrels used for maturation.

Examples of tasting notes indicating old the use of old barrel are below:

"Distinguished with a very stylish touch of new oak."

"Hints of new oak are still in evidence"

"[The winemaker] prefers old barrels, the newest were bought in 2000."

"The new wood still reigns supreme in the bouquet and taste."

"Oaky flavors of older barrels."

"The tobacco aroma lent by the old barrels is a notable characteristic."

Characteristics of the feature in Tokaj-Hegyalja

Historically new oak barrels were used for maturation because the wine was sold and exported in barrels, it could not be reused. It is not known when locals started to use old barrels but during Communism, it was dominant both in the cellars of Tokaj Wine Works and among smallholders. New barrels were reintroduced in the early '90s by those foreign investors that did not acquire the assets of the privatized Tokaj Wine Works (Hétszőlő, Disznókő, and Royal Tokaji), thus had to buy casks. Others such as Oremus kept the old barrels and discarded them gradually. Many of these wineries also bought forests in the region and established cooerage in order to achieve the desired quality.

Use of new barrels spread with the new Aszú style in the '90s while in the 2000s followers of Szepsy's dry wine style adopted it mostly. Since the second half of the 2000s, only one group of estates kept using old casks, sometimes even 10-15 years old ones: traditionalist family wineries. While the majority of winemakers preferred to use new barrels after the mid-2000s they also tried to avoid its flavoring effect. Thus new casks are used for fermentation in the first year, for maturation in the second or the third year at the earliest.

Operationalization and relevance

There was no estate in the data that excluded barrels from winemaking, as all traditional wine specialties have to be aged in oak. According to the consensus of terroir focused winemakers,

full-bodied dries are also better if wooden barrels are used for a short maturing. Even if a winery used casks for a few wines only, it was coded according to the technology applied for the production of those wines.

The operationalization did not differentiate between barrels younger than five years and brand new ones, but casks older than five years were considered as old in the model. Feature value of wineries using old barrels was set to 1 otherwise to 0. Unlike in the case of the 'Winemaking style', assortments were always homogenous in terms of barrel age. However the visible feature value those of wineries that recently renewed barrel stocks but had old wines on the market was set to 0.5. This feature became relevant in 1995, with the release of the release of Disznókő's 1992 Aszú, which was also a pioneer regarding new barrels.

5.7.3 MACERATION METHOD

Definition and appearance in publications

This was an Aszú specific feature. It concerned the production method of that particular wine, namely the maceration method of the Aszú berries. Four kinds of practices existed in the studied period: soaking in old wine, in new wine, in fermenting must and in must. The chosen method influenced the freshness of the wine thus it was a major topic of the Aszú debate in the 1990s.

Maceration method was mainly discussed in the general description of the winery and in a few cases in tasting notes also as additional information.

“In terms of Aszú production method, Hétszőlő is one of the most radical cellars as it is soaking of the Aszú berries in pure non-fermenting must, [...].”

“The Aszú berries are soaked in fermented wine, but currently they are experimenting with soaking in fermenting must.”

“In this case, the Aszú berries were soaked half in must and half in wine.”

Characteristics of the feature in Tokaj-Hegyalja

Before 1989 Aszú berries were macerated in the wine of the previous vintage. This was banned in 1991 because it allowed fortification of the wine. Despite that interviews with traditional winemakers suggested that it was an existing practice in 2014 among a few producers. However, unlike oxidative style or long maturing, this did not seem to be the result of strong norms or traditions but economic considerations.

Maceration was not the part of the Aszú reform of foreign estates; they soaked Aszú berries in new wine. Small family owned estates started to experiment first with soaking in must and in fermenting must which was adopted later by part of the larger ventures as well. Its spread involved rather newly formed small estates than existing ones, which resulted in a very slow takeover. According to the collected data 2006 was the first year when more wineries soaked Aszú berries in either must or fermenting must than in wine.

Expert's comments in publications suggested that maceration method was considered as a quality signal. Soaking in fermenting must was valued the most followed by the use must and new wine. On the other hand, it was also a scale-related feature. For wineries that produced small amounts work with fermenting must was easier than for large-scale ventures. This is possibly the reason why there were large wineries that applied high standards both regarding vine cultivation and cellar works but preferred to macerate in new wine (Disznókő).

Operationalization and relevance

For the sake of simplicity, operationalization considers only two categories: fermenting in must and fermenting in wine. The first is coded as 0 the second as 1. Certain wineries use both methods interchangeably according to the vintage. These cases are coded as 0.5, similarly to wineries in transition having both types of Aszús on market.

Maceration was a hot topic in the '90s when Aszú was the focus of debates. Later on in the 2000s it became less important as dry wines came to the fore. This is indicated by wine publications as well, Rohály did not mention it in his publications after 2004. However, in the model it has remained relevant as Alkonyi and Ripka considered it as an important feature after this year as well.

5.7.4 LENGTH OF MATURATION

“Our association aims to defend the traditional characteristics of Tokaj wine specialties because we notice that some winemakers want to change the traditional winemaking methods. For instance, our members mature their wines longer in wooden barrels than is prescribed.”

Ferenc Marcinkó chairman of Tokajvinum Hungaricum Association, 2009

„Shorter barrel aging is not aimed at lining our pockets but at producing superior wine. If we would want a get-rich-quick scheme, believe me, we would not have come to Tokaj.”

Christian Seely, chief executive of Axa Millésimes, the owner of Disznókő winery 2002

Definition and appearance in publications

The feature indicated the length of barrel aging. Arguments are similar to those of the oxidation question. While reformer estates aimed to minimize time spent in barrels as the oaky taste masks the variety and distinctive terroir, supporters of long maturation interpreted this as a violation of traditions. Even though this debate started regarding the Aszús, the maturing question was not limited to traditional sweet wines. Some traditionalist winemakers applied the characteristics of the old style on nontraditional wine types as well including long barrel aging. On the other hand, some estates matured their wine specialties only.

Besides the general winery descriptions, the feature was mostly mentioned in the tasting notes. Apart from emphasizing the strong presence of aromas that indicated barrel aging (either old or new barrels), they often gave information about the exact length of maturing.

”Old school Furmint, but with no oxidation, even after 18 months of barrel aging.”

“Clean concentrated wine with good length, tough with over-dominant oak aromas.”

”Its brief sojourn in new oak – no more than four months – did not interfere with the primary fruit aromas.”

“From this wine on, the merits of maturation had to take second place behind the virtues of the fruit.”

“The dry wines are a bit more rustic, aged for a longer time.”

“It may be that the slightly excessive tannins take away some of the elegance [...]”

“Too much oak and butter on the nose.”

Characteristics of the feature in Tokaj-Hegyalja

According to the traditional school, every Aszú must be matured in wooden casks for at least as many years for as many puttonys as the wine has. The large foreign estates violated this norm: the modern Aszú school they introduced did not specify a universal recipe, but preferred shorter maturing to keep the wine fruity. Therefore wineries following this idea usually adhered to the minimum maturing time that the law prescribed: two years of barrel maturing and one year of bottle aging before release. Most likely shortened aging was also motivated by economic considerations as it allowed an earlier return on capital and required smaller cellar capacity, but the main regard was the wine style.

Short maturing spread hand-in-hand with the reductive wine style in the '90s and the beginning of 2000s. Besides foreign ventures a handful of small family estates adopted it, and a few new market entrants both in the large and the small scale. The real breakthrough of short-maturing came with the full bodied dry wines in the second part of the 2000s. As long oak maturation masks terroir characteristics, winemakers focusing on single vineyard dry wines aimed to minimize the effect of the barrel on the taste. They also applied this approach on other wine types including Aszús.

Operationalization and relevance

It was wine type specific whether experts considered maturing time long or short. In case most of the wine specialties whose barrel aging was prescribed it is easy to determine which school was followed. While modernists approach did not mature wines longer than that, traditionalists kept their products way longer in barrels by following the puttony number rule. By looking at tasting notes, it seems that non-traditional wine types were considered as long matured when they spent more than a year in wooden barrels. Thus this was the borderline at the operationalization. Wines without barrel aging were considered as shortly matured.

Similarly to the winemaking style feature, not the ratio of long matured items but general characteristics of produced or marketed assortments were taken into account; thus, the coding was binary. Long maturation is coded as 1 while short barrel aging as 0. Similarly to other features, assortments in transition or combined assortments were coded as 0.5.

Short barrel aging was also part of the Aszú reform of Disznókő's 1992 vintage. Thus it also became relevant in 1995 when this wine was released.

5.7.5. FERMENTATION METHOD

“When I asked why this wine became so unique, it turned out that it was the first that was made with natural yeast. As a matter of fact I was quite surprised. I did not know that majority of the Tokaj dry wines were made with cultured yeast that time. [In the 2006 vintage.]”

Alföldi Merlot, wine blogger alkoholista.blog.hu 2008

“During the work in the cellar we try to make this wonderful drink with the least possible intervention.”

József Bodó, Bott pince 2013

“The most important task is to produce completely ripened and uncompromised fruit. Once it arrives at the cellar only has to be helped on its way and thus it makes itself.”

Dénes Szarka, winemaker of Pelle Cellar

Definition and appearance in publications

The feature indicated the fermentation method of wines. Must can be fermented in two ways. The winemaker either lets the must ferment spontaneously by using the yeast that the grapes naturally contain or adds pre-produced cultured or selected yeast which is designed for the specific grape variety. While natural yeast makes fermentation less predictable both regarding its beginning, length and the terminus of fermentation, selected yeast is more comfortable as it allows better control over the process. The downside is that it unifies the taste of the wines and brings variety characteristics to the fore, which is disadvantageous when the aim is to highlight terroir. Thus, Tokaj wineries focusing on terroir tended to use natural yeast. This suggests that choice between fermentation methods was based on pragmatic considerations. However, it was also a philosophical question as it expresses winemaker's attitude towards naturality. Application of cultural yeast was considered as an intervention into organic processes. For many wineries, this aspect was even more important. The applied yeast is often highlighted in the tasting notes, but more often in winery descriptions.

“Most of their wines are fermented with cultured yeast in steel tanks.”

”Their winemaking philosophy is entirely artisan and natural: neither inoculated yeast nor enzymes are used.”

Characteristics of the feature in Tokaj-Hegyalja

Natural fermentation was already practiced in the '90s by some sweet wine producers (Royal, Leskó and Szepsy), but the yeast question became relevant after the dry wine turn. Still, it was not widespread until the end of the 2000s even among terroir focused estates. This might be due to the caution of winemakers as they did not have much experience in dry wine production. After 2010 however, using natural yeast has been a common practice among such producers and also an expectation of wine experts. On the other hand exclusion of cultured yeast is not a prerequisite of being an acknowledged winemaker. For instance, Zoltán Demeter applies both methods, which does not seem to harm his reputation.

Operationalization and relevance

This feature was coded on the organization level. Feature value of wineries that used cultured yeast in a specific year was set to 1, while that of wineries fermenting their wines naturally to 0. When the assortment was mixed in this sense, the value was coded as 0.5.

The pattern was similar to other dry wine related features. Even though spontaneous fermentation was applied by wineries in the 1990s already (Szepsy, Leskó, and Royal Tokaji), it became relevant in the 2000s after full bodied dry wines came to the fore. 2003 was the year when this feature first appeared in publications. Thus this was considered as the beginning of relevance.

5.7.6 WINEMAKING TECHNOLOGY

“We use wooden barrels, just like people did a few hundred years ago.”

József Bodó, Bott Winery 2013 terrahungarica.hu

Definition and appearance in publications

This feature represented the technology used for winemaking, more closely for fermentation and maturation. On the one hand, this restriction was due to data availability, information about these two processes could be collected. On the other hand, this reflects the phases of winemaking that are most frequently mentioned in publications. Traditional technology in Tokaj was fermenting and maturing wine in wooden barrels whose volume was 136 liter or 220 liter. Modern technology included temperature controlled fermentation and maturing in steel tanks.

Technological background could be read mainly in winery descriptions, but also tasting notes gave information about it.

In winery descriptions:

“His vigorous assertive hand crafted wines faithfully reflect the unity of soil and land”

“The line of lighter wines with a relaxed structure is broken here and there by a barrique-fermented example.”

”[Royal Tokaji is] expanding with a huge winery background, fermenting room and maturation cellar.”

“The dry and sweet wines are exclusively fermented and matured in wooden casks.”

”The lovely cellar and the super-modern buildings opened in 2013, really worth a visit.”

“Modern technology was combined with a nice classic building.”

In tasting notes:

“It is a crisp, very clean and medium-bodied Furmint as benefits its steel-fermented provenance.”

“[In this wine] Molnár Péter tends to vary the proportion of stainless steel and small new oak.”

“This special wine never saw a barrel.”

“Long absences and a lack of technology are keenly felt in this wine.”

Characteristics of the feature in Tokaj-Hegyalja

In terms of technology, the two large estates in Tokaj-Hegyalja that existed in 1989 were already very outdated in comparison to Western standards, but from the model's point of view, they applied modern technology by using stainless steel tanks for fermentation. Up-to-date technology was first brought by foreign ventures to the wine region in the early 1990s. Traditional technology “entered” the market with Royal Tokaji, which began operations in 1989 as a joint venture cooperative of local growers and foreign investors relying on the existing infrastructure. Besides large-scale production, small family estates established in 1991 were following traditional methods. Later on, larger ventures and mid-sized companies were mainly using modern winemaking technology, while family owned estates employed traditional techniques.

Utilizing winemaking technology during this era raised the question of whether the declared wine-making credo of a certain winery was the result of free choice or a pressing need. Choosing barrel fermentation or aging on one’s own free will is very different from doing the same because one does not have the financial capability or skills to use controlled steel tanks. For instance, many traditional wineries had little chance to buy high technology in the 1990s and thus concentrated on making Aszú and other sweet specialties, which eliminated the need for an entire battery of stainless steel tanks.

On the other hand, some winemakers chose to stand by traditional technology. They thought that traditional maturation in large barrels would amplify the synergy between the wine and the terroir, and that it was better to minimize the use of technology in order not to interfere with the primary flavors. This was a major element of Szepsy's philosophy, which insists on always fermenting and maturing wines in wooden barrels, rather than in a closed and controlled system both at Királyudvar and his own family winery despite that he was not limited financially. With his success, this model spread among dry producers after the 2000s, which resulted in a duality in terms of traditional technology. It has been used both under financial compulsion and to enhance quality.

It is hard to decide whether this underlying pattern was entirely visible for the audience. For the wine experts most likely it was, still it was barely communicated in publications. Thus the feature vector model did not include the reasons behind technological choice but the facts only.

Operationalization and relevance

Traditional technology, which was defined as fermentation and maturation in wooden barrels was coded as 1. Any deviation from this was coded as 0. The reason behind choosing traditional technology as the pole was that unlike modern technology it was a point of reference both in the prescription of traditional wine types and in the credo of István Szepsy who has been the most influential winemaker of the region for decades.

As was discussed earlier, state-owned estates used both ways of fermentation in 1989 but predominantly aged their wines in wooden barrels, while traditional technology was first applied by Royal Tokaji and family wineries. Because both practices existed in the first year of the investigated period, the model considers this feature as relevant from 1989.

5.7.7 TECHNOLOGY OR TERROIR FOCUS

“Today it is very fashionable to speak of delimited production areas or the uniqueness of terroirs. Many producers utilize it as a marketing tool. As opposed to many other wine regions, in Tokaj-Hegyalja there is no question that the region naturally offers the possibility of the terroir uniqueness with its different formulations. In fact, it provides evidence at every single harvest and encourages us to deepen our faith and to look for further details.”

Zoltán Demeter 2016, mandiner.hu

“Members of the national wine tasting committee thought the Tokaj's greatness lays in the style. Not in the terroir but in the style.”

István Szepsy 2007

“The vineyard matters indeed. It is important in terms of the yield, but when the wine is on the market nobody is interested in Tokyo, Vienna or Budapest whether the grape was harvested in the Gangó-tető vineyard or not. If the wine tastes good, they will buy it.”

Dániel Szabó, traditionalist winemaker 2015

Definition and appearance in publications

Terroir focus had two aspects. First, that the aim of the produced wine was to express the characteristics of a unique environmental context a smaller or larger area. Second that the winemaking focuses primarily on vineyard works and restricts winemaking practices that may overshadow the terroir characteristics. This does not necessary mean excluding modern methods, as minimalist technology does not guarantee terroir-focused winemaking either. Technology focus indicates the opposite attitude, expressing varietal or wine type characteristics and putting emphasis on cellar work.

In Tokaj this duality manifest in two distinctive winemaking credos. The first believes that the essence of the wine region lies in the traditional wine types based on the unique natural phenomenon of botrytization and shaped by generations of winemakers. The aim is to improve the qualities of these following the long standing traditions, regardless how these traditions are defined in terms of wine style. The second was based on the recognition that Tokaj has very diverse and special terroirs whose presentation is the real task of local winemakers. Followers of this philosophy argue that this is the actual tradition of Tokaj-Hegyalja and the several hundred years old appellation system of vineyards suggests.

The feature was typically pointed out when a winery is focused on expressing the terroir, the opposite case was not. This attitude was often mentioned in the winery descriptions either directly or indirectly:

”Asztalos Zoltán's Furmint leaves some room for improvement regarding the specificity of the taste, but it is more than competent regarding the structure, terroir expression, and particularly its palette of bracing acids.”

”Their main aim is to dress up the terroir in its finest clothes to reveal it at its most stunning.”

”The Hétszőlő winery [...] continue to exploit the natural capabilities of the estate, including nearly pure loess [a silt-sized sediment that is formed by the accumulation of wind-blown dust] soils and warm southern exposures, to make wines of absolutely unmistakable character.”

Besides that, tasting notes contain the feature:

”The Úrágya and Király [vineyards] yielded for very distinctive wines whether based on Furmint or Hárslevelű.”

“Less than usually rounded body allows exciting notes of terroir.”

“Minerally, vibrant and consummately elegant.”

“The 2009 Szil-völgy Furmint provided irrefutable evidence of the special character loess can deliver.”

Another indirect hint of terroir focus were single vineyard releases in the assortment as these type of wines were typically produced to order to emphasize a distinctive terroir of the estate.

Characteristics of the feature in Tokaj-Hegyalja

In Tokaj, where the geographical makeup is very special, well-defined microclimatic and the varied soils resulted in a very colorful terroir system. Still, the traditional focus was not on terroir but sweetness, the other natural resource of the wine region, The winemaking methods and style based on sweetness did not support the expression of terroir characteristics, as high residual sugar content and elements of the traditional style such as long barrel maturation and oxidation all masked these.

Terroir was not in the foreground when large foreign estates aimed to reform the wine region in the '90s. In the first place, they focused on developing a modern and authentic Aszú style. This means that they did not deviate from the traditional approach which aimed to express the greatness of the wine region by the improvement of traditional sweet wines. On the other hand, unlike the former Tokaj Wine Works that unified the Aszú style region-wide, these estates endeavored to develop their own style which often included certain aspects of the terroir. However, this was rather a determination than a winemaking philosophy. There are two exceptions however when terroir was regarded. One of them was Royal Tokaji that had released multiple single-vineyard selected Aszús from vintages since the early '90s. However, only the base wine or later the must of these Aszús came from the same vineyard, the Aszú berries did not. Possibly this was the reason why many experts rather considered the vineyard indication as a branding than terroir focus. Another attempt was made by Hétszőlő which aimed to express the unitary loess subsoil, and the southern exposure that characterize their vineyards in its Aszú wines. Consequently, the distinct Hétszőlő Aszú style has been acknowledged as a terroir based trait by experts.

The real turning point was the release of Királyudvar's 2000 Úrágya Furmint, which helped István Szepsy and Zoltán Demeter to recognize the potential of Tokaj's terroirs, and the suitability of

full-bodied dry wines for the expression of their character. As a result, these winemakers changed focus. Before 2000 they aimed to justify that the Aszú is one of the best natural sweet wines in the world, while after it they have been working on proving the unique greatness of Tokaj's terroirs. The product is secondary and in this sense dry wine was just a tool for achieving the above goal. The professional and economic success of Szepsy and later Demeter resulted in the spread of their philosophy and methods, which were generally accepted and practiced at the end of the studied period.

There are three relevant features that were discussed already but are necessary to look at in the light of terroir focus: sweet or dry focus, ratio of traditional wine categories and winemaking style, the reason being that there was a correlation among them in the years when all were relevant. This was because certain values of the three feature (dry focus, nontraditional wine style, and reductive wine style) are helping terroir expression. On the other hand, they are neither a sufficient or necessary condition of it. Thus there are examples of all possible feature value pairings. Below the relationship among terroir focus and these features will be clarified. (Table 5.10)

First, the terroir-technology distinction in Tokaj did not entirely coincide with the sweet versus dry question. In fact, they were two entirely different dimensions of the Tokaj debate. Both became intense and relevant after the 2000s, but wineries have taken position on all the four possible feature variations. Examples of Hétszőlő and Royal Tokaji which were discussed above can be considered as pairing terroir focus with sweet wine focus. A more widespread strategy was however terroir focus based on dry single vineyard selections. This was the model of Szepsy such assortments typically included at least one single vineyard selection, but usually more, depending on the diversity of their vineyards. As their aim was to explore and express the diverse terroirs of the wine region they owned smaller parcels in multiple locations instead of concentrating their territories. In the case of family wineries, this fragmentation was mostly an inherited trait while companies endeavored to acquire parcels in many vineyards. Another major group consisted of wineries that followed the traditional recipe of old style wine specialties. Regarding sweetness, this necessarily meant sweet focus, while the terroir could not be expressed due to the features of the traditional winemaking style. These were predominantly family wineries, and a few large estates, most importantly the state-owned Crown Estates. The fourth variation was dry focus and technology focus which was specific for mid-sized or large estates that had found the dry market more appealing after the dry wine turn but did not engage with the terroir-based approach. They typically produced cheaper varietal dry wines made from the crop of multiple vineyards in a bigger amount. Table 5.10 presents examples of all the above strategies.

Table 5.10 Examples of 'Sweet or dry focus' – 'Technology or terroir focus' feature combinations

		FOCUS	
		Sweet (1)	Dry (0)
FOCUS	Terroir(0)	HÉTSZŐLŐ 2014	SZEPSY 2014
	Technology (1)	EVINOR 2014	BODVIN 2014

Second, neither coincided terroir focus with the ratio of traditional wine types entirely, although the four possible pairings of these features partly overlapped with the above variations. (Table 5.11) This happened because traditional wine types are sweet. Moreover, legal prescriptions regarding traditional Tokaj specialties (high sweetness, years of barrel maturing) go against terroir expression. However, there were exceptions, mainly wineries that put emphasis on the late harvest category as these are sweet but nontraditional wines.

Table 5.11 Examples of 'Traditional wine type ratio' –'Technology or terroir focus' feature combinations

		TRADITIONAL WINE TYPE RATIO	
		0.5>	0.5<
FOCUS	Terroir(0)	BOTT 2006	KIRÁLYUDVAR 2006
	Technology (1)	HIMESUDVAR 2006	OREMUS 2006

Finally, terroir focus should not be confused with wine making style (Table 5.12). Being engaged with reductive style does not mean terroir expression. If parcel selection and yield limitation were not applied, characteristics of terroir would hardly manifest in the wine. However, as oxidative notes are masking terroir traits reductive style is a necessary condition of terroir expression. Still, there was one estate which followed a rather oxidative path and released vineyard selected Aszús (Royal Tokaji), but there was no consensus about its terroir focused attitude in the publications.

Table 5.12 Examples of 'Traditional wine type ratio' –'Winemaking style' feature combinations

		WINEMAKING STYLE	
		Oxidative (1)	Reductive (0)
FOCUS	Terroir (0)	(ROYAL TOKAJI 2000)	HOMONNA 2010
	Technology (1)	HOMOKY 2010	DEGENFELD 2010

Operationalization and relevance

Coding was binary; feature value of terroir focused wineries was set to 1, while that of technology-focused organizations to 0. Values of wineries in transition were coded as 0.5 similar to other features.

According to publications this feature became relevant as early as 1999, with the first mention of terroir focus. This year is earlier than the release of the first terroir based dry wines, which suggests that attempts of sweet wine focused estates discussed above were recognized by the audience. In 1999 such Aszús of Hétszőlő winery were on the market already which were exclusively produced from own yield thus could reflect the loess soil of the estate's vineyards. The same applies for Royal's single vineyard Aszús, although such wines were produced earlier as well. All in all, it seems that terroir focus became a topic already in the sweet wine era but it gained importance with the spread of Szepsy's and Demeter's model.

5.8 CULTIVATION FEATURES

5.8.1 GRAPE PURCHASE

“We only use our own grapes for winemaking, this way we can secure a high level of care both regarding growing and winemaking.”

Rémusz Dávid winemaker of Budaházy-Fekete Kúria in 2015 (www.bfk-tokaj.hu)

“I would like to note that majority of winemakers who are calling themselves the savior of Mád, never bought a single grape bunch from the local vine growers. On the other hand, there is not a single person among these winemakers who did not sell his grapes or even his otherwise unmarketable wine to Promontorbor.”

Tibor Gagány director of Promontorbor 2010 boraszat.hu

Definition and appearance in publications

This feature indicated whether the winery bought grapes for the wine production. This could be either an occasional purchase or a long-term cooperation between producers and wine growers with controlled cultivation methods.

The feature mostly appeared at the general winery information section:

“The estate itself is being rounded out, so the winery will be buying less grapes from other growers in the future.”

“[...] they also buy grapes from the famous Szent Tamás vineyard in Mád, out of which they have managed to bottle several outstanding dry Furmint.”

Some wineries bought grapes for certain wines only. In these cases, the feature was mentioned at the wine characteristics section.

“The quality of the fruit was guaranteed by local producers whom the winery contracted at the beginning of the year so that they could buy up grapes only from Mád and solely from healthy vineyards.”

Characteristics of the feature in Tokaj-Hegyalja

Even though the feature addressed grape purchasers, it is worth looking at the selling party as well. Besides that, one needs to consider the different forms of cooperations both regarding regularity and cultivation control. Finally, the size of the venture has to be taken into account as one would expect large estates to buy and smaller ones to sell. After discussing the characteristics of Tokaj-Hegyalja from these aspects, a summary will be given about the trends of the studied time interval.

Not all of the large estates bought grapes, but they were typically purchasers. They mostly bought aszú berries only, besides cultivating their vines. Such transactions could happen both on a long term contract, when the parties agreed in advance on the amount and quality of the grapes, or on a case-by-case basis at harvest time, depending on the demand of the actual year. In the second case quality checks happens before the transaction, while the first instance typically included prescription and monitoring of cultivation methods, such as yield limitation, plant protection and harvest time.

Of course, there were wineries buying healthy grapes as well on contract, typically the ones that were putting more emphasis on dry wine production. In this model, the level of control was higher. Some companies such as Szent Tamás winery were outsourcing part of their vine cultivation to vine growing families, by prescribing even daily task in their plantations.

There were also few large companies without vineyards or with a small territory, focusing on winemaking, such as Promontorbor. Besides aszú berries, they are also buying grapes, must and some of them even fermented wine. They typically produced cheap and low-quality wines; thus their purchase strategy was based on buying cheaply the low quality or even unmarketable stocks of the growers. Their role was rather controversial; thus they were often the target of criticism from high-quality winemakers.

Small family wineries were involved in grape buying less often. If they did so, it was either an occasional purchase of additional aszú berries in bad vintages or regular contracted purchase of such grape varieties that they did not cultivate. Tokajbor-Bene winery was an example of the first while Himesudvar and Pelle of the second. There were also a few middle-sized family ventures that built-up their winemaking facility with a governmental subsidy. In return, the state contracted them to buy a certain amount of grapes from vine growers each year. This was the model of Lajos Kun's winery.

Despite the widespread practice of such trading, the majority of estates produced wine from

their own grapes only. However, this did not mean that they were not selling. The question arises, why the model did not include grape (or wine) selling as a relevant feature. First of all, it was impossible to track it. Databases were not available and collecting comprehensive primary data proved to be extremely complicated due to the relatively long time scale and the reluctance of most sellers to provide information. But most importantly, by adhering to our definition of relevant features, we can conclude that selling grapes was not relevant as it was not mentioned in the publications. This may be because the authors faced the same problems regarding information. But it is more likely that the exclusion is due to the fact that unlike purchased grapes, sold grapes did not affect the produced wines directly. Still, it is worth looking at both sides for a better understanding.

Typically small-scale wineries were involved in selling their yield either due to limited wine-making capacity or because they were not satisfied with the quality of it. The second case also applied to wine. For instance, István Szepsy, the most recognized winemaker of the region sold all his wines loose in bad vintages, to keep his brand intact. There were also family wineries that primarily focused on vine growing. They sold the majority of their yield on contract and produced wine from a part of it only. It is important to note that this was often a transition state between vine growers and family wineries. Regarding grape selling and buying, three trends could be observed during the studied period. First, after the rapid collapse of the Soviet Union sweet wines of Tokaj could not find the way to alternative markets which reduced the overall need for aszú berries.

Second, demand for aszú berries has been decreased gradually since. This process started with the privatization of the Tokaj Wine Works which was the primary purchaser in the region. Even though its demand had been partly substituted by the new foreign ventures, they need for Aszú berries has decreased after their newly planted or replanted vineyards started to yield in the late '90s. Many of them became even self-supporting. The state-owned Tokaj Crown Estates, the successor of the Tokaj Wine Works has remained on the market ever since, but it did not make grape selling very profitable for vine growers, as it became a "social institution" with low buying prices and a loss-making operation. The third trend was connected to the first two. The diminishing profitability of grape sale stimulated local vine grower families to try selling their wines instead, but the sweet wine market was not promising. Probably the turning point was the success of dry Furmint in the 2000s which opened up new possibilities and attracted many market entrants.

The last trend was also related to the dry wine turn. Dry wine pioneers were mainly small-scale wineries, but the process brought to life a new form of cooperation in the 2010s: larger estates or

cooperatives integrated local vine growers by buying a big amount of strictly controlled grape for dry wine production. These initiatives were typically village based, and the wine was labeled as the Furmint or Hárslevelű of the settlement. Until 2014 three organizations have released such products: Szent Tamás winery in Mád, Tállya Wines and the Wine Friends of Olaszliszka.

Operationalization and relevance

The coding system was simplified. To wineries that bought wine or grapes the value of 1 was assigned, while to the ones that produced wine from own grapes only the value of 0. The ratio of bought grapes did not influence the coding due to the lack of data, and the fact that the publications do not discuss these transactions in details. However, they usually reveal the level of cooperation, which was considered in the coding: buyers with a long-term contract and detailed prescribed cultivation methods were coded as 0.5.

Grape purchase had been general practice already under the communist rule, and it remained widespread after that. Still, the feature became relevant in 2000 only. The reason was possibly wine quality-related. Until this year majority of the highest ranked wines were released by large foreign estates such as Disznókő and Hétszőlő. These wineries either replanted their inherited vineyards or started to operate with brand new plantations, thus relied on bought grapes in the '90s. Therefore, using purchased grapes for winemaking could not be a quality related feature in these years for the audience's eyes. Later on, as most prestigious estates could avoid grape purchase it became a signal of quality, thus a relevant feature.

5.8.2 YIELD LIMITATION

“I came to Tokaj-Hegyalja in 1974. I worked for the Tokaj Wine Works during the times of communists winemaking. That time the task was to grow at least 15 tones of grapes per hectare to produce the amount of wine that meets the Russian demands. So we did it. And in very small-scale, in our vineyards and cellars, we applied the vine growing and winemaking methods that we learned in school.”

Miklós Prácsér, director of Gróf Degenfeld Winery 2008.

”Regarding winemaking, the main difference between us and our parents' generation is clearly the level of yield limitation.”

László Kvaszinger Jr., Kvaszinger winery 2016, vinoport.hu

“In the year when I started radical yield limitation, my workers refused to follow my orders during green harvest. A lady was even crying while cutting off immature grape bunches.”

Zoltán Asztalos, AZ Nektár winery 2013

Definition and appearance in publications

This feature indicated whether an estate applied radical yield limitation in a particular year. Reduced yield was important for producing high-quality wine. Removal of green bunches induced the vine to put all its energy to the remaining grapes, which ripened better and also had a richer, more acid taste. The reliable acidity of the grapes is a necessary condition of terroir-specific notes; thus yield limitation was inevitable for producing full-bodied single vineyard dry wines. This feature was typically mentioned in the winery descriptions:

“Meticulous vineyard work and reduced yields result in concentrated wines, [...]. ”

“The yield is between 1-1.5 kg per vine.”

Besides that, there were indirect ways to indicate it. For instance, when plantation density and quantity of produced wines was given in publications.

Characteristics of the feature in Tokaj-Hegyalja

During the communist times, there was no yield limitation in Tokaj-Hegyalja, as its implications opposed the winemaking philosophy of that period: large quantity and low quality. This determined the attitude of locals as well; thus green harvest and bunch selection was viewed with suspicion, when it was first introduced by foreign investors and experts in the early '90s.

Radical yield limitation (around 1,5-2 kg of grapes per vine) was first applied by István Szepsy in 1992. His aim was to increase the level of botrytis infection and reach better ripeness of grapes, which proved to be a successful experiment. As a result, he was followed by a few family-owned wineries and also larger estates established in the late '90s, but the real breakthrough came after the successful debut of his single vineyard Furmint. These wines aimed to express the traits of the terroir which is hardly possible without reduction of the yield. In the 2000s newly founded, terroir-focused small estates followed in Szepsy's footsteps, but large ventures also reduced their yield further. On the other hand, a considerable part of wineries remained unaffected, mainly the traditionalist ones and domestic large-scale producers. More importantly, vine growers did not applied yield reduction either as mass grape purchasers – first of all the state-owned Tokaj Crown Estates – did not demand or reward it. Thus, in terms of all the cultivated vineyards throughout the wine region, yield limitation was a peripheral phenomenon even in 2014 which is practiced by numerous but mainly small-scale wineries.

Operationalization and relevance

Even though yield limitation is clearly a linear phenomenon, the coding was binary, due to limited availability of accurate and quantifiable data in certain periods. The adequate borderline between reduction levels feature values of 1 and 0 was the practice of Szepsy. On the one hand, his methods have not changed in the relevant period of the feature; he has limited the yield of his vines to about 1,5-2 kilograms since 1992. On the other hand, as a pioneer of this practice and the most respected person of the winemaker community his cultivation methods were the inspiration and guideline for many wineries.

In many wineries level of yield limitation varied vineyard by vineyard. This was so because different wine types require specific grape quality; thus, various level of yield limitation. For instance, production of high-quality terroir focused dry wines stand in need for very low yield cultivation, while cheaper everyday wines do not. Besides that, young vines grow way more bunches than older plants.

The same phenomenon applies for old variety clones: pre-war Furmint vines have less and smaller bunches than the ones planted during the communist rule. Considering all these, the deciding factor was whether an estate limited the yield in any of its vineyards to 2 kg/vine in the particular year. Besides that yield limitation only mattered if grapes from that specific areas were bottled separately. Feature value of those wineries that met these conditions were set to 1, otherwise to 0. The feature became relevant in 1995 with the release of the first Szepsy wines that were made from reduced yield.

5.8.3 OLD PLANTATIONS

“If we plant a grape, we eat the first crop from it in 4 years and we have the first wine that can show its place of growth in 15-20 years time. It might be our children the next generation, who will get the real sense of achievement from it.”

Judit Bodó winemaker of Bott Winery in 2013 terrahungarica.hu

“Terroir wine is made exclusively from old grapes. There is no way that fresh young roots, idly dwelling in the top 50-60 cm could facilitate to express the characteristics that are unique to the growing site. In my portfolio, apart from a new Kövérszőlő plantation, the age of the vineyards is at least 27-28 years. The vines in Szerelmi vineyard are 65 years old, while in Boda vineyard there are 100 year old vines.”

Zoltán Demeter 2016 mandiner.hu

Definition and appearance in publications

This feature regarded the age structure of an estate's vineyards. It is not the average age of vineyards which mattered but the ownership of any old vineyard and its cultivation. It was also important in that reduced yield had to be bottled separately and not blended with wines made from grapes of younger plantations.

Cultivation of old vineyards was often mentioned in general descriptions of wineries, but it appeared in tasting notes more frequently. Experts often pointed out if a plantation was young, but rather as an excuse for the wine quality. But the most straightforward way of highlighting it in publications was when vineyards of the estate were listed with detailed information about their structure and age.

”Béres's Furmint from the Omlás vineyard was not quite as successful, possibly on account of the new vines.”

”Cultivated in the stake-support system and harboring some very old clones, their sites will be a treasure-trove for the Furmint fans of the future.”

“The vines are naturally very young at the moment.”

“Their relatively small parcels can be found in the best historical vineyards [...] with more than 60-year-old vines.”

“Made from the crop of old vines, this Furmint is distinguished by its smooth elegance.”

Characteristics of the feature in Tokaj-Hegyalja

Old vines play an important role in quality winemaking, primarily due to terroir. On the one hand, as vines have a deep root system that allows them to draw upon the water reserves in the subsoil, they are also able to extract more minerals from the deeper layers characteristics. On the other hand, older vines produce fewer and smaller bunches, which results in higher concentration of minerals and sugar in the grape.

In addition, old and sometimes abandoned plantations were the source of pre-war Furmint clones, which are more suitable for the needs of quality winemaking. During the decades of communist rule, few Furmint clones were planted across the wine region, which had a high propensity for oxidation and high yields. These clones were favorable from the point of view of the quantity-oriented planned economy and met the needs of the dominant winemaking style of that time. However, they failed to meet the requirements for producing quality dry wine, and also made it harder to avoid oxidation of sweet wines. Therefore, winemakers that were interested in achieving superb Furmint quality started actively seeking out plantations established before the communist regime both for harvesting quality grapes and as a source of vine propagation. István Szepsy was the pioneer of this activity, and his 1995 Aszú was the first wine made from the crop of old clones planted before the socialist era. The success of his wines resulted in many followers. Nowadays, the “old vine” label is very popular among dry Tokaj wine customers.

It is also noteworthy that recultivating these old vineyards requires extreme effort and resource investment. Even though they were initially cheap to acquire (later on, they became very expensive due to the shortage and the success of Szepsy's wines), revitalization of them is costly. Moreover, these old

plantations are often located in remote steep hillsides, which are difficult and expensive to access and cultivate. (This is the reason why the quantity-oriented winemakers ceased their cultivation.)

After Szepsy's success with old vines, new market entrants attempted to acquire old plantations. On the one hand large estates founded in the second half of the 2000s did so (Holdvölgy or Szent Tamás) but many newly founded boutique wineries, such as Balassabor, AZ Nektár and Bott, also preferred older vineyards. Some business owners were fortunate to inherit old plantations. These were typically descendants of former vine growers. However wineries founded in the early '90s typically did not own old vineyards. Large estates either acquired mainly the best plantations of Tokaj Wine Works, thus a relatively young portfolio (Oremus) or planted entirely new vineyards (Disznókő and Hétszőlő). Later on, they did not expand their portfolio with old plantations. Some of them acquired very few old plantations as well by the privatization (Pajzos and Royal Tokaji), but the crop of these has not been separately bottled until the late 2000s. However, after wines of old plantations gained popularity, more of them decided to do so.

Similarly, the earliest family wineries owned relatively new plantations with efficient cultivability (Úri Borok, Monyók, and Puklus). They have also been reluctant so far to expand their vineyard portfolios. However, their plantations will gradually grow older and acquire the prestigious status through natural maturation.

Operationalization and relevance

Definition of old vineyard is rather ambiguous, as neither Tokaj-related wine literature nor winery publications offered consistent criteria. This issue is further exacerbated by the fact that most winemakers tried to emphasize the old age of their vineyards, as it has become a valued feature. Thus, in the present study, the traits that Szepsy considered were utilized to determine the age of a vineyard: deep root system and old clone types.

The most secure approach to delineate these types was to include those vineyards in the old category that were planted before 1949. On the one hand, the root system does not necessarily need 50 years to reach subsoil layers, especially if the soil is thin. Nobilis winery, for instance, developed a new plantation on a hillside in 1999, where the topsoil thickness did not exceed 40 centimeters. Yet, products from that vineyard have been considered terroir wines by experts since the first 2005 vintage. Also, as vines mature, they develop deeper roots, making the establishment of the exact age at which vineyards are deemed old irrelevant. On the other hand, the definition of old clones is also ambiguous,

especially given that the clone transition was gradual after 1949. Thus, plantations from the '50s or '60s could be planted with old clones. Moreover, vines can be regrafted, which was a common practice for spreading the old clones. This means that even new clones of vines with deep roots planted after 1949 could be altered. Considering all these factors, in the present study, a dynamic borderline of 40 years was applied in the data coding process. Thus, estates that cultivate vineyards that meet this criterion and bottle the crop of that vineyard separately were assigned the value of 1, which is otherwise set to 0.

The feature was first highlighted in 2003 publications, even though Szepsy released his first Aszú which was made from grapes of old plantations many years prior. On the other hand, these publications came just one year after the release of the 2000 Úrágya Furmint, the pioneer single vineyard dry wine which was also made from old vines' grapes. This suggests, that the audience values this feature more if it is part of a dry wine production.

5.8.4 ORGANIC CULTIVATION

”After my lung surgery, I became seriously allergic to pesticides. After spraying I could not go into my vineyards for quite a while, which was worrisome. [...] I had to find a solution rapidly; otherwise, I should have given up on viticulture. As a result of a long research, I found it: bio pesticides. Unfortunately, they are more expensive, but they do not cause allergic reactions at all. I got my profession back.”

Ákos Ferdinánd Bihari, winemaker of Ferdinánd cellar 2012

”[...] On the other hand, it is true that there is a new attempt: organic and biodynamic wines. I don't say it is necessarily a dead end. Not a competitor, rather just fashion. And I do not intend to criticize them in any way because we also would like to be organic. We apply many elements of it. Sometimes we are even stricter than its prescriptions.”

Szepsy István 2016 mandiner.hu

”It is good to know that when my husband sprays this tiny estate with his backpack, there is orange oil in it as well as algae extract, and maybe some sulfur. None of which are harmful to anybody's health. It is good to work with nature and see that it works.”

Judit Bott 2013, www.terrahungarica.hu

Definition and appearance in publications

Organic cultivation as a feature was defined in a somewhat broader sense. It indicates wineries practicing organic vineyard work regardless whether they were certified by any organization including biodynamic and organic associations. The reason behind this simplification is that in Tokaj biodynamic and organic certification were not a hot topic, although organic or environmentally friendly farming became widespread recently. According to interviews conducted, most vintners looked at them from a practical point of view and integrated their practices partly or fully into their cultivation methods when they thought that it could be beneficial for their wines. Besides, there were a few certified wineries as well, mostly estates with significant export markets.

The feature typically appeared in the general descriptions of wineries. However, wine experts rarely discussed these methods in details. Often they did not even differentiate among environmentally friendly practices but used the general ‘bio’ label. Exceptions were the most prestigious wineries and longer reports or interviews about well-known estates in wine magazines, where detailed information was given about cultivation.

“[The vintner] avoids using chemicals on his own vines so his wines are especially recommended for bio enthusiasts.”

“The bio estate of Márta Wille-Baumkauf is known by every Tokaj enthusiast today.” (the winery was biodynamic)

“[...] the upper part of the Király [vineyard] was never touched by chemicals since it lay uncultivated for decades.”

Characteristics of the feature in Tokaj-Hegyalja

Environmentally friendly cultivation did not exist in Tokaj-Hegyalja before the millennium, and it was not widely practiced until the last decade. Small-scale non-traditionalist family estates were pioneers in the early 2000s and even in 2014 the majority of wineries that adopted some form of organic cultivation fall into this size range. Estates mostly did not aim to receive any certification and in terms of the methods they rather followed an “à la carte” strategy. This selective approach could be the reason for the equivocal labeling of wine experts. Recently also a few larger ventures decided to adopt organic practices (Degenfeld, Királyudvar), but unlike family businesses they applied for biodynamic or organic certification.

Operationalization and relevance

Feature value was set to 1 if a winery cultivated its vineyards by following mainly organic practices in a specific year. It did not necessarily mean being certificated, but to all certificated estates (both organic and biodynamic) 1 was assigned. Otherwise, the feature value was set to 0. Many wineries switched to organic cultivation on some of their vineyards only or preferred a gradual transition. In either case, the value of the feature was set to 0,5.

The first wineries that stopped using fungicides and pesticides were Szepsy and Királyudvar in 2001, both directed by István Szepsy at that time. The first estate converting to biodynamics was Pendits which started the transition in 2005 and was certified in 2008. The first time that a publication mentioned organic viticulture was in 2006. Considering that the first Szepsy wines from 2001 were released in 2003 and the aszú of that vintage in late 2004, the market reaction was somewhat delayed. The reason might be that the audience appreciated or perceived organic farming more when dry wines were produced.

5.8.5 MECHANIZED CULTIVATION

“You have to kneel down at each and every vine and touch them with humbleness. Here one is on the same level with the grapevines. True that at the end of the harvest we do it on all fours because we can't do it otherwise. But one learns a lot from it too.”

Judit Bodó, winemaker of Bott Winery 2013

“We are proud that most of the cultivation works are done by hands in our vineyards. This way we are providing jobs for many locals and we can also avoid pesticides entirely.”

Rémusz Dávid winemaker of Budaházy-Fekete Kúria in 2015 (www.bfk-tokaj.hu)

Definition and appearance in publications

Cultivation in Tokaj can not be entirely mechanized as the aszú berries are picked out from the grape bunch during harvest. However, other tasks, such as spraying or soil work can be. The feature refers to these; it indicates whether they were done manually. Cultivation methods were highlighted in the general winery descriptions. In the case of manual vineyard work either the winery was labeled as artisan or the wines as hand-crafted.

"This artisan winery formed in 2006 [...]."

"No meaningless trappings, but an informal atmosphere with hand-crafted goodness."

Characteristics of the feature in Tokaj-Hegyalja

Mechanized cultivation gained a foothold in the region after World War II. After nationalization, plantations were transformed with the rows adjusted to be able to accommodate machinery. Thus, during socialism, mainly those vineyards were cultivated manually which remained in private hands. After 1989 mechanized cultivation remained dominant, both at the large estates and at the early established family wineries.

Whether a vineyard was cultivated manually also depended on its traits. Steep parcels, densely planted vineyards or vineyard terraces can be cultivated manually with special machinery only. This follows that manual cultivation was not always the choice of the vintner but sometimes a necessity. On the other hand, vineyards could be transformed or sold. For instance, foreign estates that inherited plantations of the Tokaj Wine Work transformed them gradually by increasing plantation density from about 3000 vines/hectare to 6000-8000 vines/hectare. Other large estates such as Degenfeld or Királyudvar sold and bought smaller vineyards in the past decades to adjust their vineyard portfolio to their winemaking ideas. Thus, in the long term we can assume that cultivation choices more or less reflected the philosophy of the vintner. Consequently, the decision of the winemaker played a more important role regarding this aspect of the cultivation method than the circumstances.

The reappearance of hand cultivation in Tokaj-Hegyalja was also decision-based. István Szepsy started manual cultivation in the early 2000s in a part of his vineyards, despite being financially strong enough to acquire modern machinery. As an important method of his winemaking practice, hand cultivation was also adopted by wineries that participated in the dry wine revolution.

It is important to note that there was a correlation between manual cultivation and two other

features: yield limitation and old vineyards. On the one hand, yield limitation often went together with high plantation density, which determined hand cultivation. Reduced crop was a necessary condition of high-quality winemaking, but it was less economical in case the vineyard had low plantation density as the amount of harvested grapes per hectare had been low. Thus, wineries that limited their yield either preferred to acquire dense plantations or transformed their vineyards by enhancing plantation density. On the other hand, old pre-war plantations were designed for hand cultivation, as mechanization of cultivation had started later in the 1960s. These imply that the model would be more realistic if the three features were considered as a single one. However, publications highlighted all three of them separately. As our model defined the relevant features as traits or characteristics of organizations or their products that were considered as important by wine experts in their publications, all three were regarded as separate and relevant features.

Operationalization and relevance

Following the above considerations, feature value of a winery that cultivates manually was set to 0. If this cultivation method was limited to certain vineyards only it was coded as 0.5. Otherwise the value of the feature was coded as 1. According to publications this feature became relevant in 2004.

5.9 ORGANIZATIONAL FEATURE VECTORS

Determination of the yearly relevant feature set and operationalization of the features allowed coding of yearly feature vectors of wineries. These vectors indicate the annual location of wineries in the feature space. By perceiving these characteristics and comparing them to other organizations' traits, the audience forms similarity clusters and assigns each winery with memberships in them. The purpose of feature vector coding was to model the winery sub-clusters in this sense and to gain insight into cluster dynamics. To this end, an extensive data set has been collected regarding yearly values of the relevant features. As Chapter 2 discussed this topic already, here the sources of each feature data type will be summarized only in Table 5.13.

Table 5.13.Sources of feature value data

RELEVANT FEATURES	DATA SOURCES																	
	Wine guides	Wine magazines	Other printed sources	Wine blogs	Winery homepages	Municipal homepages	Wine association homepages	Online wine shops	Wine competition results	Other online sources	Broadcasted programs	Company register	Wine collections	Wine label collections	Wine expert interviews	Winemaker interviews	Wine trader interviews	Wine tasting events
Familt winery / company	X	X	X	X	X	X	X	X		X	X				X	X	X	X
Domestic / foreign ownership	X	X	X	X	X	X	X	X		X	X	X			X	X	X	X
Non-wine related activities	X	X	X	X	X	X					X	X			X	X	X	X
Size of estate	X	X	X	X	X		X	X			X						X	X
Sweet / dry focus	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X
Sweet wine ratio	X	X		X	X			X	X	X			X	X		X		X
Traditional wine type ration	X	X		X	X			X	X	X			X	X		X		X
Small bottled amounts	X	X		X	X			X	X	X			X	X		X		X
Non-local varieties	X	X		X	X			X	X	X	X		X	X	X	X	X	X
Winemaking style	X	X		X	X			X			X				X	X	X	X
Age of barrels	X	X		X	X			X							X	X	X	X
Length of maturation	X	X		X	X			X							X	X	X	X
Fermentation method	X	X		X	X			X							X	X	X	X
Maceration method	X	X		X	X			X								X		X
Winemaking technology	X	X	X	X	X			X			X					X		X
Technology/terroir focus	X	X	X	X	X		X				X				X	X	X	X
Grape purchase	X	X		X	X						X					X		X
Yield limitation	X	X		X	X			X			X					X		X
Old plantations	X	X		X	X			X			X					X		X
Organic cultivation	X	X		X	X			X			X					X		X
Mechanized cultivation	X	X		X	X			X			X					X		X

As was discussed earlier both data collection and feature vector coding was effectuated on two levels to differentiate between visible and real traits of organizations. To this end each organization was assigned with two vectors each year: a visible and a real feature vector. As an example, Table 5.14 presents these vectors of Gizella winery. The shaded fields indicate that the specific feature was not relevant in the given year.

Table 5.14: Yearly visible and real feature vectors of Gizella Winery 2005-2014

YEAR	ORGANIZATION	RELEVANT FEATURES																				
		Familt winery / company	Domestic / foreign ownership	Non-wine related activities	Sweet wine ratio	Traditional wine type ratio	Winemaking style	Technology/terroir focus	Sweet / dry focus	Small bottled amounts	Maceration method	Age of barrels	Winemaking technology	Fermentation method	Length of maturation	Grape purchase	Organic cultivation	Old plantations	Yield limitation	Mechanized cultivation	Size of estate	Non-local varieties
VISIBLE FEATURE VECTORS																						
2006	Gizella	1	1	0.5	0	0	0	1	1	0	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2007	Gizella	1	1	0.5	0.333	0	0	1	1	0	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2008	Gizella	1	1	0.5	0.667	0.167	0	1	1	0	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2009	Gizella	1	1	1	0.5	0.167	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0433	0
2010	Gizella	1	1	1	0.5	0.167	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0667	0
2011	Gizella	1	1	1	0.286	0.143	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0967	0
2012	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0
2013	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0
2014	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0
REAL FEATURE VECTORS																						
2005	Gizella	1	1	0.5	0.5	0.25	0	1	1	0	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2006	Gizella	1	1	0.5	0.667	0.167	0	1	1	0	0	0	1	1	0	0.5	0.5	1	1	0	0.0433	0
2007	Gizella	1	1	0.5	0.5	0.25	0	1	1	0	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2008	Gizella	1	1	0.5	0.5	0.167	0	0	0	1	0	0	0	1	0	0.5	0.5	1	1	0	0.0433	0
2009	Gizella	1	1	1	0.429	0.143	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0433	0
2010	Gizella	1	1	1	0.429	0.143	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0667	0
2011	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0.5	1	1	1	0	0.0967	0
2012	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0
2013	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0
2014	Gizella	1	1	1	0.222	0.111	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0.0967	0

CONCLUSION

This chapter focused on the relevant features. It delineated their yearly set, discussed their meaning, weighting and operationalization. Besides that, coding of winery feature vectors was summarized. The next chapter will model and analyze the sub-clusters an attempt to answer the research questions regarding the recent development of winemaking in Tokaj-Hegyalja.

Chapter 6

SIMILARITY CLUSTERS

So far, the yearly sets of the relevant features have been specified and operationalized. Both the visible and real feature vectors of the organizations were coded by collecting the feature value data about wineries. The next step of the analysis will be to model and analyze the similarity clusters that the audience can perceive. The purpose of this step is to determine the yearly grade of memberships of winery organizations in each cluster, which is necessary for calculating contrasts, densities, and fuzzy densities.

In addition, the intended grade of the memberships of the new entrants will also be determined, which will be based on their real feature values in the year of foundation. These serve the analysis in two ways. On the one hand, the sub-cluster dynamics of the wine producer population will be analyzed and visualized with the help of these data. On the other hand, the grade of the memberships of the newly founded organizations will allow testing the contrast dependence theory on sub-clusters.

The structure of the chapter will be as follows. Firstly, the applied clustering method, Fuzzy C-means algorithm will be introduced. This section will discuss the original model, its limitations regarding the analyzed population, and the modifications which were implemented to eliminate these shortcomings. Secondly, results of the analysis will be presented regarding cluster centers, grade of memberships, cluster contrasts, vital rates, cluster densities and fuzzy densities. Thirdly, results will be discussed. This section also aims to answer the four research questions regarding the development of Tokaj-Hegyalja between 1989 and 2014.

6.1 CLUSTER ANALYSIS

The most simple way of grouping the objects of a population is hard clustering, which partitions the data set into a specified number of mutually exclusive subsets. In other words, it assumes that an object either does or does not belong to a cluster. As the winery sub-clusters were defined as fuzzy sets, another method, fuzzy c-means clustering (FCM clustering) algorithm was applied. This method was developed by Dunn (1973) and improved by Bezdek (1998). It assigns the memberships to each object corresponding to each cluster center, based on the similarity distance between them. The algorithm

itself is an iterative process, which searches the cluster centers of the prespecified number of fuzzy subsets that represent the data the best. Its steps are the following:

Let $X=\{x_1,x_2,\dots,x_n\}$ to be the set of objects, $V=\{v_1,v_2,\dots,v_n\}$ be the set of cluster centers.

- 1) Selecting random c cluster centers.
- 2) Calculating the fuzzy membership μ_{ij} by using the following formula:

$$\mu_{ij} = 1 / \sum_{k=1}^c (d_{ij} / d_{ik})^{2/(m-1)} \quad (6.1)$$

Where μ_{ij} represents the membership of i^{th} object in the j^{th} cluster, c is the number of clusters, d_{ij} represents the Euclidean distance between *the* i^{th} object in the j^{th} cluster center, and m is the fuzzification parameter.

- 3) Computing the new centers v_j by using the following formula:

$$v_j = \left(\sum_{i=1}^n (\mu_{ij})^m x_i \right) / \left(\sum_{i=1}^n (\mu_{ij})^m \right), \forall j = 1, 2, \dots, c \quad (6.2)$$

Where n is the number of objects, c is the number of clusters, μ_{ij} represents the membership of i^{th} object in the j^{th} cluster center, x_i is the coordinate vector of the i^{th} object, and m is the fuzzification parameter.

- 4) Repeating step 2) and 3) until the minimum J value of the objective function is achieved, which is calculated as follows:

$$J(U, V) = \sum_{i=1}^n \sum_{j=1}^c (\mu_{ij})^m \|x_i - v_j\|^2 \quad (6.3)$$

where J is the objective function U is the fuzzy membership matrix, V is the set of cluster centers, n is the number of objects, c is the number of clusters, μ_{ij} represents the membership of i^{th} object in the j^{th} cluster center, $\|x_i - v_j\|$ is the Euclidean distance between the i^{th} object and the j^{th} cluster center and m

is the fuzzification parameter.

The original FCM algorithm has certain shortcomings, which disallow it from being applied to the examined population; hence, it was modified in certain aspects. Next, these limitations and the applied changes will be discussed.

Distance calculation

The standard FCM algorithm uses the Euclidean distance while calculating the similarity between the cluster centers and data points. Because of the binary values of winery feature vectors, in our model Manhattan distance or transformation distance was applied similarly to the study of Pontikess and Hannan (2014), which is calculated as the sum of the absolute values of distances between the coordinates of the cluster center and the feature vector.

Cluster centers

In the standard FCM algorithm, coordinates of the cluster center vectors have continuous values. This is not problematic in the case of the few features that were coded as continuous variables in the model; however, as most of them are binary, the settings of the standard algorithm had to be changed. Continuous values are not realistic from an empirical point of view, either. It is more likely that the audience perceives cluster centers as concrete prototypes with binary feature values than as an average of the cluster members with a mean feature vector. If the `cmeans` function in R is run with the Manhattan distance calculation, cluster center values of binary features are calculated as 0, 0.5 or 1, while non-binary features are continuous. Although the 0.5 values do not correspond with assumed audience perception, it is not in contradiction with the operationalization of binary feature values, which allowed this for transitional and hybrid cases. In addition, in years when a relevant feature was weighted as 0.5, it is necessary to include this value of cluster center vectors.

Membership in all clusters

Another problem with the FCM algorithm is that it assigns organizations with some degree of membership in a cluster if they show the slightest similarity to its center. As in our model, values of the center vectors are mostly binary, and the number of clusters is presumably higher than two in certain

years; it is most likely, then, that each cluster will have a fair number of members with a very low grade of membership. Moreover, as some continuous features have values closer to 0.5 than to 1 or 0 (e.g. 'Sweet wine ratio' and 'Traditional wine type'), the algorithm would assign nonzero membership to all the organizations in every cluster. On the one hand, this does not correspond with the assumed clustering method of the audience. (Hannan, Pólos and Carroll 2007 41-47.) It is not realistic that enthusiasts and experts seek for even the smallest similarities between organizations and form inclusive clusters. More likely, they look for significant differences that result in the exclusion of very dissimilar objects from the cluster. On the other hand, this would lead to biased contrast values. As it is calculated as the average of the grade of memberships, cluster contrast levels would be low and close to each other.

To avoid this problem, membership outcomes of the FCM algorithm were modified. The aim was dual: to exclude organizations with a very low grade of memberships from clusters, and increase the perceived membership of those wineries that are located in the cluster core. For this purpose, a modified negative exponential function was applied.

$$GoM_m(i, j, y) = \begin{cases} 0 & \text{if } \mu(i, j, y) < 0.15 \\ 1 - e^{2\mu(i, j, y) - 0.15} & \text{if } \mu(i, j, y) \geq 0.15 \end{cases} \quad (6.4)$$

Where $\mu(i, j, y)$ denotes the membership of i^{th} organization in the j^{th} cluster in year y calculated by the FCM analysis, while $GoM_m(i, j, y)$ denotes the modified grade of membership. Due to this modification, organizations with lower memberships than 0.15 were excluded. Still, the modified values are problematic as their sum is lower or higher than 1 for most of the organizations. Thus, the final grade of membership of an organization in a cluster was calculated by dividing its modified membership in that cluster by the sum of its memberships in all clusters.

$$GoM(i, j, y) = \frac{GoM_m(i, j, y)}{\sum_{k=1}^c GoM_m(i, k, y)} \quad (6.5)$$

Where c is the number of clusters, $GoM_m(i, j, y)$ denotes the modified grade of membership of the i^{th} organization in the j^{th} cluster in year y , while $GoM(i, j, y)$ is the final grade of membership.

Optimal number of clusters

In the FCM algorithm, the number of clusters has to be specified before the analysis. As our model assumes a dynamic, relevant feature space, the number of perceived clusters could change during the studied period. Therefore, it is essential that we predetermine the optimal cluster number correctly. To this end, two methods were applied.

First, by running an FCM clustering analysis with various cluster numbers in the same year, one can narrow down the possibilities. In case the predetermined number is much higher than the optimal number, the algorithm will calculate analogous or very close cluster centers. The yearly maximum numbers of clusters which did not result in duplicated centers are listed in Table 6.1. The growing number is possibly due to the enhancing density of the population and the increasing set of relevant features. Although this method reduced the number of possibilities, it did not help to determine the optimal number of clusters.

Second, we can rely on the empirical experiences by trying to transform into optimal cluster numbers what the recent history of Tokaj-Hegyalja suggests. As was discussed in the earlier chapters, there were two major changes between 1989 and 2014: transformation of the sweet wine style and technology in the 1990s and the switch from sweet- and technology focus to dry- and terroir focus in the 2000s. Most of the new relevant features connected to either of these. As well as this transformation attempts were connected with size and ownership. The first was initially carried out by large and foreign estates, while the second was started by small domestic family wineries. Of course, this setup changed over time, and there were always hybrids and outliers with special strategies. However we can assume that in general, the Tokaj winemaking population was divided twice: firstly along the modern style-traditional style line and secondly along the dry-sweet or terroir-technology debate.

Both changes have a well-documented starting point: the first modern style Aszú was introduced by Disznókő in 1995, while the first terroir-focused dry Furmint was introduced by Szepsy's Királyudvar in 2002. It, therefore, follows that the number of optimal clusters was two from 1995 to 2001 and four thereafter. In fact, it could be only three, as followers of the old style did not split. This occurred because they were either the less innovative or the most conservative winemakers in the region. However, the main reason is that traits of the traditional winemaking style are not suitable for terroir expression.

Outcomes of the methods for each year are summarized in Table 6.1. We can conclude that they do not give a clear direction. Unfortunately statistical tests for determining the optimal cluster number are available for K-means clustering only. Therefore, further analysis will rely on the empirical model which suggests a two-cluster setting until 2001 followed by a three-cluster setting until 2014.

Table 6.1: Summary of the optimal cluster number tests

YEAR	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992	1991	1990	1989	
FINAL MODEL	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MAXIMUM NO. OF CLUSTERS WITHOUT DUPLICATION	5	5	5	5	5	5	5	4	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2
EMPRICAL MODEL	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Fuzzification parameter

The m fuzzification parameter defines the degree of fuzzification. Its value is defined for real numbers greater than 1. The bigger m is the fuzzier the memberships of the cluster members will be. Thus, m greatly influences the result of cluster analysis. The optimal value that Pal and Bezdek (1995) suggests is between 1.5 and 2.5; thus, m will be set to 2 in our analysis. In order to check the robustness of the results, a sensitivity analysis will be conducted by running the statistical test with different fuzzification parameters.

For the analysis ‘cmeans’ package of the R statistical software that was used, the Fuzzy C-means analysis was run with the parameters discussed above

6.2 RESULTS OF THE ANALYSIS

6.2.1 CLUSTER CENTERS

The FCM algorithm results in cluster center vectors, but these have to be connected yearly to gain insight into the development of the cluster space. Due to the changing relevant feature set, exit entries and the changes in organizations' feature values cluster centers can move in the feature space. Thus, cluster continuity is not always self-evident. As a result, even if an organization did not change its feature values, its membership could change from one year to another; thus, to determine cluster continuity, winery memberships were looked at in the consecutive years. Those cluster pairs of consecutive years were considered as the same, which overlapped the most concerning primary members. Exceptions were the early years, when cluster densities were very low and relevant feature vectors very short; thus, any change in either of them could fundamentally reshuffle memberships. In these cases, feature center proximity served as the basis of continuity determination. The similar method was applied for the year 2002 when a new cluster came into being.

Visual inspection of the cluster space was also most helpful to determine cluster continuity. Part of the analysis was to visualize the yearly cluster space with multidimensional scaling. Besides giving a better insight into cluster dynamics, these figures revealed cluster continuity, which helped to decide in some unclear cases. This visualization method will be discussed at the end of this chapter. Next, the delineated clusters will be introduced and characterized regarding their yearly cluster center vectors.

Cluster 1 (Table 6.2)

The first cluster was marked by larger-size and corporate ownership. In the 1990s, this meant foreign ownership as well, but later on, the value of this feature became domestic. Regarding winemaking, this cluster contained most estates that were engaged with the “modernist” approach such as a reductive style, short maturing in new barrels and maceration in must. According to the values of the center vector, members of this cluster adhered to these after the 2002 split, but did not participate in the dry wine revolution. This attitude seemed to change in the 2010s regarding certain features ('Yield limitation', 'Sweet or dry focus', 'Technology or terroir focus' and 'Traditional wine type ratio'). This is partly due to the transition of former cluster members (Hétszölő), and partly to newly established estates (Szent Tamás). It is assumed, also, that hybrid members played a role.

Table 6.2. Yearly centers of Cluster 1

CLUSTER 1	Family winery / company	Domestic / foreign ownership	Non-wine related activities	Size of estate	Sweet / dry focus	Sweet wine ratio	Traditional wine type ratio	Small bottled amounts	Non-local varieties	Winemaking style	Age of barrels	Length of maturation	Fermentation method	Maceration method	Winemaking technology	Technology / terroir focus	Grape purchase	Yield limitation	Old plantations	Organic cultivation	Mechanized cultivation
	1989				0.94											0					
1990				0.94											0						
1991	0			0.42											0						
1992	0	0		2.17											1						
1993	0	0		1.92											1						
1994	0	0		1.75											1						
1995	0	0		1							1	0	1		0					0	
1996	0	0		0.94		0.82					1	0	1		0						0
1997	0	0.5		0.43		0.82					1	0	1		0						0
1998	0	0.5		0.52		0.79					0	0	0		1						0
1999	0	0.5		0.52		0.8					0	0	0		0	1					0
2000	0	0.5		0.52		0.69					0	0	0		0	0	0.5	0	0.5		
2001	0	1		0.33		0.63	0				0	0	0		0	0	0.5	0	0		
2002	0	0.5	0	0.38		0.7	0.67	0	0	0	0	0	0		0	0	1	0	0		
2003	0	1	0	0.28		0.69	0.67	0	0	0	0	0	0	0.5	0	0	1	0	0	0	0
2004	0	1	0	0.27	1	0.69	0.63	0	0	0	0	0	0	1	0	0	1	0	0	0	0
2005	0	1	0	0.28	1	0.73	0.67	0	0	0	0	0	0	1	0	0	1	0	0	0	0
2006	0	1	0	0.33	1	0.75	0.67	0	0	0.5	0	0.5	1	0.5	0	1	0	0	0	0	0
2007	0	1	0	0.35	1	0.76	0.64	0	0	0.5	0	0.5	1	0.5	0	1	0	0	0	0	0
2008	0	1	0	0.38	1	0.78	0.64	0	0	0.5	0	0.5	1	0.5	0	1	0	0	0	0	0
2009	0	1	0	0.35	1	0.71	0.57	0	0	0	0	0	1	0	0	1	0	0	0	0	0
2010	0	1	0	0.33	1	0.69	0.55	0	0	0	0	0	1	0	0	1	0	0	0	0	0
2011	0	1	0	0.27	1	0.67	0.5	0	0	0	0	0	1	0	0	1	0	0	0	0	0
2012	0	1	0	0.26	0.5	0.63	0.38	0	0	0	0	0	1	0	0	1	0	1	0	0	0
2013	0	1	0	0.26	0.5	0.57	0.36	0	0	0	0	0	1	0	0	1	0	1	0	0	0
2014	0	1	0	0.25	0	0.5	0.25	0	0	0	0	0	1	0	0	0.5	0	1	0	0	0

The second cluster covered the group of family wineries that followed the traditional wine style and production methods, by producing oxidative, long-matured wines, which are fermented and matured in barrels. Their assortment mainly consisted of traditional wines and sweet wines with a technology focus. According to the results of the FCM algorithm, this cluster had been the most stable as far as feature values are concerned until the 2010s. During this time, some feature values of the cluster center vector approached those of the other two clusters ('Winemaking style', 'Winemaking technology', 'Age of barrels' and 'Length of maturation'). The possible reasons behind this phenomenon will be discussed later.

Table 6.3. Yearly centers of Cluster 2

CLUSTER 2	Family winery / company	Domestic / foreign ownership	Non-wine related activities	Size of estate	Sweet / dry focus	Sweet wine ratio	Traditional wine type ratio	Small bottled amounts	Non-local varieties	Winemaking style	Age of barrels	Length of maturation	Fermentation method	Maceration method	Winemaking technology	Technology / terroir focus	Grape purchase	Yield limitation	Old plantations	Organic cultivation	Mechanized cultivation
	1989				7											1					
1990				7											1						
1991	1			0.11											1						
1992	1	1		0.11											1						
1993	1	1		0.1											1						
1994	1	1		0.1											1						
1995	1	1		0.11						1	1	1			1				0		
1996	1	1		0.11			0.88			1	1	1			1				0		
1997	1	1		0.12			0.86			1	1	1			1				0		
1998	1	1		0.12			0.89			1	1	1			1				0		
1999	1	1		0.13			0.86			1	1	1		1	1				0		
2000	1	1		0.13			0.88			1	1	1		1	1	0.5	0	0			
2001	1	1		0.13			0.83	0		1	1	1		1	1	0.5	0	0			
2002	1	1	0	0.15		0.78	0.83	0	0	1	1	1		1	1	1	1	0			
2003	1	1	0	0.13		0.78	0.8	0	0	1	1	1	0.5	1	1	1	0	0	0		
2004	1	1	0	0.17	1	0.78	0.75	0	0	1	1	1	1	0.5	1	1	0	0	0		0.5
2005	1	1	0	0.17	1	0.78	0.75	0	0	1	1	1	1	0.5	1	1	0	0	0		0.5
2006	1	1	0	0.17	1	0.78	0.73	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2007	1	1	0	0.17	1	0.8	0.71	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2008	1	1	0	0.17	1	0.79	0.7	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2009	1	1	0	0.17	1	0.78	0.7	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2010	1	1	1	0.17	1	0.78	0.67	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2011	1	1	1	0.17	1	0.77	0.64	0	0	1	1	1	1	0.5	1	1	0	0	0	0	0
2012	1	1	0	0.25	1	0.75	0.64	0	0	0.5	1	1	1	0.5	0	1	0	0	0	0	0
2013	1	1	0	0.25	1	0.73	0.54	0	0	0.5	0	0.5	1	0.5	0	1	0	0	0	0	0
2014	1	1	0	0.25	1	0.73	0.53	0	0	0.5	0.5	0.5	1	0.5	0	1	0	0	0	0	0

The third cluster is the product of the second split. It covers those small-scale estates that focused on terroir and dry wines. These wineries were located somewhere between the other two groups in the feature space before the emergence of the new cluster. Regarding the organization related features and 'Winemaking technology', they shared feature values with the second group, while concerning other winemaking-related features they were more similar to the first cluster. Possibly, those features made them a distinct cluster that became relevant with the dry and terroir focus, as values of these were different from the other two-cluster centers. Not counting the expansion of the relevant feature set, the center vector of this cluster is relatively stable. An interesting phenomenon, however, is that the values of many new, relevant features became distinct from the other cluster centers a few years after their introduction ('Sweet or dry focus', 'Fermentation method', 'Technology or terroir focus' and 'Old plantations'). This suggests that the community of experts recognized new innovations as relevant features earlier than they became widespread within a cluster.

Table 6.4. Yearly centers of Cluster 3

CLUSTER 3	Family winery / company	Domestic / foreign ownership	Non-wine related activities	Size of estate	Sweet / dry focus	Sweet wine ratio	Traditional wine type ratio	Small bottled amounts	Non-local varieties	Winemaking style	Age of barrels	Length of maturation	Fermentation method	Maceration method	Winemaking technology	Technology / terroir focus	Grape purchase	Yield limitation	Old plantations	Organic cultivation	Mechanized cultivation
	2002	1	1	0	0.11		0.71	0.6	1	0	0	0	0.5	0	0	1	1	0	1		
2003	1	1	0	0.11		0.75	0.67	1	0	0	0	0	0.5	0	1	1	0	1	0.5		
2004	1	1	0	0.1	1	0.67	0.44	1	0	0	0	0	1	0	1	1	0	1	1		0
2005	1	1	0	0.11	1	0.63	0.38	1	0	0	0	0	0	0	1	0	0	1	1		0
2006	1	1	0	0.1	0	0.5	0.33	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2007	1	1	0	0.1	0	0.5	0.33	1	0	0	0	0	0	0	1	0	0	1	1	0	0
2008	1	1	0	0.09	0	0.46	0.25	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2009	1	1	0	0.08	0	0.5	0.22	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2010	1	1	0	0.09	0	0.5	0.25	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2011	1	1	0	0.08	0	0.4	0.2	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2012	1	1	0	0.08	0	0.4	0.2	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2013	1	1	0	0.1	0	0.33	0.14	1	0	0	0	0	0	0	1	0	0	1	1	1	0
2014	1	1	0	0.1	0	0.33	0.13	1	0	0	0	0	0	0	1	0	0	1	1	1	0

5.2.2 GRADE OF MEMBERSHIPS

As was discussed earlier, the model coded two feature vectors for organizations in each year: a visible feature vector, which contains the values that are perceived by the audience, and a real feature vector, which records the features that characterize the wines that were produced in the actual year. In the yearly FCM algorithms, visible feature vectors were used because the clustering aimed to model the audience's perception. Consequently, the grade of memberships and cluster contrasts were based on these features. In addition, memberships were calculated from the real feature vectors by running a one-iteration long FCM algorithm with predetermined cluster centers, which had been computed earlier from the visible feature values for the same year. These memberships were also modified according to the method discussed above.

The purpose of this measurement is to indicate the desired grade of memberships of new entrants, which is necessary for the yearly entry rate calculations of clusters. For the sake of clarity, denomination of this type will be pseudo grade of membership (pGoM), while the term grade of membership (GoM) will refer to the memberships calculated from visible feature vectors.

6.2.3 CLUSTER CONTRASTS

Cluster contrasts were calculated according to the existing theory (Hannan, Pólos and Carroll 2007). It is equal to the average grade of membership of those organizations that have nonzero membership in that cluster.

$$C(j, y) = \frac{\sum_{i=1}^{n(y)} GoM(i, j, y)}{m(j, y)} \quad (6.6)$$

Where $C(j, y)$ is the contrast of the j^{th} cluster in year y , $n(y)$ is the number of organizations in the winery population in year y , $GoM(i, j, y)$ is the grade of membership of organization i in the j^{th} cluster in year y and $m(j, y)$ denotes the number of organizations with nonzero membership in the j^{th} cluster in year y .

Contrast dynamics of the sub-clusters can be seen in Figure 6.1, where two distortions are clearly marked. On the one hand, contrasts are very high in the first two years. This is because both the number of relevant features and the density of the winery population was very small at that time, hence

the FCM algorithm for two clusters assigned the organizations with full membership. On the other hand, contrasts of the already existing clusters drop in 2002, when the model introduces the third group. This is due to the calculation method. As the sum of memberships is 1 for each organization, the average grade of memberships are decreasing with the growth of cluster numbers. Still, the yearly ratio of contrasts is unbiased. Moreover, these contrast values are also suitable for the contrast dependence tests, because intended memberships of new entrants similarly drop with the increase of cluster numbers.

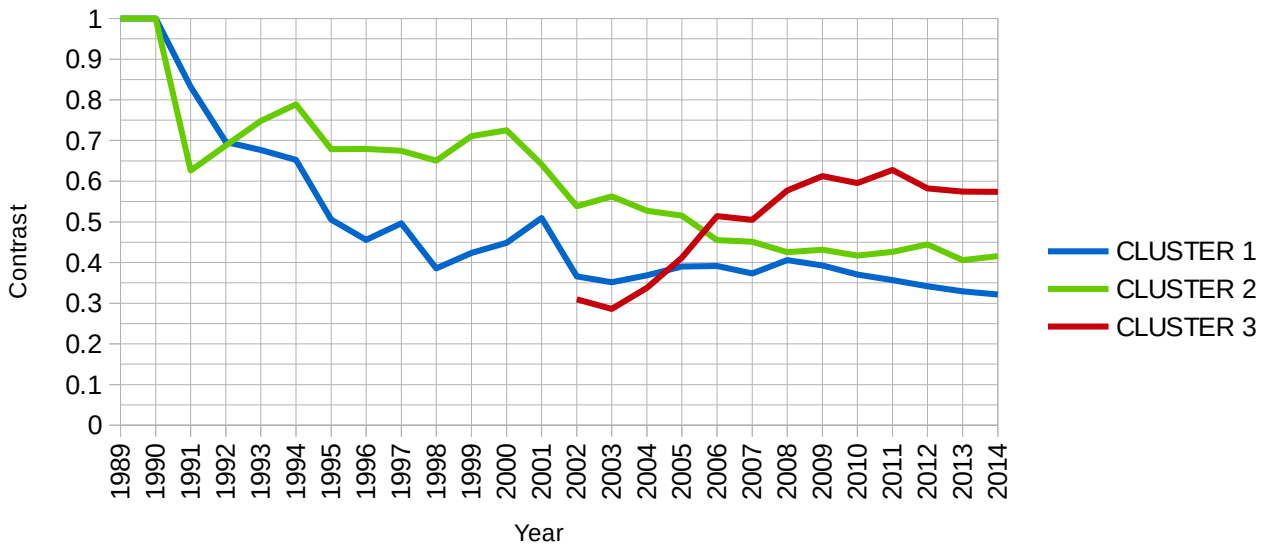


Figure 6.1: Cluster contrast 1989-2014

Not counting these, the following patterns can be seen. The contrast of both Cluster 1 and 2 decreases gradually. Apart from the first four years, the second cluster had a higher contrast. A possible reason might be that feature values of its members were more similar. Another explanation is that members of the future third cluster, which was located between the two clusters, were closer to the second center than the first, thus decreased its contrast less. This gap remained for the whole period, but became narrower, mainly due to the decreasing contrast level of Cluster 2. The third cluster started with the lowest contrast; however, in a few years, it became the crispest one. To oversee these mechanisms in more detail, vital rates of clusters and yearly densities will be shown.

6.2.4 VITAL RATES

As discussed above, event rates were calculated by using pseudo grades of memberships of organizations. For composing entry data sets of fuzzy clusters, two possible solutions are feasible. The first option is to consider wineries' primarily pseudo grade of memberships only while calculating entry rates. The second option is to produce count data which group entrants according to their level of pGoM in each cluster.

For data description purposes, the first was applied as it carries more information. Entrants in each cluster were divided into four pGoM groups. Cluster 1 was characterized by lower pGoM entrants in general than the others, which is particularly true in the years after 2000 (Figure 6.2). This corresponds with the contrast pattern of this cluster, which was discussed above. There is an increase in average pGoM in the 2010s, which is possibly due to changes in the cluster coordinates, especially regarding estate size and assortment structure features. Cluster 2, which consisted of traditionalist family wineries, attracted almost exclusively high pGoM entrants until the late 1990s, but changed radically after that time (Figure 6.3). The pGoM values of newcomers suggest that only a few organizations were established after 2002, whose primary cluster is the second. Cluster 3, comprising the terroir and dry-focused small estates, has the opposite pattern for these years, as the entry rate of core members is high. Considering the fact that the centers of clusters 2 and 3 share a particular set of feature values, peripheral entrants of the second cluster after 2000 were likely to be core entrants of the third cluster that had a high, but not exclusive, membership in it. (Figure 6.4)

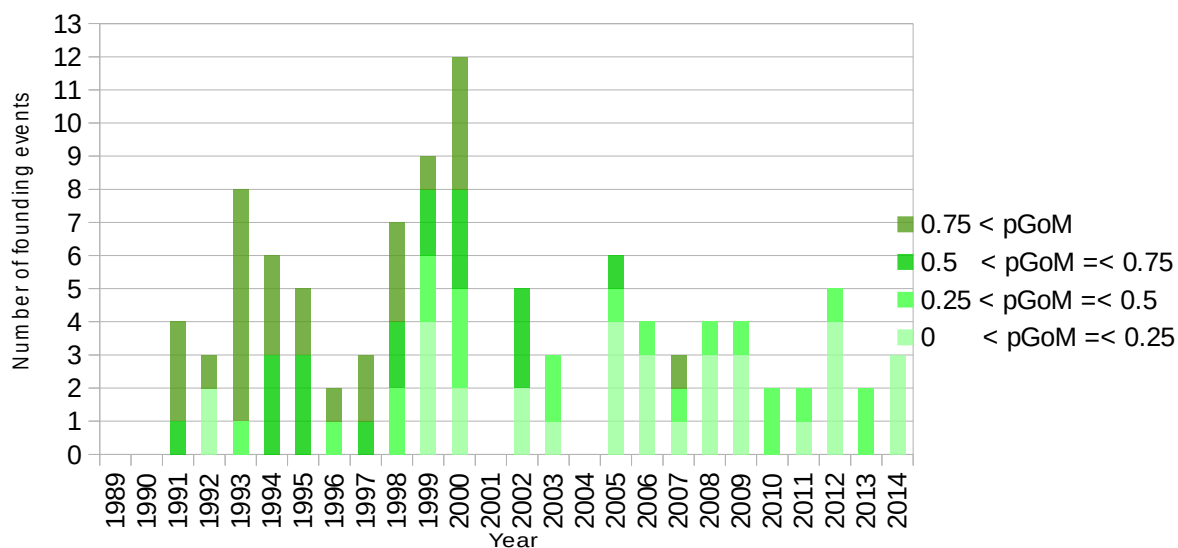


Figure 6.2: Founding rates of Cluster 1 1989-2014

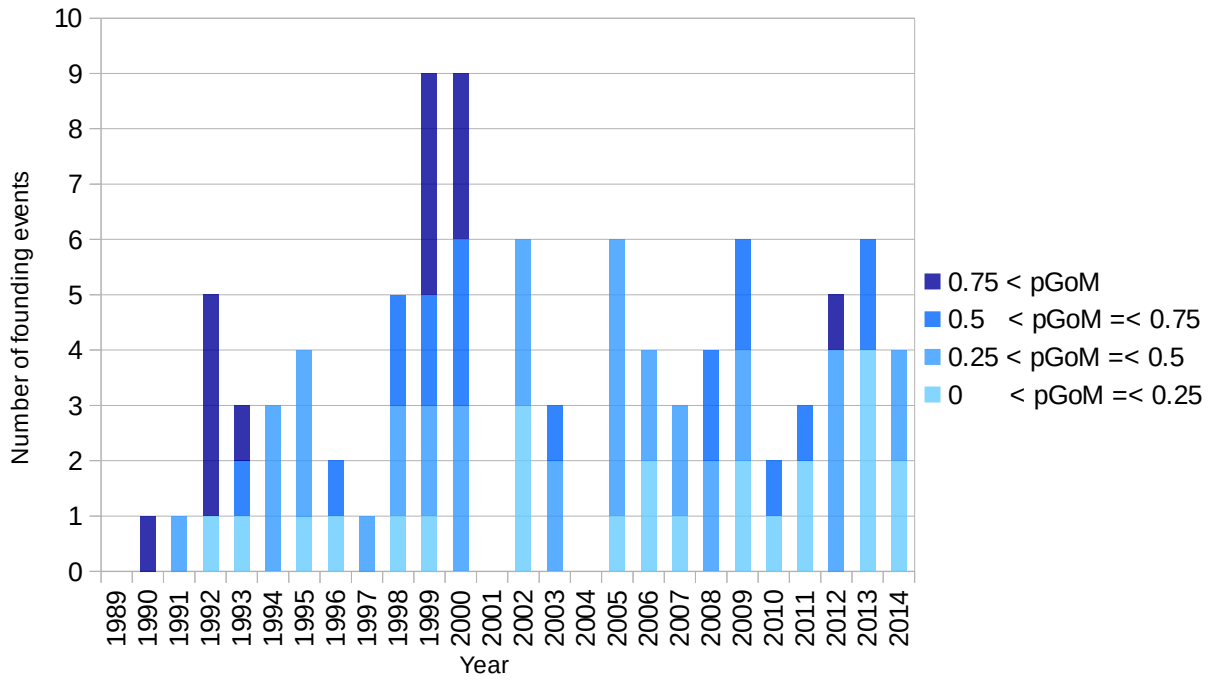


Figure 6.3: Founding rates of Cluster 2 1989-2014

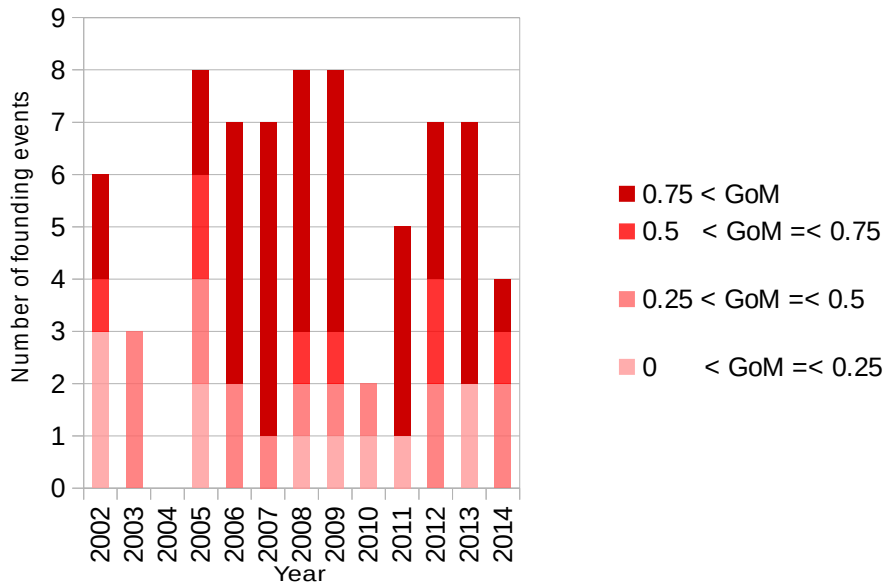


Figure 6.4: Founding rates of Cluster 3 1989-2014

As only a few organizations left the population during the studied period, exit dynamics are not so meaningful as entry rates. Figure 6.5 is even misleading in this sense, as it contains each event multiple times because of the fuzzy setting. Certain patterns can be observed, for instance the higher membership of terminated wineries in Cluster 2 after 2007, and decreasing exit rates of Cluster 3. However, none of these are reliable assumptions due to the low number of events.

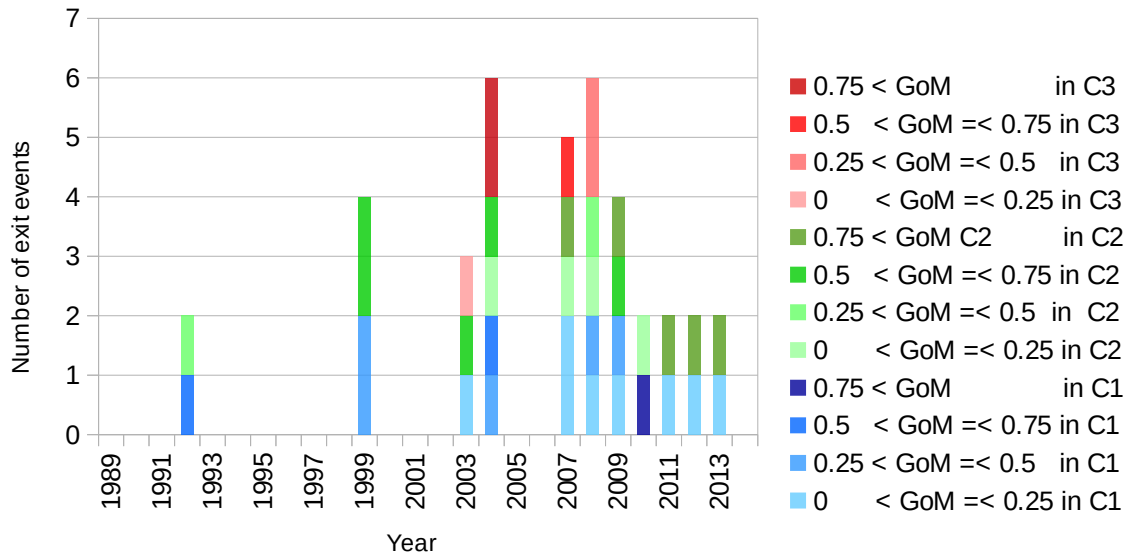


Figure 6.5: Exit rates of clusters 1989-2014

6.2.5 DENSITY AND FUZZY DENSITY

In this setting, density of cluster is the number of organizations on the market with a nonzero grade of membership in it. Figure 6.6 shows the yearly densities of the three clusters and, for comparison, that of the main population as well. It is conspicuous in that there is a gap between the cluster density curves and the population density curve. This is because certain organizations have 0 membership in one or two clusters. Thus, the size of this gap indicates the number of organizations having 0 membership in either of the other clusters. There seems to be a general growth of it for all clusters during the period, but most likely this is due to the different cluster numbers in the later period. Regarding fuzzy density, the pattern is similar to the contrast development (Figure 6.7). The difference lies in the growth of all rates, which is due to the increasing density of each cluster (Figure 6.1).

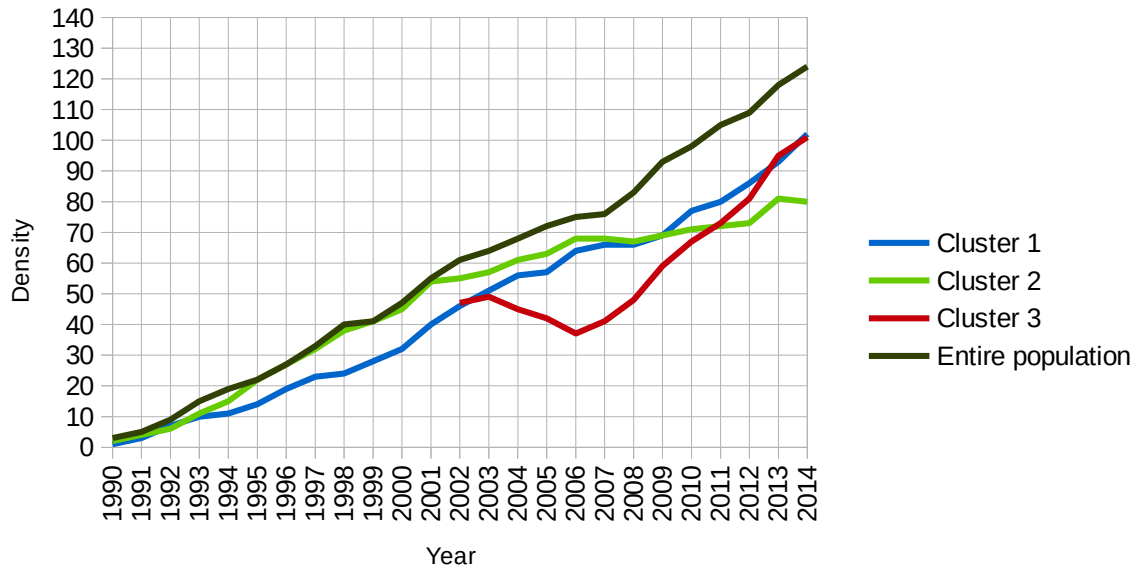


Figure 6.6: Cluster densities 1989-2014

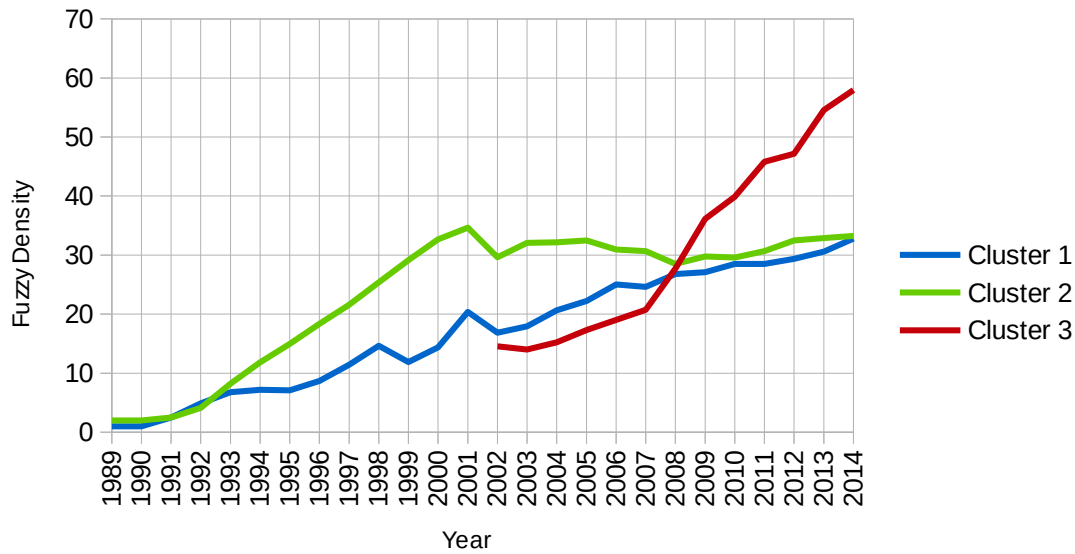


Figure 6.7: Cluster fuzzy densities 1989-2014

The following two sections will analyze the sub-clusters in the light of the research questions and the hypotheses by building on the results of the FCM analysis. First *Hypotheses 1 and 2* will be tested the following section. After that, the development of each winery cluster will be reviewed according to the results of the FCM analysis. This process will allow answering the research questions, and by identifying the proposed contrast mechanisms to test *Proposition 1*.

6.3 CONTRAST DEPENDENCE TESTS

Chapter 1 proposed several contrast related mechanisms that can occur in the space of overlapping similarity clusters, where the relevant feature set is dynamic. It argued that the specific evolution of winery sub-clusters was mainly the result of these mechanisms. To decide whether this is true, the first step is to prove that contrast accounted for the legitimation and proliferation of clusters. To this end, a contrast dependence test will be carried out regarding cluster entry rates. Chapter 1 introduced two hypotheses regarding contrast dependence theory. By finding evidence for contrast driven entry rates these can be also justified.

Hypothesis 1.: Contrast dependence takes effect on the sub-category level.

Hypothesis 2. Contrast dependence can take effect in early stages of legitimation already.

A negative binomial model was applied to test the effect of cluster contrasts on the yearly entry rate, as this was the method of earlier research on entry rate (Carroll and Swaminathan 1992; Lomi 1993; Carroll and Swaminathan 2000; Mezias and Mezias 2000; Lomi 2000; Kuilman and Li 2006). The applied data paired yearly contrasts of clusters (*Contrast*) with the number of annual entry events in them. The dependent count variable N_{ENTRY} considered only those entrants that had a higher pseudo grade of membership in the year of their entry than 0.5, the aim of it is to detect primarily memberships. Also, three categorical dummy variables C_1 , C_2 and C_3 were defined in order to test the contrast effect on the clusters separately. Besides these, the previous year's gross domestic product growth GDP_t and two cluster density variables were included as controls. *Density* was the number of organizations in the cluster, while $Density_{>0.5}$ contained only wineries with a higher grade of membership than 0.5. This restriction had two consequences. On the one hand, every entry event appeared only once in the data. On the other hand, hybrid entries of the 2002-2014 period which had no dominant cluster membership were excluded from the count variable. The number of observations was 58. In accordance with the results of the optimal cluster number tests, the above N_{ENTRY} and *Contrast* had two entries yearly and three after that. The first three years were excluded because contrasts were 1 for all the clusters due to the low density and the small relevant feature set.

Table 6.5 presents the results of entry rate models of winery similarity clusters. According to the results, α was not zero in either model, which indicates overdispersion. Model 1 tested the effect of

contrast on the clusters in general. The entry rates increased as contrast grew, which is statistically significant at 1 percent level. The coefficient requires interpretation. Because contrast varies between 0 and 1, the 4.474 value means a 0.474 increase in entries caused by 0.1 growth in contrast. The GDP of the previous year does not have a significant effect.

The first results showed that contrast had a significant and positive effect on entry rates. The question arises whether this applies to all clusters. To find out this, Model 2 tested the impact of contrast separately on the clusters by including categorical dummy variables in the rest. Cluster 3 was used as the reference group; therefore the algorithm automatically omitted it from the test. This means that the coefficients of C1 and C2 show the effect of contrast on the entry rates of Cluster 1 and Cluster 2 compared to Cluster 3. The results show that the effect is strongest on Cluster 3 and weakest on Cluster 2. The effects are significant in all three cases, but in Cluster 1 the significance level is low. Besides that, the previous year's GDP has a weak but significant positive effect on entries, which suggests that general economic growth had a weak and significant effect on winery establishments in this model. The log-likelihood value of -101.854 and an $LR \chi^2$ value of 25.6 of the second model indicate an improvement in fit over Model 1.

In order to test whether density also had an effect on entries, Model 3 and 4 included cluster densities in the test as control variables. Results show that neither of them had a significant impact on entries, and they did not weaken the effect of contrast.

The contrast values that regression included were calculated by the fuzzy cluster analysis, where the value of the fuzzification parameter was set to 2. In order to test the sensitivity of the results, the FCM algorithm was rerun with two different m values (1.8 and 2.2), and the negative binomial models were also recalculated. The effect of contrast remained strong and significant in the altered models as well. Results of the sensitivity analysis are presented in Appendix 3.

Table 6.5: Maximum Likelihood estimates of negative binomial models for entry rate of winery similarity clusters 1992-2014

Variable	Model 1	Model 2	Model 3	Model 4
Contrast	4.474 *** (1.074)	5.740*** (1.197)	4.971*** (1.351)	5.718*** (1.165)
GDP ₁	-0.070 (0.054)	0.092* (0.052)	0.081 (0.051)	0.091* (0.050)
C ₁		-0.531* (0.315)	-0.717** (0.350)	-0.731* (0.0350)
C ₂		-1.049*** (0.317)	-1.081*** (0.307)	-1.117*** (0.313)
C ₃		omitted	omitted	omitted
Density			0.006 (0.005)	
Density _{>0.5}				-0.012 (0.120)
Constant	-1.784 (0.625)	-1.931 (0.706)	-1.297 (1.004)	-1.486 (0.808)
α	0.507 (0.240)	0.268 (0.187)	0.221 (0.182)	0.038 (0.182)
LR $\alpha = 0$	11.41***	3.94**	2.5*	2.61*
log - likelihood	-107.012	-101.854	-101.314	-101.225
LR χ^2 (d.f.)	15.29 (2)***	25.60 (4)***	16.68 (5)***	11.65 (5)***
No. obs. (years)	59	59	59	59
Significance levels:				
* :10% ** : 5% *** : 1 % Standard errors are in parentheses				
Fuzzification parameter m = 2				

In conclusion, the results strongly support both Hypotheses 1 and 2 as contrast dependence takes effect on the sub-category level, and in the early stages of legitimation as well. Regarding Tokaj winemaking, the above analysis proved that contrast was the driver of legitimation; thus, proliferation of the clusters. The next step of the analysis will investigate whether the proposed contrast-related mechanisms applied to the evolution of the winery sub-clusters. For the tests, the nbreg function of Stata was applied.

6.4 CLUSTER DYNAMICS

Based on the complete sub-cluster model, the following part of the analysis will reveal how each cluster evolved regarding contrast, density and vital rates. The same evolution process will be looked at in terms of the proposed contrast mechanisms as well. On the one hand, this will allow the answer to three of the four empirical research questions concerning the empirical challenge. The fourth will be discussed in Section 6.6. On the other hand, by identifying and tracking the proposed contrast mechanisms during the development processes their relative importance will be compared.

The empirical research questions to be answered are as follows:

1. Why did dry wine production break through in the 2000s?
2. What prevented the modernist sweet wine style from spreading during the 1990s?
3. Why did the traditional wine style remain dominant for so long?

Each question is related to one of the clusters. Question 1 addresses the emergence of Cluster 3; Question 2 addresses the development of Cluster 1; Question 3 deals with Cluster 2. Thus, these points will be discussed in the light of the cluster dynamics regarding vital rates, densities, contrasts and cluster centers. Besides, the effect of the changing relevant feature set will be taken into account.

The general answer for each of the questions was that, according to the existing theory, the spread and success of winemaking clusters had depended on their legitimation and, therefore, on their contrast. According to the test results of Hypothesis 1 and 2, this was true. Now a more interesting question arises: what mechanisms influenced cluster contrasts generally and are they applied to the particular case of Tokaj winemaking? In fact, this is the question that Proposition 1 addresses.

Proposition 1.: Contrast mechanisms driven by the dynamic relevant feature set were more influential than the other mechanisms.

Chapter 2 has already identified these mechanisms by both building on existing theory and suggesting new interactions based on clusters whose relevant feature set is dynamic. It also made the assumption that those mechanisms were the most important that are induced by the change of the relevant feature set. Below, a selection of these mechanisms is summarized, those that are applicable for the Tokaj setting (for instance derecognition of relevant features was excluded). Also, the mechanisms were rephrased and classified differently as the analysis focuses on the starting point of the process.

I. An existing organization that changes one of its feature values affects the contrast of its cluster(s).

I.1. Contrast increases when the new value is similar to that of the cluster center.

I.2. Contrast decreases when the new value is different from that of the cluster center.

II. Exit and market entry events modify the affect contrast of their (former) cluster(s).

II.1. Contrast increases when a high-GoM member enters or a low-GoM member exits the cluster.

II.2. Contrast decreases when a low-GoM member enters or a high-GoM member exits the cluster.

III.A new relevant feature influences cluster contrast by changing the distances between its members.

III.1. Contrast increases when its members are similar regarding that feature.

III.2. Contrast decreases when its members are dissimilar regarding it.

IV. A new relevant feature influences contrasts of overlapping clusters, by changing the distance between their centers, thus the extent of overlap.

IV.1. Contrasts increase when their centers are dissimilar regarding that feature.

IV.2. Contrasts decrease when their centers are similar regarding that feature.

V. A significant group of existing organizations that change one of their feature values in the same way can change the cluster center vector, thus the contrasts of the overlapping clusters.

V.1. Contrasts increase when their centers become dissimilar regarding that feature.

V.2. Contrasts decrease when their centers become similar regarding that feature.

The following subsections will look at the development process in the light of the above mechanisms. The aim is to identify these regarding each cluster. Cluster 3 will be analyzed in this sense, followed by Cluster 1 and, finally, Cluster 2. The reason for this order is that reform attempts of Clusters 3 and 1 were similar, despite the different outcomes. This way, the two cases will be easier to compare.

To gain more insight into cluster dynamics, further measurements will be presented. First, Figures 6.9, 6.10 and 6.11 show yearly cluster densities of different GoM categories separately, which allows the tracking of the density dynamics of the cluster cores and the peripheries. Second, Figure 6.8 presents yearly relative distances between the cluster centers, which were calculated by dividing the Manhattan distance of center vectors by the number of relevant features of that year. This chart illustrates the effect of newly recognized relevant features on cluster overlap (IV.1 and IV.2). Third, Table 6.6 summarizes the mean and the weighted standard deviation of the new relevant feature's values for each cluster in the year of their introduction. These allow tracking the effect of new relevant features on cluster contrasts (III.1 and III.2).

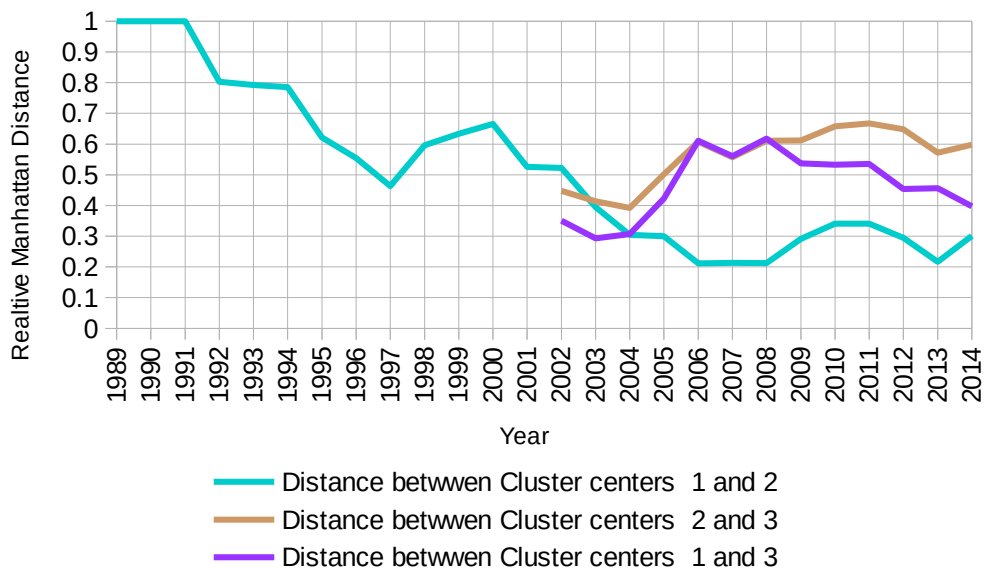


Figure 6.8 Yearly distances of cluster centers 1989-2014

Table 6.6: Mean, deviation and cluster center values of new relevant feature values

First year of relevance	Feature value		Weighted mean			Weighted standard deviation			Cluster center value			Empirical challenge
	Name of feature value	Relevance weight	Cluster 1	Cluster 2	Cluster 3	Cluster 1	Cluster 2	Cluster 3	Cluster 1	Cluster 2	Cluster 3	
1995	Winemaking style	1	0.75	0.95		0.50	0.21		1	1		Sweet wine reform
1995	Age of barrels	1	0.55	0.95		0.70	0.24		0	1		
1995	Length of maturation	1	0.77	0.91		0.50	0.31		1	1		
1995	Yield limitation	1	0.08	0.06		0.23	0.25		0	0		
1996	Traditional wine type ratio	1	0.85	0.88		0.12	0.12		0.82	0.88		
1999	Maceration method	1	0.40	0.76		0.79	0.88		0	1		
2000	Technology / terroir focus	0.5	0.37	0.48		0.26	0.49		0.5	0.5		
2000	Grape purchase	0.5	0.17	0.22		0.29	0.34		0	0		
2001	Small bottled amounts	0.5	0.11	0.08		0.24	0.21		0	0		
2002	Sweet wine ratio	1	0.73	0.78	0.74	0.15	0.11	0.18	0.70	0.78	0.71	Dry wine revolution
2002	Non-wine related activities	0.5	0.12	0.18	0.11	0.25	0.30	0.23	0	0	0	
2002	Non-local varieties	1	0.04	0.03	0.03	0.21	0.17	0.16	0	0	0	
2003	Fermentation method	1	0.43	0.42	0.32	0.19	0.20	0.30	0.5	0.5	0.5	
2003	Old plantations	0.5	0.07	0.03	0.27	0.19	0.12	0.34	0	0	0.5	
2004	Sweet/dry focus	1	0.90	0.98	0.79	0.31	0.13	0.36	1	1	1	
2004	Mechanized cultivation	0.5	0.44	0.42	0.17	0.18	0.21	0.21	0.5	0.5	0	
2006	Organic cultivation	0.5	0.46	0.47	0.23	0.14	0.12	0.34	0	0	1	

6.4.1 CLUSTER 3 – THE DRY WINE REVOLUTION

Cluster 3 was first perceived in 2002 according to the model. Its birth was triggered by the introduction of a new wine type (full-bodied, terroir-focused dry wine) and by the recognition of relevant features of the audience in the early 2000s, that were partly connected to this innovation. The features included: 'Technology or terroir focus', 'Grape purchase', 'Small bottled amounts', 'Sweet wine ratio', and 'Non-wine-related activities'.

Regarding contrast, the cluster was below the other two in 2002. However, after a rapid growth, it overcame them in 2006 (Figure 6.5). In the subsequent years, the contrast remained high, which resulted in a high entry rate of organizations with a high grade of membership (Figure 6.4); in other words, in the breakthrough of the dry wine movement. This confirmed the theoretical expectations of contrast dependence (Pólos, Hannan and Carroll 2007), although the early contrast growth remained unexplained.

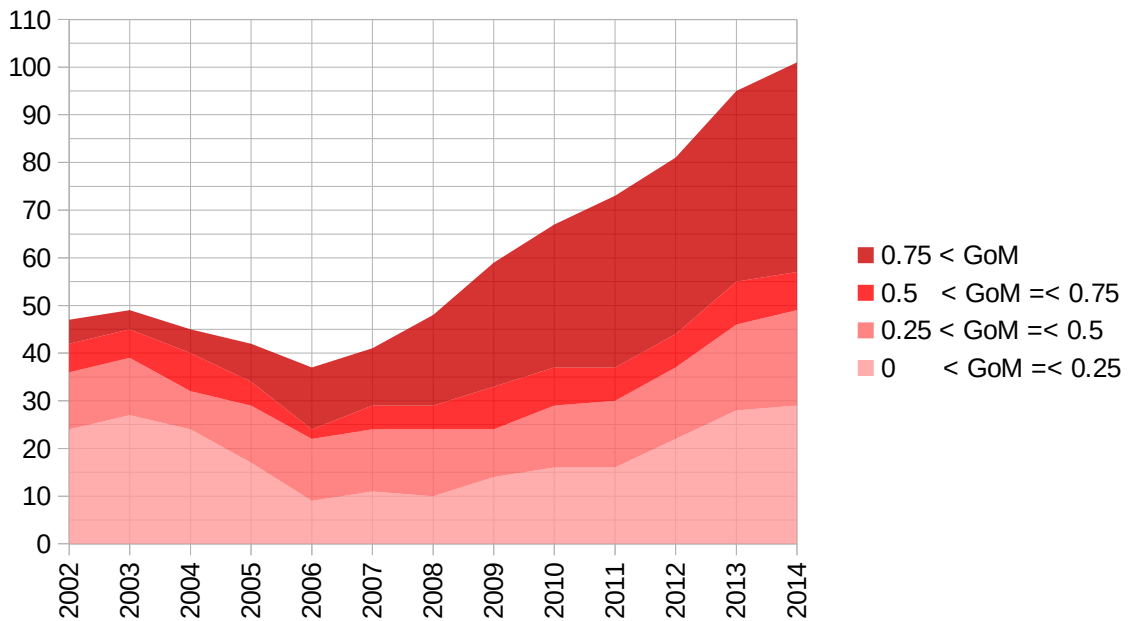


Figure 6.9: Yearly Densities of GoM groups, Cluster 3 2002-2014

The density pattern was also unusual: unlike the other cluster densities that grew monotonically during their lifetime, Cluster 3 experienced a temporal downturn between 2002 and 2006 (Figure 6.9).

By looking at the vital rates (Figures 6.4 and 6.5), we can conclude that this decrease can not be the result of exits. Figure 6.9 clearly shows that, besides a slight growth of members with high GoM, predominantly the disappearance of peripheral multiple-cluster members accounted for the density decrease. Moreover, this was the reason for the rapid contrast increase in the same period (Figure 6.1), as the density of other GoM categories within the cluster did not change significantly.

The question that arises, therefore, is why did these peripheral multiple category members leave the cluster? As the exit rate can be ruled out (Figure 6.5), two possible reasons remain. On the one hand, these organizations could change certain feature values, which increased their similarity distance from the cluster center; thus, their GoM decreased to 0. On the other hand, they could lose their similarity and membership because the relevant feature set changed and increased the distance between Cluster 3 and their primary cluster. Indeed, five new features became relevant between 2003 and 2006, and core members of Cluster 3 had typically different values regarding them compared to the other cluster members. (Table 6.6). This phenomenon also applied to the calculated cluster centers either in the first year of relevance or a few years later (Tables 6.2, 6.3 and 6.4). Moreover, the effect became stronger as the relevance weight of three of these features grew in the subsequent years (Table 6.2). Finally, Figure 6.8 shows that relative distance doubled between Cluster center 3 and the other two centers during this period. These all strongly suggest that relevant feature set dynamics were the primary reasons for the contrast growth by increasing the distance between Cluster 3 and the others.

It is important to look at the other consequence of the new relevant features, namely their impact on the similarity between the cluster members and, therefore, on the contrast. According to the proposed mechanism, if feature values of cluster members are similar, contrast will increase, otherwise it will decrease. To reveal this effect, weighted standard deviation of feature values were looked at (Table 6.6). The values suggest that, from this perspective, the new feature values hampered legitimation, as the dissimilarity with Cluster 3 members was higher regarding all new features than that of the other clusters. This follows that the effect of the decreasing overlap on contrast was greater.

Figure 6.9 indicates another phenomenon that is worth looking at – namely that, after 2011, contrast decreased (Figure 6.5). This is most likely due to the proportional growth of peripheral members in the cluster (Figure 6.9). The dynamics of the relevant feature set could not account for their appearance, as it did not change after 2006 (Table 6.6). The entry pattern did not alter fundamentally either, as predominantly estates with a high grade of membership were established at that time (Figure 6.4). Thus, only two possibilities remained. The first was that either organizations with medium GoM

in Cluster 3 changed such feature values, which decreased their typicality and, ultimately, the cluster contrast; or, second, wineries that formerly had 0 GoM in Cluster 3 approximated its center, thus gaining membership in it and decreasing its contrast. Because the density of the medium GoM category did not drop in this period, the second mechanism applied.

It is a relevant question regarding this process as to whether core or peripheral members of the other clusters approximated Cluster 3. While calculating the cluster centers, the FCM clustering algorithm weights feature vectors of organizations according to their membership in the specific cluster. In other words, core members play a more important role in the determination of cluster centers. Thus, it would likely affect the center vectors of Clusters 1 and 2 if their core members changed feature values; however, it would not if peripheral members did so. By looking at the cluster center distances in the 2010s (Figure 6.8) we can conclude that the pattern of changes supports the possibility of core members entrants: Cluster center 1 approximated the prototype of Cluster 3, regarding 'Sweet or dry focus', 'Sweet wine ratio', 'Traditional wine type ratio' and 'Technology or terroir focus'. (Tables 6.2 and 6.4). On the other hand distance between Cluster 2 and 3 did not change significantly until 2013, when it also started to approximate it. According to the cluster center vectors (Tables 6.3 and 6.1) this included 'Traditional wine type ratio', 'Winemaking style', 'Age of barrels' and 'Length of maturation'. This also follows that the mechanism that describes this contrast drop is a growth of cluster overlap initiated by organizations. The above mechanisms explained the process of the dry wine revolution from an organization ecology perspective.

1. At the millennium, the group of modernist small family estates was situated between the two early clusters in the feature space. Innovation and the introduction of terroir-focused dry wine and its recognition as a relevant feature(s) allowed them to be perceived as a separate similarity cluster from 2002.
2. The contrast of this cluster was low initially, but other features connected to this winemaking philosophy became relevant between 2002 and 2006, which excluded peripheral members from the cluster by reducing its overlap with another clusters and raised its contrast. As a result, it increased its legitimation (Mechanism IV.1).
3. This enhanced the entry rate after 2006; hence, both contrast and density grew steadily. As entrants had high GoM, the contrast grew further (Mechanism II.1).

4. In the 2010s, members of other clusters began to adopt typical feature values of terroir-focused dry wine producers; in other words, they entered Cluster 3 with a low grade of membership. As these entrants were core members of other clusters, they altered the centers of them, thereby increasing the cluster overlap and decreasing contrasts (Mechanism V.2).

6.4.2 CLUSTER 2 – THE FAILED SWEET WINE REFORMATION ATTEMPT

The second cluster consisted of the larger companies, initially foreign ones that aimed to reform the traditional production methods and types of sweet wines. Even though they gained a foothold in the wine region, it is difficult to conclude that the effort was ultimately successful, as their cluster remained below the other two regarding entry rates, contrast and density (Figures 6.1 and 6.2). The research question regarding this cluster addressed this failed attempt.

The detailed density chart (Figure 6.10) shows the following patterns. Not counting the early years, core members with high GoM were always the minority within the cluster. On the one hand, its density was always high, which was due to the high number of peripheral multiple cluster members.

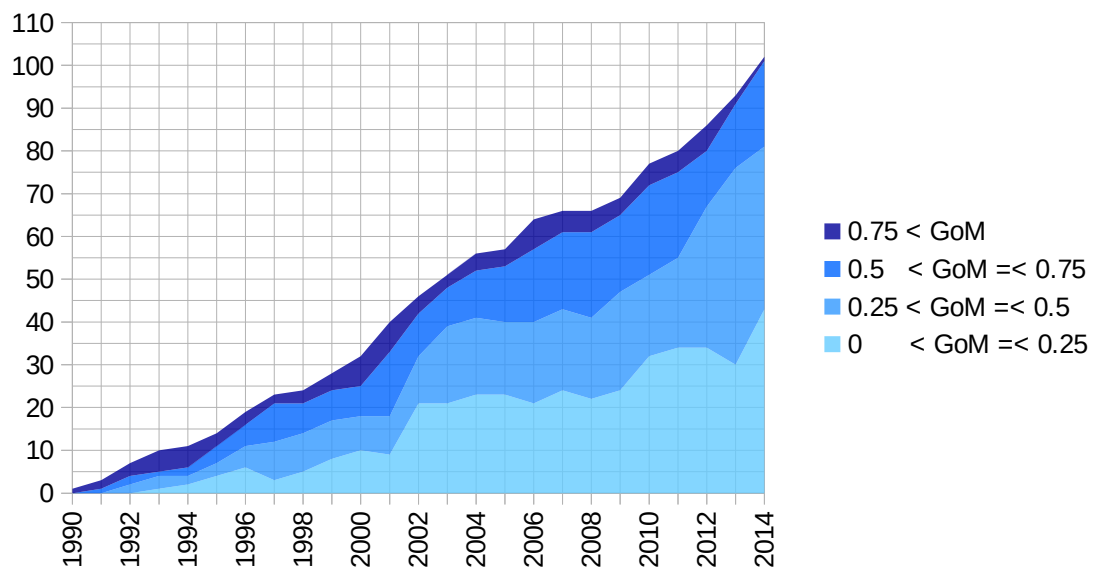


Figure 6.10: Yearly Densities of GoM groups, Cluster 1 1990-2014

The key period regarding the research question was 1995 to 1996. These were the years when the features of the new sweet wine style were invented by the members of this cluster and recognized by the audience as relevant: 'Winemaking style', 'Age of barrels' and 'Length of maturation' and

'Traditional wine type ratio'. Besides these, two other features became relevant in the 1990s. These features were 'Maceration method' and 'Yield limitation'. These were not part of the aszú reform of Cluster 1, but introduced and mainly practiced by István Szepsy. By evaluating the effect of these new features on the similarity of cluster members, we can conclude that they had a negative impact on it.

Standard deviations of the feature values in Table 6.6 show that, in terms of three of the six new features, these were significantly higher than that of Cluster 2 in three cases, while the deviation value was very close regarding the other three. This follows that their contrast dropped. In terms of the overlap of relevant feature set, this was also negative: four of the six cluster center values were equal or very close to that of Cluster 2. When considering that the number of relevant features was low, this resulted in a significant overlap between the two clusters. This can be confirmed by the growing number of peripheral members in both categories after 1995 (Figures 6.10 and 6.11) and the decrease in the center distance between 1995 and 1997 (Figure 6.8). The process was the opposite when compared to Cluster 3. While it decreased its density and increased its contrast by excluding peripheral members, Cluster 1 increased its density and decreased its contrast by including them. According to the proposed theory, the key was dissimilarity within the cluster in terms of new relevant features, why similarity regarding them to the other cluster.

Both factors were based on the composition of Cluster 1. On the one hand, it contained two groups of hybrid-type organizations: modernist family wineries and traditional large companies. Although the first type of wineries gained membership by following the new style, they remained moderate members, because they differed in terms of relevant organizational features such as 'Size of Estate', 'Family winery or company' and 'Foreign or Domestic ownership'. The other group was similar in terms of these, thus had a high GoM initially. However, its members did not change their features in terms of the new winemaking-related features. As a result, their GoM dropped.

On the other hand, the low number of core members played an important role. Because of this, the several de-alio entrants (those wineries that existed before but entered the cluster by changing some of their feature values) or deviants had a great impact.

Consequently, as Cluster 1 was badly affected by the new relevant features in both ways, its density grew while its contrast decreased. As a result, it could not proliferate in the 1990s, as the third cluster did in the 2000s. From an organization ecology point of view, this is the reason why the modern sweet wine style remained secondary during the 1990s.

6.4.3 CLUSTER 2 – LATER DYNAMICS

Even though the research question regarding Cluster 2 has been answered, there are still interesting dynamics in its later lifetime. First, there was a short relative revival of the cluster in the late 1990s and early 2000s. Its contrast was growing between 1998 and 2001 (Figure 6.1), and attracted a number of high GoM entrants in 1999 and 2000 that entered the market later. As can be seen in Figure 6.10, this was due to a growing number of high GoM members within the cluster that were not new entrants (Figure 6.2). New relevant features of these years did not have a positive effect on memberships, as was discussed earlier, and the same applied to those ones that became relevant in 2000 (Table 6.6). Only one possibility remained: existing members had to enhance their membership by changing some of their feature values to grow similarity to the cluster center. In fact, these were wineries that did so earlier, but the effect was delayed. New winemaking-related feature values of those large wineries that adopted the new practices after 1995 only became visible for the audience during this period only due to the prescribed long maturation. Still, this was a minor growth, which did not last long because of the effects of the dry wine revolution.

Second, after 2001, the contrast dropped again due to the new relevant features that enabled the emergence of Cluster 3. As Cluster 1 and 2 had similar values regarding most of these (see Table 6.6), the distance between their centers decreased dramatically (Figure 6.8). This resulted in the growth of the peripheral multi-cluster members (Figure 6.10) and a contrast decrease in 2002 (Figure 6.1). Despite the growing overlap between Cluster 2, the contrast level did not decline further until 2008. A possible reason for this is that those peripheral organizations that were excluded from Cluster 3 at that time gained higher membership in this cluster.

Finally, core organizations of Cluster 2 changed their feature values in the 2010s to approximate Cluster 3. Besides the changing center vector (Table 6.2), this process is indicated by the decreasing center distance and contrast level after 2008 (Figures 6.8 and 6.1) and the disappearance of the high GoM group of the cluster (Figure 6.10).

1. The sweet wine reform extended the relevant feature set in 1995. This decreased the contrast of Cluster 1 both because of the dissimilarity of its members concerning the new features and the similarity of its center values to that of Cluster 2 regarding them. Mechanism III.2. and IV.2.

2. In the late 1990s the contrast increased again as feature values of those members that changed them to follow the sweet wine reform earlier became visible for the audience. Mechanism I.1
3. New relevant features of the 2000s decreased the contrast of the cluster because its center was similar regarding these feature values to those of Cluster center 3. Mechanism IV.2.
4. In the 2010s organizations of the cluster started to adopt typical feature values of terroir focused dry wine producers (Cluster 3) this way they altered the cluster center. This resulted in increasing overlap between the two and in decreasing contrasts. Mechanism V.2

6.4.4 Cluster 3 – Survival of the traditions

The third cluster was the group of traditionalist wineries that adhered to the old methods, wine style, and wine types. The research question addressed the long survival of these features. Survival is the right word in case of the members also, because unlike the wineries of the other clusters, traditionalists winemakers did not make any attempt to change their operation to overcome the sales crisis of Tokaj wines. They did not innovate any features, and according to the dynamics of their cluster center vector (Table 6.3) until the last years of the studied period the majority of them refused to adopt any innovation of wineries of the other clusters. This suggests that their survival was mainly the result of dynamics of other clusters and the relevant feature set.

The detailed density chart shows a stable high GoM core of the cluster which proliferated until the millennium, remained relatively intact until the 2010s, and started to decompose after that (Figure 6.11). However, there seems to be a growth in terms of contrast in 2014, which is the result of the growing proportion of high GoM members and a slight decrease of the periphery. This process is confirmed by the vital rates as well (Figures 6.3 and 6.5) As long as the stable core was dominant newly founded organizations had a high grade of membership in the cluster. After 2000 as the core gradually became the minority, peripheral entrants were typical. In other words unlike in the 1990s, after 2000 dynamics of the cluster were not influenced by this stable core but the periphery.

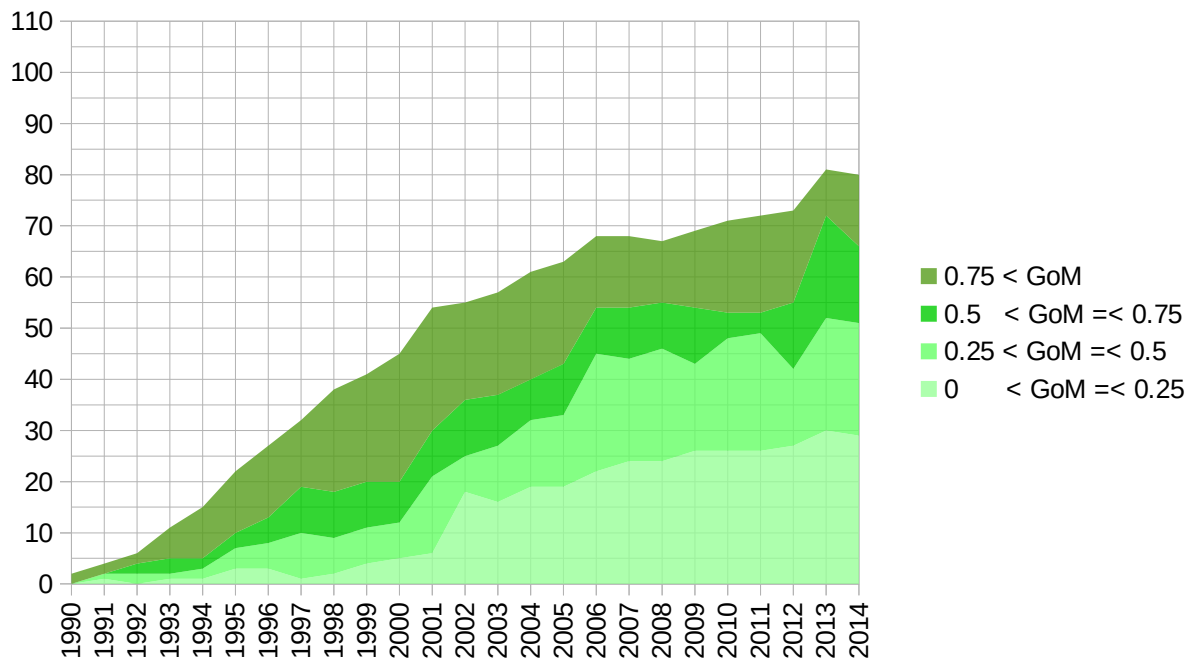


Figure 6.11: Yearly Densities of GoM groups, Cluster 2 1990-2014

Both the advantageous period of the 1990s and the disadvantageous 2000s were mainly influenced by the reform attempts of the other two clusters. Until 1995 when the sweet wine reform started Cluster 2 developed a relatively decent density in comparison to Cluster 1. Thus, the increasing overlap with it, which was the result of the common values regarding the new relevant features was less harmful. Due to the low density of the other cluster, the number of multiple-cluster members was low in comparison to the core members. Hence contrast of Cluster 2 did not decrease such an extent as that of Cluster 1. On the other hand, the new features had a positive effect on the similarity between cluster members as traditionalist winemakers had a full agreement on not adopting any new winemaking techniques (Table 6.6). As a result, both contrast and entry rates remained high until the early 2000s.

In turn, dynamics of the relevant features set in the 2000s had the opposite effect. As was discussed above, members of Cluster 1 and 2 typically had the same values regarding these features which increased similarity between their members and cluster centers (Figure 6.8) thus resulting in a greater overlap and a lower contrast. This drop is observable in Figure 6.11 between 2000 and 2006. Regarding the internal similarity effect Cluster 2 benefited more than Cluster 1 as the weighted standard deviation of its values were smaller regarding the new features (Table 6.6). In the subsequent years, the contrast was mainly affected by low GoM entrants. Although their number was smaller than

those of Cluster 1, their average membership was lower (Figures 6.1 and 6.2). The same applied to exit rates after 2007 terminated organizations were characterized with high membership in the traditionalist cluster (Figure 6.5). After 2010 entry and exit patterns remained similar, and the feature set did not change. However, similarly to Cluster 1, members of the traditionalist cluster also changed some of their feature values which altered the center vector. As this affected such feature values that were specific for Cluster 3 in comparison to the other clusters in the previous years ('Winemaking style', 'Age of barrels' and 'Length of maturation', 'Ratio of tradition wine types') its overlap increased regarding both clusters.

In conclusion dynamics of the second cluster were influenced mainly by external effects. Not counting the 2010s, its core members followed the same path which resulted in high legitimation and entry rates in the early period when the cluster center was distinct and the core members very similar. However, the cluster lost legitimation later on when the relevant feature set changed unfavorably from its point of view. First, this resulted in the drop of high pGoM entries, later on in high pGoM and in changes of core member's feature values. All in all, prolonged survival of traditional winemaking was the result of relevant feature dynamics and cluster space structure. Regarding the proposed mechanisms the following processes can be seen:

1. Feature dynamics of the 1990s enhanced the contrast of Cluster 2 by increasing the similarity of its members. On the other hand, it increased its overlap with Cluster 1. However, the negative effect of this was not that strong due to the unequal densities of the two cluster. Mechanism IV.2. and III.1.
2. Affects of new relevant features in the 2000s were the opposite regarding significance. While it reduced the contrast level strongly by extending the overlap between Cluster 1 and 2, the growing internal similarity moderated this. Mechanism IV.2. and III.1.
3. Entry of low GoM members and exit of high GoM members decreased cluster contrast in the second part of the 2000s. Mechanism II.2.
4. In the 2010s organizations approximated both other cluster centers by giving up cluster specific feature values. As a result, the feature vector changed which increased the overlap with both clusters thus reducing contrast. Mechanism V.2.

Altogether 14 instances of cluster mechanisms were identified. Most of these affected more than one cluster at the same time. Two of them was induced by entries or exits (II.), four of them by existing organizations and eight of them by the change of the relevant feature set. This suggests that at least regarding the winemaking population of Tokaj-Hegyalja the dynamic feature set was the most influential among the identified mechanisms. Thus Proposition 1 was supported by the results.

These results are hardly generalizable, both because of the method and the particular empirical set. Still, it confirms the possible impact of the changing feature value set.

6.5 MULTIDIMENSIONAL SCALING OF CLUSTERS

To summarize the processes described above and to provide a better understanding, yearly development of the cluster space was visualized by applying multidimensional scaling (Cox and Cox 2000). The aim of this was to help the understanding of the above analysis and see the development of winery sub-clusters as a whole.

Multidimensional Scaling is a data analysis tool for displaying distance like data. Originally it was used in psychometrics in order to understand people's similarity judgments regarding the members of a set of objects. The algorithm visualizes the similarity of such objects in a two or three-dimensional space, that differ in more than three dimensions. It calculates similarity distances between each pair of objects and assigns them with coordinates which represent the relative distances the best. (Young 2013). In this study, multidimensional scaling was used to visualize similarity clusters of wineries that the audience perceived and the dynamics of them. `Cmdscale()` function of R was used with Manhattan distances for calculations, similar to the applied FCM clustering algorithm. As the aim was to show the clusters the audience perceived, yearly visible feature vectors were included in the calculations. The results were presented in two-dimensional charts because this layout proved to be more spectacular. These figures were the not basis of any further analysis, they are presented for illustration purposes only.

In the yearly charts (Figures 6.12, 6.13, 6.14, 6.15 and 6.16), organizations are located according to their relative distances from each other, which allows the overseeing of the dynamics of similarity clusters. Also, their labels are colored according to their grade of memberships using the sRGB color scale, which corresponds to the former pattern: Cluster 1 is blue, Cluster 2 green and Cluster 3 red. Consequently, a bright red object indicates a winery with high membership in Cluster 3, while purple coloring refers to dual membership in Cluster 3 and Cluster 1. Coloring also carries information regarding fuzziness: the brighter the color of members the higher the contrast. Similarly, distance and dispersion of objects helps to identify cluster properties. Dense areas indicate the center crisp clusters. The visualization begins in 1995 as this is the first year when population density and the number of relevant features were high enough to result in meaningful illustrations. Annual charts will be presented in groups of four in order to expose the changes.

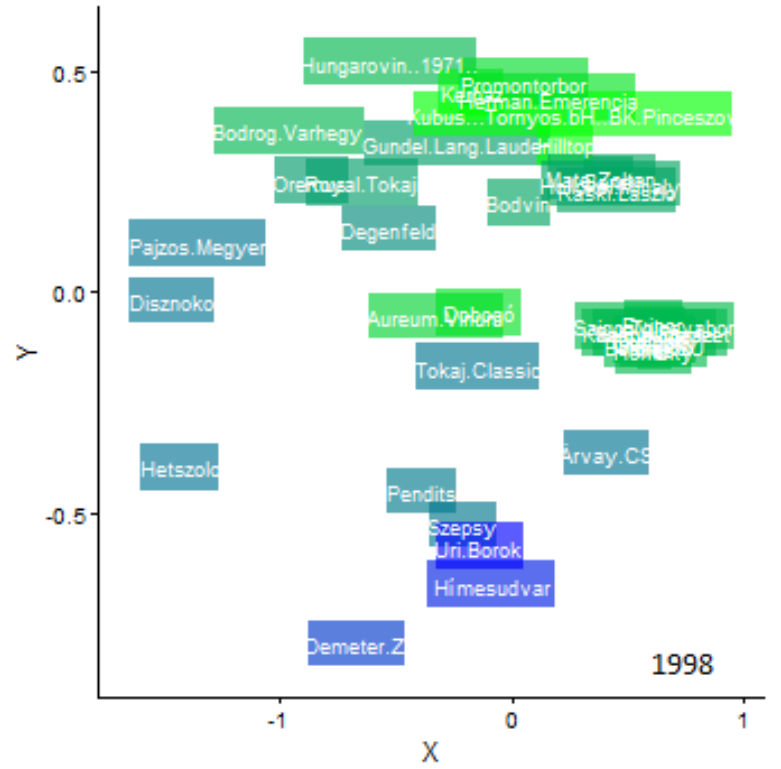
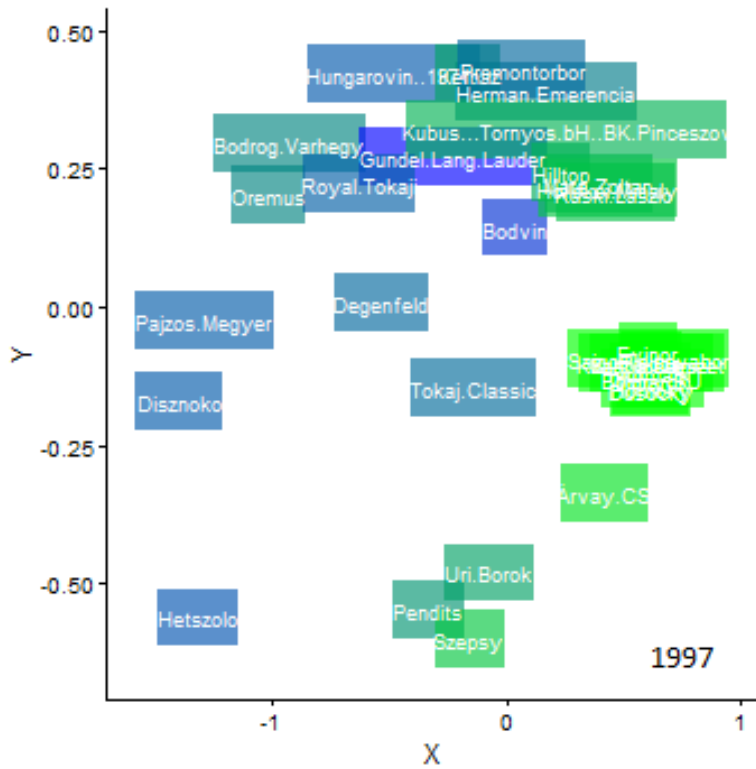
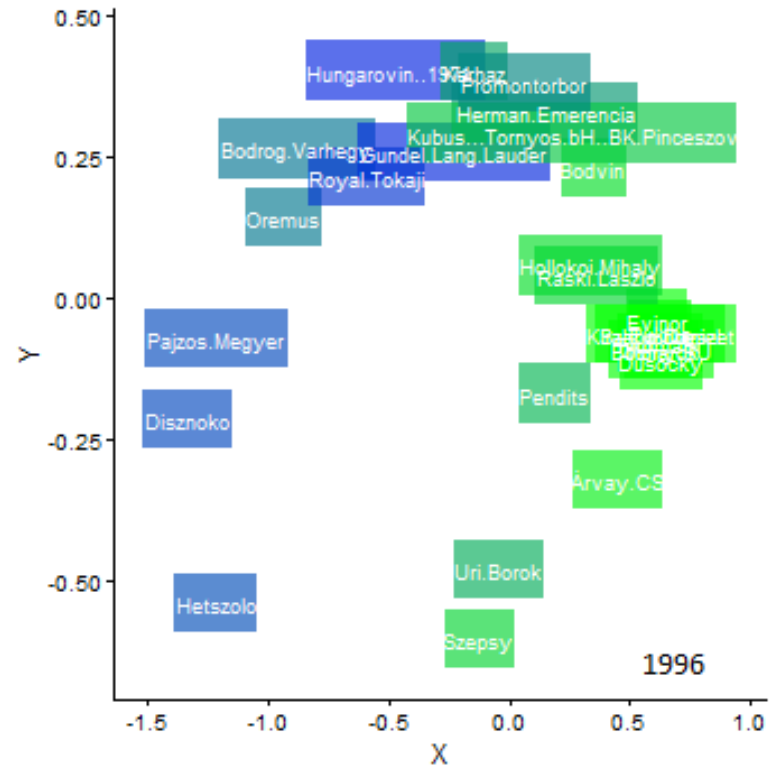
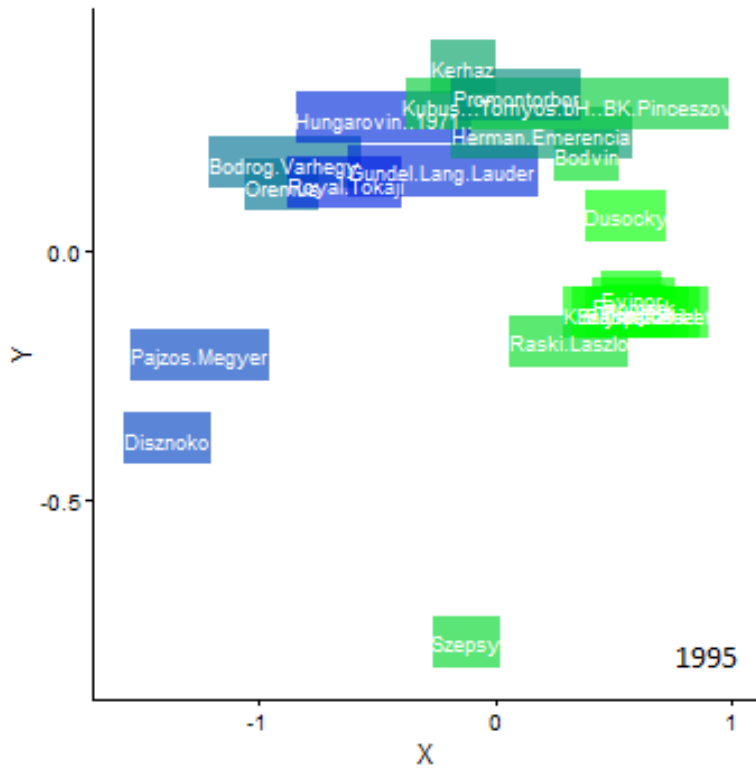


Figure 6.12: Multidimensional scaling of Tokaj winery sub-clusters 1995-1998

Cluster charts of the mid-1990s show the early period of the sweet wine reform attempt (Figure 6.12). Two Clusters could be perceived that time: the traditionalist Cluster 1 which contained predominantly small family (green) and the modernist cluster consisted of mainly large foreign estates (blue). The hybrid type nontraditional family wineries are located on the bottom, while the other transitional group the traditional large estates can be found on the top. As it was discussed earlier, a number of these type of organizations compared to core members determined cluster contrast. The core of the traditionalist Cluster 2 (green) was more dense and unified, its contrast was high which resulted in a higher entry rate. The modernist Cluster 1 (blue) remained smaller in terms of core members, thus lower in contrast which ultimately hindered the spread of modern sweet wine production. During these years the relevant feature set was stable, which is reflected by the relative position of wineries.

Figure 6.13 shows the early emergence of Cluster 3. Due to the new relevant feature values, the group of non-traditional family wineries gradually distanced itself from the other two clusters, as its members differed from the other types of wineries regarding these traits. Due to the same effect, the core of the future Cluster 3 became more dense, because typical members became more similar. Both paths of development can be observed on the charts. Despite this detachment, the overlap of Cluster 3 with the other two groups remained significant, which is indicated by the numerous purple and brown objects. This accounted for the early low contrast and low entry rate of the cluster.

Figure 6.14 covers the period when Cluster 3 narrowed and increased its contrast as a result of the growing relevant feature set. This also triggered new core entries in this cluster in 2005 and 2006 already. Besides that, the charts clearly show how the distance between the other two clusters decreased and they developed a greater overlap. This is indicated by the increasing number of teal colored objects.

Figure 6.15 shows the development of the cluster space between 2007 and 2010. This the period when Cluster 3 proliferated by attracting entrants with a high grade of membership. Even though many organizations entered at the periphery of the cluster, the high number of core members did not allow the contrast to drop. The charts show both phenomena. On the one hand, the number of purple and brown objects increased, on the other hand, the red center of the cluster became more and denser. In this period the winery population was shaped mainly by new entries because the relevant feature set and the cluster centers were stable. As these events predominantly happened in Cluster 3 contrast and composition of the other two clusters did not change much.

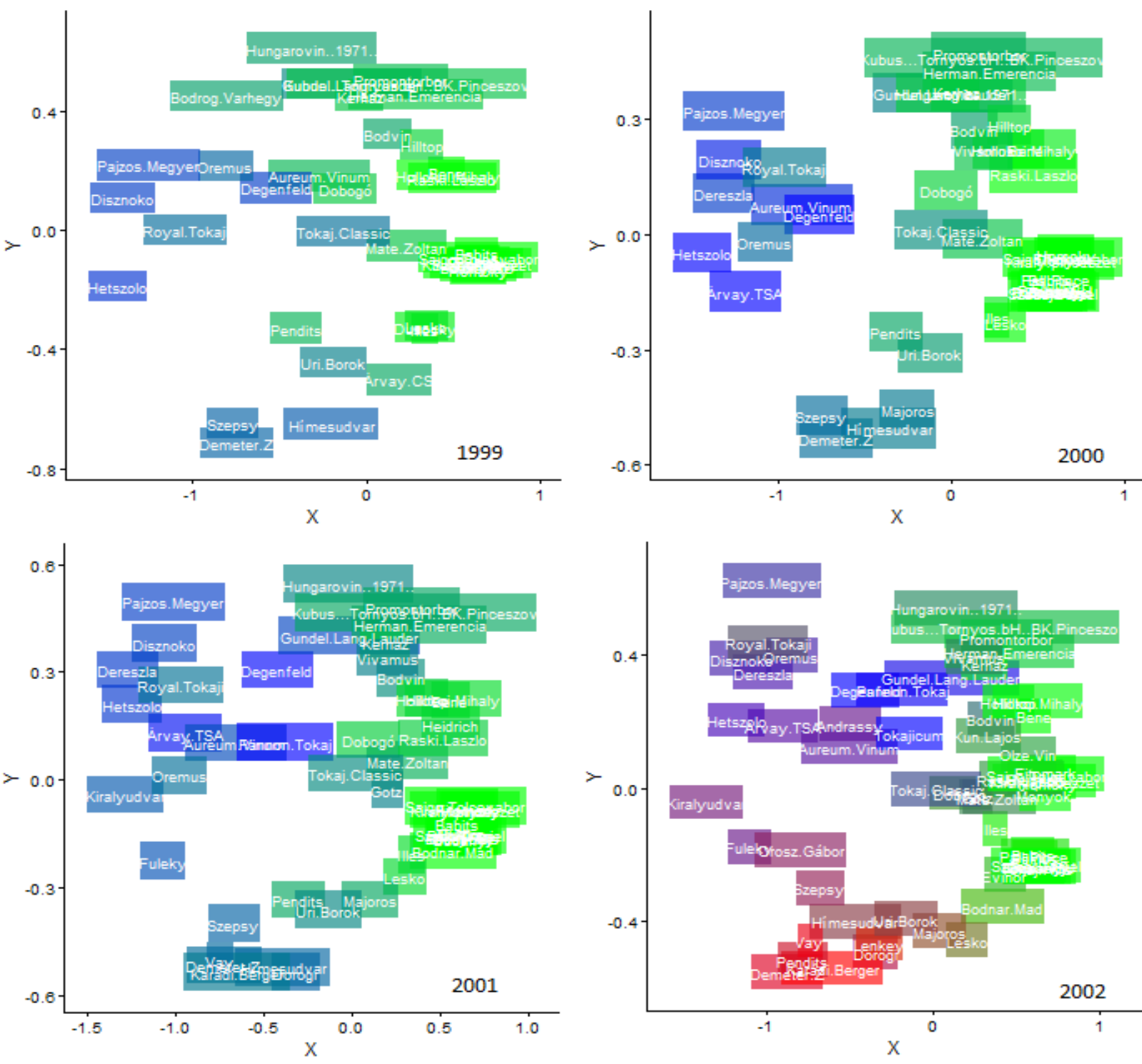
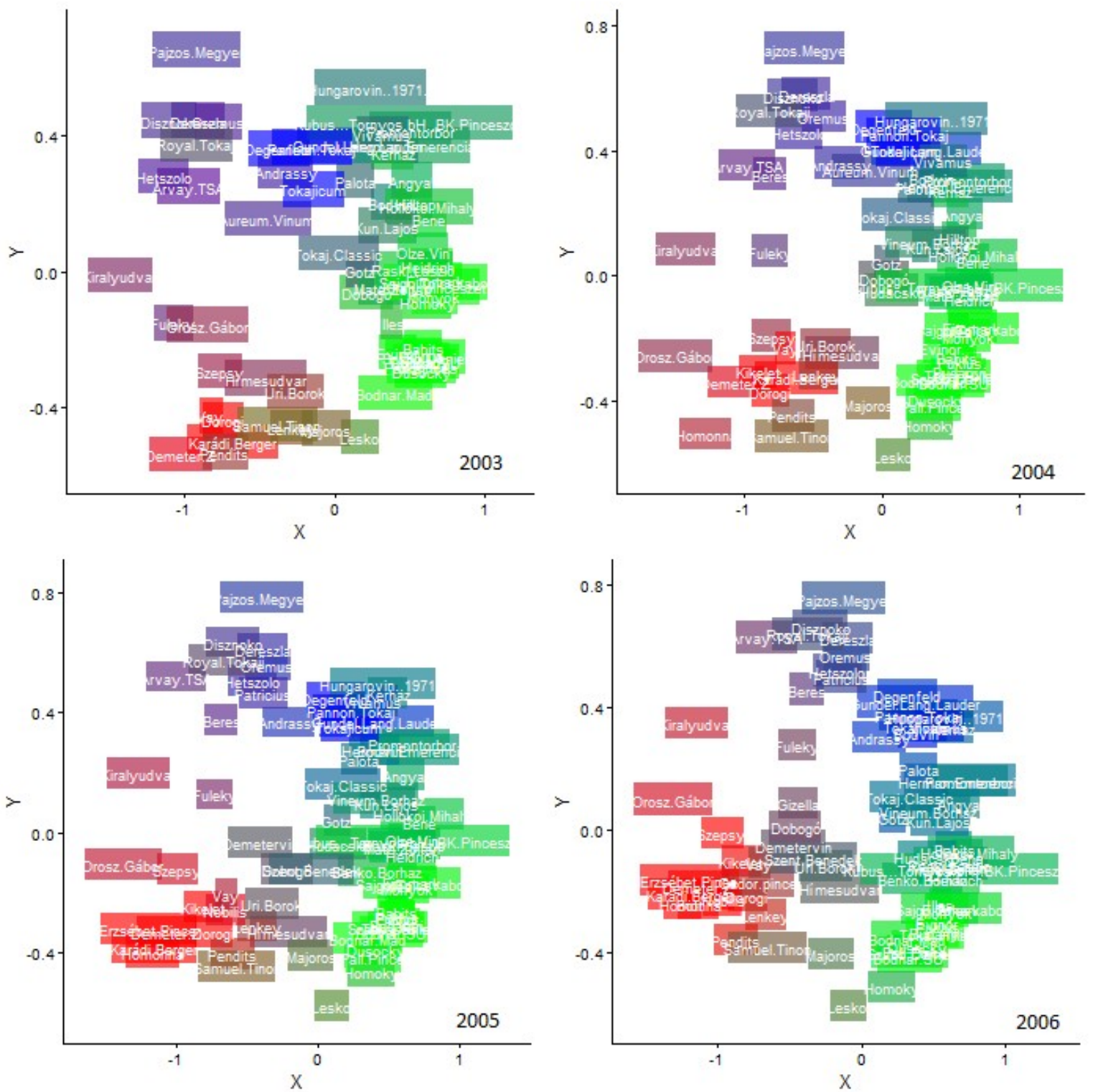


Figure 6.13: Multidimensional scaling of Tokaj winery sub-clusters 1999-2002



- Figure 6.14: Multidimensional scaling of Tokaj winery sub-clusters 2003-2006

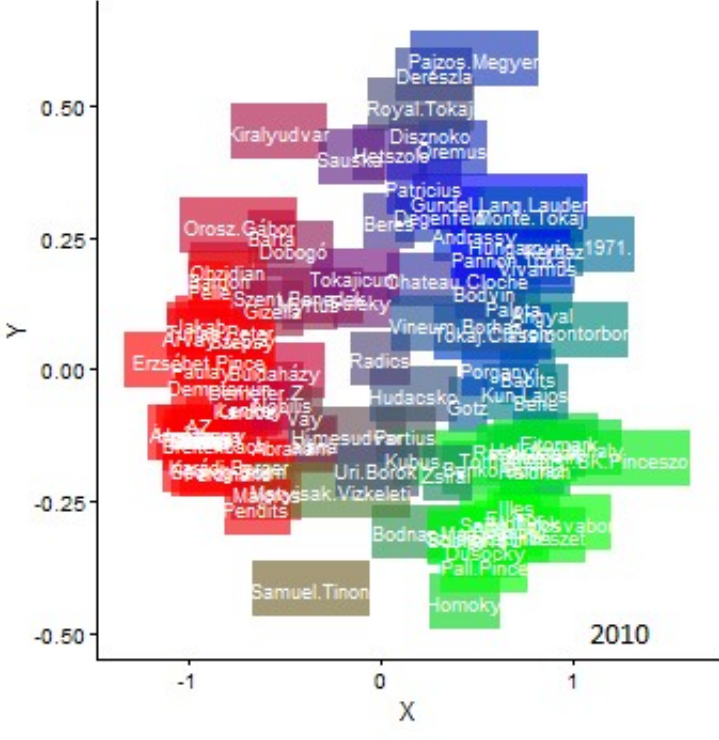
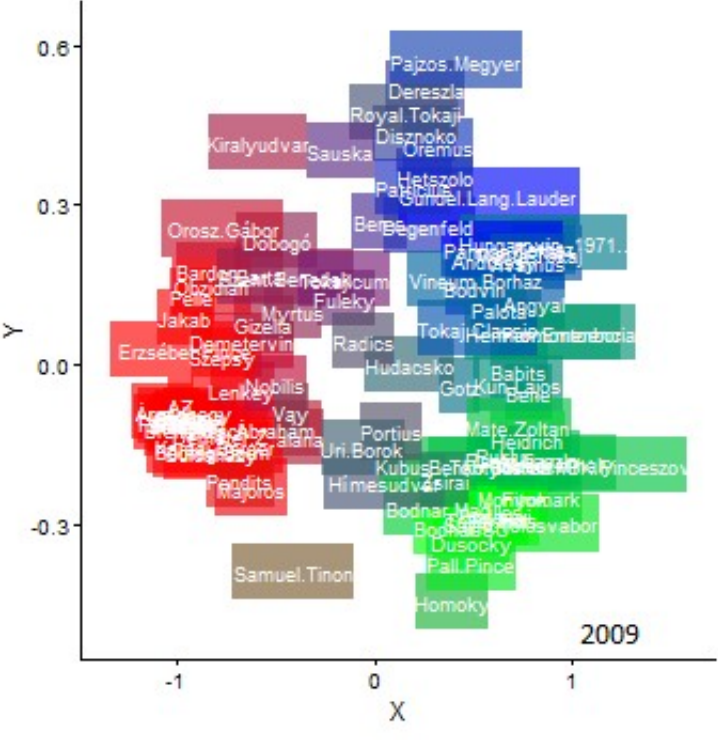
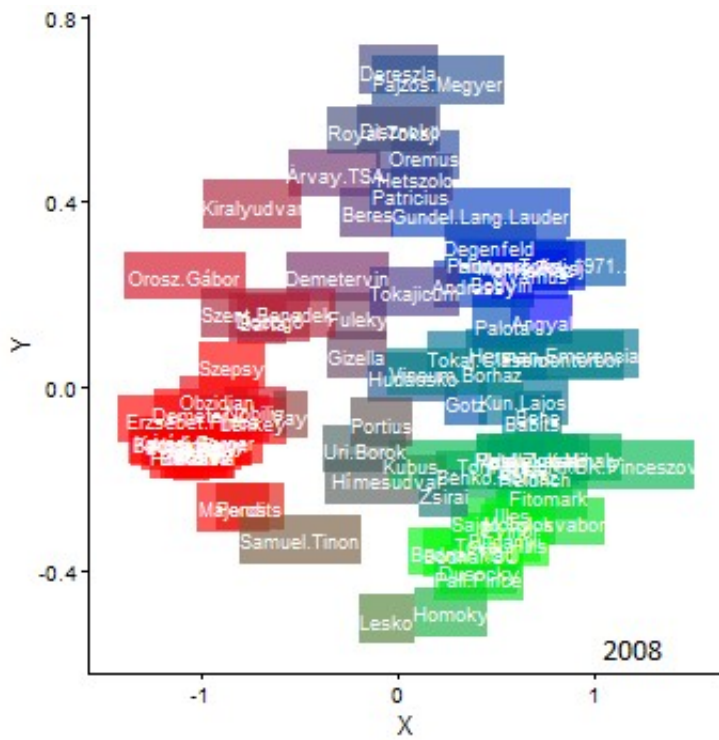
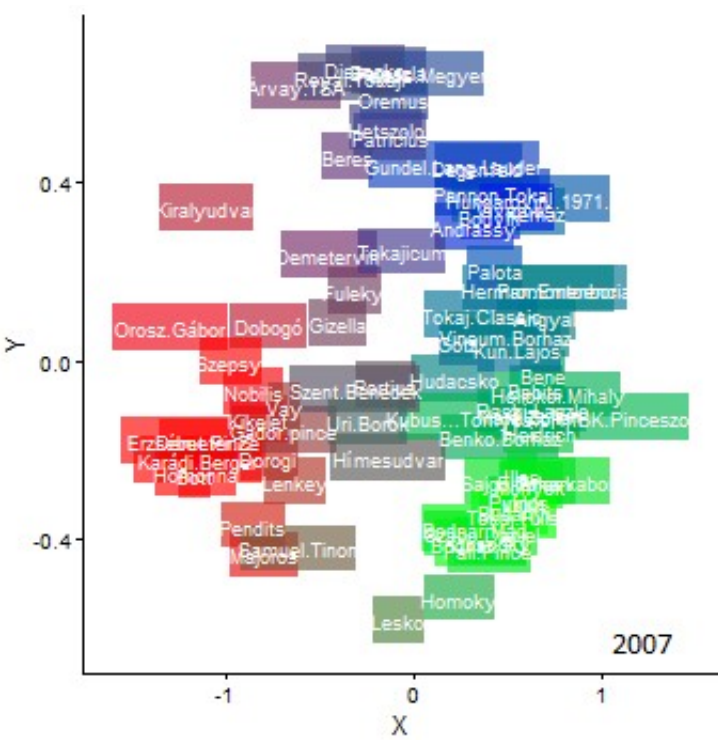


Figure 6.15: Multidimensional scaling of Tokaj winery sub-clusters 2007-2010

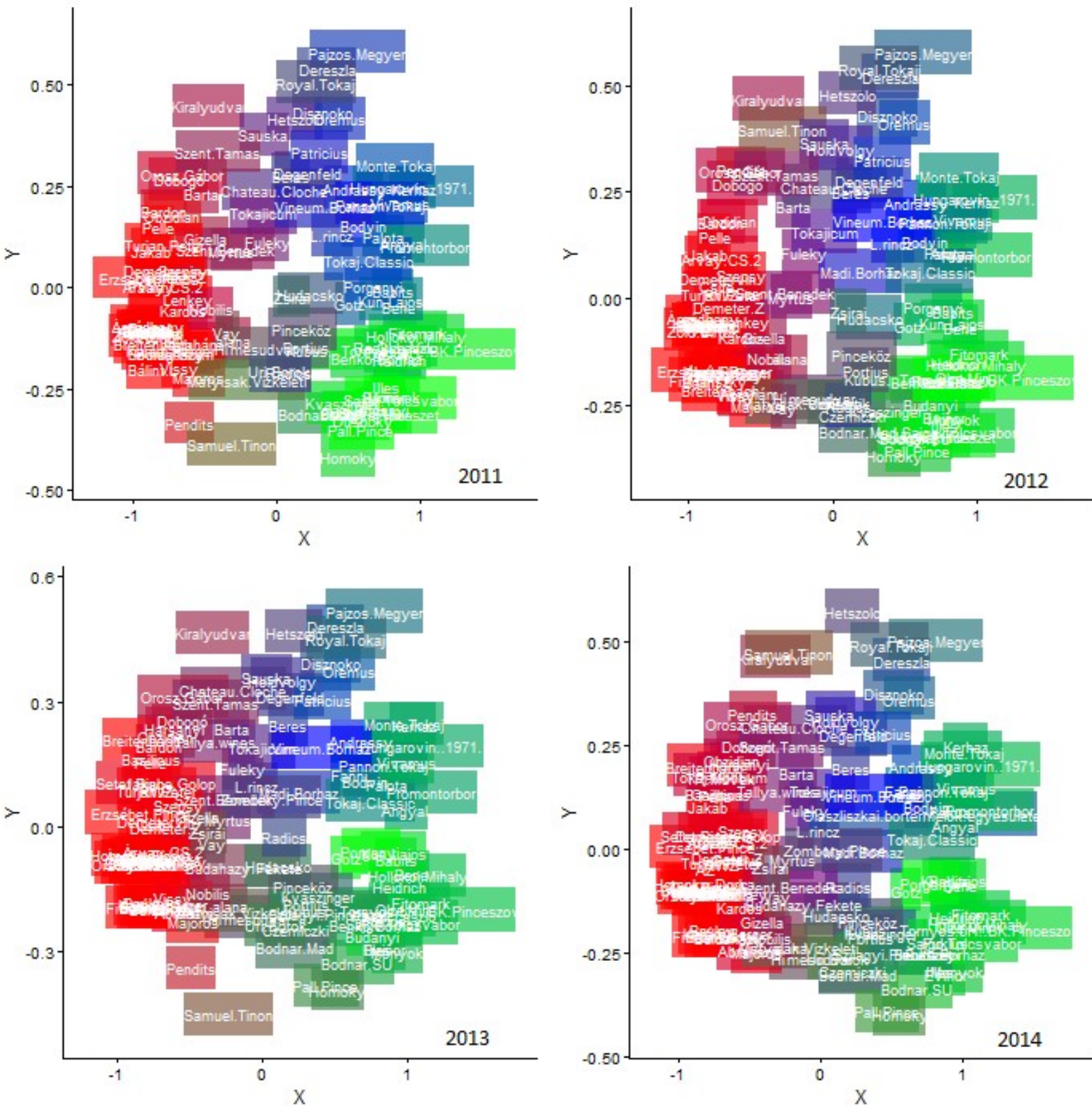


Figure 6.16: Multidimensional scaling of Tokaj winery sub-clusters 2011-2014

The most important phenomenon of the recent period is the approximation of organizations to the center of Cluster 3. The figures clearly show a growing number of wineries with hybrid membership (purple and brown objects). Besides that, the gradual approximation of cluster centers can be seen: the distance between the brightest spots of each cluster (location of members with a high grade of membership) decreased year by year. (Figure 6.16).

6.6 STRATEGIES

The fourth empirical research question addressed the successful strategies of winery groups. One of the most interesting findings of the research was the role of feature value dynamics. Presumably wineries or group of wineries can influence the composition of the relevant feature set, either by introducing and propagating new features or dismissing old ones. In other words, they can drive the proposed mechanisms in a way which is beneficial for them. In light of that, the following strategies are effective.

1. The introduction of those features is reasonable whose values are uniform within the cluster. As a consequence the similarity distance between cluster members will decrease; thus memberships and the contrast will grow.
2. It is even more beneficial when the core members of the cluster share the same value while peripheral members typically have the opposite. As a result, peripheral members might lose membership, which will increase cluster contrast,
3. Considering a set of two competing clusters the right strategy is to introduce such features whose typical value is different in the initiating cluster from that in the other cluster. This way similarity distance between the members of the two clusters will grow, and the extent of the overlap will decrease, resulting in a higher contrast for both clusters.

All three points applied on the new features that were introduced by the members of Cluster 3 in the mid-2000s. As a result, the contrast and legitimation of it grew which led to the increase of density due to the new entrants. The opposite was true in case of the sweet wine reform attempt of

Cluster 2. In fact the traditionalist Cluster 1 was the beneficiary of the process.

4. In the case of a set of more than two competing clusters, the most beneficial strategy is to introduce such features whose typical value is specific for the initiating cluster. In this case, the overlap with all other clusters will decrease. Also, the overlap will increase between the other clusters as similarity distance between their members will decrease. This way initiating cluster benefits from both its contrast growth and the contrast drop of the others.

Again the dry wine reform was characterized by the above mechanism. Regarding this point however we also have to take into account the possibility of dropping relevant feature. Even though this was not the case so far according to the collected data, but empirical evidence suggests that it is likely in the near future. Recent modification of the Wine Act, initiated by modernist winemakers banned most of the traditional wine types and reformers would like to go even further. As a result assortments will become unified, and the portfolio-related distinction will lose its meaning. In other words, the portfolio-related features will lose their relevance. In such cases the contrast effect is the opposite: dropping of those features is beneficial whose value typically concurs from that of the other clusters. Evaluating the Wine Act in this sense suggests that it will rather harm the legitimation of Cluster 3 by increasing the overlap with other clusters.

As another plans and initiatives of these winemakers concern similarly diverse features (for instance compulsory yield limitation for certain wine categories) it seems that the goal of Cluster 3 is not the separation anymore, but an accelerated conversion of other wineries. In other words, assimilation of the other clusters. Long term success of this strategy depends on the length of transition. The first period will definitely result in contrast drop, due to the high number of new peripheral members in Cluster 3. After a point however further unification will increase category contrast. Therefore, if the dry-wine producer cluster survives the initial part of transition, the strategy will succeed.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

The empirical setting of the research was the wine producer population of Tokaj-Hegyalja, a traditional wine region in Hungary, which went through a major transition in terms of winemaking technology, cultivation method and products between 1989 and 2014. The thesis gave an explanation for this process within an organizational ecology context. To this end, existing theories were tested and extended.

7.1 AIMS, EXPECTED CONTRIBUTIONS AND RESEARCH QUESTIONS

The research agenda set goals both regarding empirical and theoretical contribution.

In terms of the empirical challenge, it aimed to give an explanation for the unusual development of Tokaj winemaking and to show new aspects of wine related market mechanisms. Research questions 1. 2. 3. and 4. addressed this challenge, while Proposition 1 revealed the key market mechanism that triggered the transition process.

Research Question 1.: Why did dry wine production break through in the 2000s?

Research Question 2.: What prevented the modernist sweet wine style from spreading during the 1990s?

Research Question 3.: Why did the traditional wine style remain dominant for so long?

Research Question 4.: What strategies of winery groups proved to be successful?

Proposition 1.: Contrast mechanisms driven by the dynamic relevant feature set were more influential than the other mechanisms.

By unfolding the development process in a detailed way and analyzing the strategy of winery clusters, these empirical goals have been achieved.

The expected theoretical contribution was twofold. On the one hand, the aim was to support the existing contrast dependence theory with empirical evidence.

Research question 5. and 6. which was the basis of Hypothesis 1. and 2. aimed to support this goal by addressing such parts of the theory that were not tested yet.

Research Question 5.: Does contrast determine vital rates on the sub category level?

Research Question 6.: Does contrast determine vital rates of similarity clusters?

Hypothesis 1.: Contrast dependence takes effect on the sub-category level.

Hypothesis 2. Contrast dependence can take effect in early stages of legitimation already.

The hypotheses were tested and supported statistically. This way the thesis provided evidence for contrast dependent legitimation by finding that contrast growth has a positive effect on cluster contrast on entry rates. This complements the study of Bogaert, Boone and Carroll (2006) that explored a causal interference between contrast and mortality rate. It is important to emphasize the effect applied to multiple clusters in a longer time period. Moreover, the meaning of clusters changed by time due to the dynamic relevant feature set. Consequently, contrast dependence generally applied to the Tokaj winemaker population.

Another expected contribution was to develop the theory further by introducing the possibility of a dynamic relevant feature set. Based on this extension several contrast mechanisms were described and identified in the empirical setting. A more important contribution is that a dynamic relevant feature set offers of modeling the long known recognition that the meaning of organizational forms change by time. Moreover, this also enables to include environmental drifts to future models through the changes of audience preferences regarding relevant feature values.

7.2. LIMITATIONS

Main limitations of the research can be divided into three groups. Limitations regarding the variables that were included in the analysis, limitations regarding the model and limitations regarding causal effects.

Variables. Many more factors could be included in the model either as independent or control variables. Here, the focus will be on the two most prominent limitations. First, the research did not differentiate between entirely new wineries and those organizations that operated before (for instance as vinegrowers). It is likely, that contrast mechanisms affected these types differently. It is also likely that the origin of wineries determined their initial feature values. Finally, defining vine growers as a risk pool of possible winery foundings could sophisticate the analysis further, as the entry rate possibly depended on the number of these "winery candidates" also. Such analysis however, requires complete data of winegrowers, which was not available.

The second excluded variable is price. The practical reason behind this was that wine price or portfolio price level was not detected in experts' publications; thus it was not considered as a relevant feature. Still, the initial data collection covered price data as well. The collection was difficult however especially for less prominent wineries and past prices. Thus, the collected price data correlated with certain winery types. In other words, it was not randomly assigned which did not allow it to include it in the analysis. Nonetheless, classical evolutionary studies of organizational ecology that cover longer periods (density dependence papers for instance), also used mortality rates as success indicators instead of product price.

Model. Contrast effect on mortality was not tested because of the low number of detected events. This is partly due to the traceability problem: the analysis did not include those wineries that failed before they market their products. Another explanation is that joint businesses such as tourism and mainly the possibility of selling the grapes to the state-owned cooperative allowed organizations to maintain winemaking even if it was not profitable.

In the model, non-wine-related activities were coded as feature values. Possibly a more appropriate modeling would have been to consider them as memberships in different organizational populations, for instance, hotels and restaurants. It is most likely that such multiple category

memberships also affected vital rates either positively (more secure financial background) or negatively (consequences of a lower grade of membership). The reason of the coding method were the simplification of the modeling and research agenda, data limitation and the fact that this factor was mentioned in experts' publications as a relevant feature.

Causal effects. In the research, wineries were understood mainly as dependent actors of external effects (relevant feature set) or impact factors that were the results of determined collective actions (cluster contrast). Even though organizational ecology suggests that organizations are rarely the masters of their own fate, the predictable collective movement of populations is always composed of individual paths of action. Also regarding Tokaj, there are relevant causal relationships that the thesis did not address. One of these is the domain of relevant features. What kind of organizations introduced them? What kind of wineries adopted their new values? Under what conditions accepted the audience a new feature as relevant? Similarly, the research did not address the reasons behind the movement of organizations in the feature space. The main reason while these questions were not addressed was the necessity of narrowing down the scope of the research project.

7.3 FUTURE RESEARCH

In terms of future research, two main directions can be taken. On the one hand the existing research can be improved by overcoming some of the limitations listed above. Inclusion of mortality rate is possible by redefining the event including permanent activity break or switching primary activity. This step would strengthen the theoretical claim about the effects of contrast by demonstrating its influence on the another vital rate. Similarly, inclusion of further overlapping organizational categories would strengthen the same claim on the contrast's side.

Investigating the reasons behind inventing, adopting and accepting new relevant feature values is also an interesting path, similarly to feature vector changes. The existing data set is suitable for this kind of analysis after a medium extension.

On the other hand, two of the suspended research avenues can be improved further. In a case of the status-based approach unfolding the empirical puzzle of Tokaj-Hegyalja is not justifiable anymore.

However, by testing and elaborating the theory of status transfer mechanisms could contribute to the status literature. This requires either improving the model of label operationalization or finding a solid data set about past status data. If the second condition is met, it would also allow studying aspects of status signaling on wine labels by including those difficulties that led to the rejection of label-based status measurement: signal faking, delayed signaling, signaling according to the desired status level and signal development.

The sub-form emergence model is rather a seed of a future theory, that requires further development and an appropriate empirical setup for testing. One possible direction of theory development is focusing on the effect of hybrid members and unfold how they block the transition process by lowering the contrast of the new sub-form. A possible test is the comparison of the same organizational form in countries, where the composition of the population differs in terms of hybrid ratio.

APPENDICES

Appendix 1

List of primary data sources

Wine guides

Rohály Wine Guide Hungary 1994-2011 (Rohály 1994-2011)
Gault&Millau Hungary 2014-2016 (Molnár 2014, 2015 and 2016)
Ripka Tokaj Kalauz Guide 2014-16 (Ripka 2014, 2015 and 2016)
Alkonyi Tokaj Compass 2008 (Alkonyi 2008)
Alkonyi Borbarátok 7x7 2006-2007 (Alkonyi 2006 and 2007)
Rohály-Mészáros-Nagymarosy: Terra Benedicta 2004 (Rohály et al. 2004)
Dániel Kézdy – Emberek és Dűlők (Kézdy 2014)

Wine magazines

Borigo Magazine 2004-2016
Decanter Hungary 2003-2011
VinCE Magazine 2011-2016
Borbarát 1996-2010

Other printed materials

Dlusztus Imre - Magyar Borászok – Árvay János (Dlusztus 2004a)
Dlusztus Imre - Magyar Borászok – Szepsy István (Dlusztus 2004b)
Sándor Ésik – Borsod-Abúj Zempléni Almanach (Ésik 2004)
László Alkonyi - Tokaj: the wine of freedom (Alkonyi 2000)
László Alkonyi - Tokaj: the myth of terroir (Alkonyi 2004)

Wine blogs:

albertgazda.blog.hu
alkoholista.blog.hu
borbandi.reblog.hu
borboy.blog.hu
bordogsag.blog.hu
borrajongo.blog.hu
gaultmillau.hu
hozamkorlat.blog.hu
imad.blog.hu
muvelt-alkoholista
szomjasgodeny.hu
tancolomedve.hu

Online wine press

bor.mandiner.hu
boraszportal.hu
borespiac.hu
borigo.hu
borravallo.hu
elitbor.hu
vinoport.hu

Wine association homepages

Tokaj Renaissance – www.tokaji.hu
Mád Circle – www.madikor.hu
Tokaj Wine Artisans' Society – www.tokajbormivelok.hu
Tokajvinum Hungaricum Society - www.tokajvinum.hu
Tokaj Woman and Wine – www.tokajborbaratnok.hu
Association of Winemakers in Tokaj - <http://tokajiboraszokasztaltarsasaga.hu>

Online wine retailers

bortatsasag.hu

borbolt.hu

borhalo.com

borhazmagyarország.hu

borkereskedes.hu

bornyito.hu

borrendeles.com

borszoba.hu

borterasz.hu

borudvar.hu

drinktracy.hu

idrinks.hu

italwebaruhaz.hu

kezmuvesborok.hu

mitiszol.hu

monarchiaborok.hu

pannonborbolt.hu

pincearon.hu

pincekulcs.hu

radovin.hu

selection.hu

terrahungarica.hu

tokajiborbolt.hu

vinodoro.hu

zwackwebshop.hu

Broadcasted programs

Radio programs:

- Bor Klub (Klubrádió)
- Borivóknak való (Hungarian Catholic Radio)
- Hordóminta (InfoRádió)
- Borjour (Jazzy Rádió)

Television programs:

- Adventures in Tokaj-Hegyalja (Zemplén TV)
- Törzsasztal Magazine (Szeged TV)

Youtube chanel:

- Bortárság
- Terra Hungarica
- Furmint USA

Wine expert interviews

- Gábor Rohály (Wine Guide Hungary)
- László Alkonyi (Friends of Wine)
- Gergely Ripka (Tokaj Guide)
- Sára Megyeri (Borjour)
- László Bálint (Borigo)
- Dániel Kézdy (Vinoport.hu)
- Adrienn Tóth (Vinoport.hu)
- Tamás Unger (Művelt Alkoholista)
- János Gervay (Onyx Restaurant)

Winemaker interviews (winery names in parantheses)

János Árvay (Árvay Winery)
Zoltán Asztalos (AZ Nektár)
András Bacsó (Oremus)
István Balassa (Balassabor and Szent Tamás)
Sarolta Bárdos (Tokaj Nobilis)
Ákos Bihari (Ferdinánd)
Sándor Bodnár (Bodnár és Társa)
Zoltán Demeter (Demeter Winery)
István Götz (Götz Winery)
Attila Homonna (Barta and Homonna Winery)
Péter Várhelyi (Hímesudvar)

Wine trader interviews (shops in parantheses)

Antal Kovács (Pinceáron)
Richárd Póta (Dropshop)
Mammut melleti boros figura (Szalonspicc)
Dávid Fekete (Palack)
Dávid Polák (DiVino)
József Szentesi (Kézmes Borok Háza)
Viktória Németh (Pohárszék)
Krisztina Mátéffy (Dolce Vita)

Winery interviews on wine tasting events

Andrássy
Babits
Balassabor
Béres
Bott
Bodvin
Disznókő

Degenfeld
Ferdinánd
Gizella
Hétszőlő
Kikelet
Majoros
Nobilis
Orosz Gábor
Pajzos-Megyer
Pelle
Pendits
Szarka
Szent Tamás
Tállya Wines
Tokaj Kereskedőház

Appendix 2

TRADITIONAL WINE TYPES

Aszú

Aszú is a botrytized sweet cuvée, one of the most known products of Hungary. The original meaning of its name is dried or shriveled in old Hungarian, which refers to the production method of it. The botrytized berries the so-called Aszú berries are selectively picked out from the grape bunches one by one. As the botrytis infection spreads gradually on the grape, there are several pickings in the same vineyard the harvest workers have to go through again and again. They collect berries in large vats where it is trampled to a consistent paste the "Aszú dough", which is soaked in the base wine or must for 24 or 48 hours. The purpose of this maceration is to extract the sweetness and the aromas of the berries. After the soaking, the wine or must is moved to a wooden barrel or steel tank for fermentation. The fermented wine must be matured for at least two years wooden barrels and for a year in bottles. According to the level of their natural residual sugar content, Aszús are labeled with "puttony" numbers from 3 to 6 (3 from 60 g/l, 4 from 90 g/l, 5 from 120 g/l and 6 from 150 g/l). Puttony is a traditional harvest tool, a wooden hod carried on the back, served for collecting and transporting the Aszú berries. Originally puttony numbers on wine indicated the amount of Aszú dough that was added to a traditional Gönc cask (136 liters) of must or wine, but today categorization is based on measured residual sugar content. Aszúesszencia is another sub-category of Aszú wines which has higher natural residual sugar content than the 6 puttonyos Aszú (above 180 g/l). The Aszú categorization system was simplified in 2013. From that year only one Aszú can be produced, with a minimum residual sugar content of 120 g/l.

Sweet Szamorodni

Szamorodni wines were the most popular wine types of the region until the late 16th century which is the assumed invention time of the Aszú, and even after that time they remained important products. There have never been essential differences regarding production methods between Szamorodni and ordinary wines: harvested grapes are picked and pressed in the usual way. The difference is that bunches used for Szamorodni wines contain a significant amount of Aszú berries. Its name, which has Polish origin also refers to this production method; it means "the way it was grown". From a different

angle, Szamorodni differs from the Aszú in the sense that botrytized berries are not picked out of the bunch before pressing and are not soaked in the base wine or must after. Thus, unlike the Aszú which is more tannic and robust because of the extended maceration, Szamorodni is a fruitier wine. In comparison with regularly fermented wines, it has a higher alcohol and extract content, and the residual sugar level is also higher (up to 120 grams). Another difference is longer aging, as Sweet Szamorodnis have to be matured for at least two years wooden barrels.

Dry Szamorodni

As its name suggests, this wine differs from its sweet counterpart in the level of residual sugar. Dry Szamorodni is produced when bunches contain less Aszú berries, thus most of the must's sugar content converts into alcohol. On the other hand, this wine also has the Szamorodni aroma characteristics and concentration, besides it is also matured in wooden barrels for years. Some wineries prefer not to fill the Dry Szamorodni barrels in order to age their wine in the presence of oxygen. During this process the wine develops a thin layer of yeast on its surface which results in a particularistic sherry-like taste. Despite being a unique wine type, nowadays Dry Szamorodni is barely produced, even those vintners who prefer the classical Tokaj wines rarely keep it in their assortment.

Esszencia

Esszencia is the sweetest wine specialty of Tokaj-Hegyalja. It is made from the must which is pressed out from the dough solely by the weight of the Aszú berries themselves without any pressure applied. This wine is produced in very limited quantities as 1 liter of it requires about 30 liters of Aszú dough. The sugar content of the Esszencia must can exceed 800 g/l, which makes the alcohol level incapable to rise higher than 6 degrees during fermentation. So strictly speaking, it can not even be considered as wine. Esszencia is aged in glass carboys.

Fordítás and Másolás

Fordítás is a sweet wine which name means "turning over". This wine is made with the reuse of the Aszú dough that still contains plenty of sweetness after the maceration in the base wine of the aszú. The dough is soaked again in fresh must and fermented after it. Apart from that, Fordítás is made the same way as the Aszú, not counting that law does not prescribe the minimum length of maturing in wood. Its residual sugar level depends on the quality of the Aszú dough after, but the wine can reach the sugar

content of high category Aszús.

Máslás in turn, is mostly dry. It is produced by using the marc of Fordítás or Aszú for maceration; otherwise the technique is the same. Both Máslás and Fordítás are rare types nowadays. Recently only such wineries were producing it still whose aim was to have a complete traditional portfolio. In 2013 both categories were ceased to rationalize the traditional portfolio.

Semi-sweet varietal wines

These wines are on the bottom of the traditional assortment. They are produced from healthy grapes of all three varieties, both in wooden casks and stainless steel tanks depending on the winery. Price-wise, semi-sweets are typically the cheapest product of the wine region.

NON-TRADITIONAL WINE TYPES

Dry varietal wines and cuvées

First historical source about dry wine production is from the 18th century. It mentions Ordinárium or ordinary wine which is a simple dry cuvée made from non-botrytized grapes of different varieties harvested, together. In some sense, this is the predecessor of today's dry wines, but in 1989 varietal semi-sweets were dominant. Thus there is not such a continuity as in the case of the wine specialties. In the studied period, two main distinctive dry styles existed, light and fruity dry wines fermented and matured in stainless steel tanks and full-bodied dry wines matured in oak. Both types were discussed earlier in detail. The model does not categorize them separately because other features include the differences.

Single vineyard selections

The main difference compared to the previous category is that these wines are produced from the yield of a specific location, which is indicated on the label. The aim of this wine type is to express the characteristics of the terroir of the vines whose grapes it was made from. This can be facilitated by strong yield limitation and cultivation of old vines. Single vineyard selections are typically made in reductive wine style and matured mostly in the short term in young oak casks, thus regarding style they are similar to the second type of dry varietal wines. In terms of fermentation some winemakers prefer

to use stainless steel (Demeter and Nobilis) but the majority ferment it in wooden barrels (Szepsy, Homonna and Bott.).

Late Harvest Wines

This category was created as a workaround in the early '90s by wineries whose Aszús and Szamorodnis did not pass the "style examination" of the National Wine Tasting Committee. Thus, originally it consisted of such sweet wines that went against the traditional taste with reductive winemaking style and short maturation. Later on as not being tightly regulated, it became a wine category of every sort of non-traditional sweet wines, covering a wide range regarding wine style production method and sweetness level. According to the consensus of the late 2000s, it is a reductive Szamorodni type wine with a residual sugar above 100 g/l made of bunches containing botrytized or shriveled berries and matured shortly in oak or in steel tanks only. In the assortment of many non-traditional wineries this was the only sweet wine type besides Aszú. It was positioned below it both in pricing and prestige.

Ice wine

Ice wine is type of dessert wine that is made from grapes that have been frozen on the vine. When temperature continuously remains below zero water content of the berries freeze which increases their concentration and sugar content. After pressing the ice remains in the marc, while concentrated juice flows out. It is not beneficial when grapes of ice wine are botrytized, because the wine will not have a fresh taste. Thus climate of Tokaj-Hegyalja is not particularly suitable for ice wine production. Still, there were vintages which allowed it and some winemakers produced it in these years. However, they could not release their ice wines because the wine committees did not approve it. Thus, producers labeled them as sweet cuvées with names referring to ice, such as "Ice spell" or "December Cuvée". Consequently, these wines will be considered as late harvest wines in the model, despite their recognizability.

Sparkling wine

Sparkling wines have not been produced in Tokaj-Hegyalja until 2009. Since then multiple wineries started to experiment with it. They predominantly used Furmint as base wine and followed the champagne method. The early attempts were partly motivated by the weak vintages of 2009 and 2010, but as market feedback was positive, pioneer winemakers kept producing it. It is hard to foresee

whether it will remain in the assortments for a long time but acknowledged winemakers such as Zoltán Demeter and István Szepsy Jr. claim that sparkling wine will be the main topic of the next decade in the wine region. There were also single vineyard sparkling wines produced in Tokaj. Despite parcel selection, these products are also considered as part of this category in the model.

Appendix 3

Contrast dependence test - Sensitivity analysis (m=1.8)

Variable	Model 1	Model 2	Model 3	Model 4
Contrast	4.065 *** (0.967)	4.173*** (0.970)	3.324*** (0.970)	4.230*** (0.949)
GDP ₁	-0.064 (0.054)	0.064 (0.050)	0.050 (0.047)	0.061 (0.049)
C ₁		-0.593* (0.326)	-0.879*** (0.337)	-0.833** (0.0359)
C ₂		-0.710** (0.306)	-0.831*** (0.294)	-0.791** (0.305)
C ₃		omitted	omitted	omitted
Density			-0.011* (0.006)	
Density _{>0.5}				-0.016 (0.1191)
Constant	-1.693 (0.600)	-1.293 (0.614)	-1.004 (0.806)	-0.844 (0.689)
α	0.495 (0.238)	0.339 (0.208)	0.246 (0.189)	0.308 (0.201)
LR $\alpha = 0$	11.05***	5.43**	2.95**	4.37*
log - likelihood	-106.806	-103.991	-102.029	-103.000
LR χ^2 (d.f.)	15.70 (2)***	21.33 (4)***	25.25 (5)***	23.31 (5)***
No. obs. (years)	59	59	59	59

Significance levels:

* :10% ** : 5% *** : 1 %

Standard errors are in parentheses

Fuzzification parameter m = 1.8

Contrast dependence test - Sensitivity analysis (m=2.2)

Variable	Model 1	Model 2	Model 3	Model 4
Contrast	4.495 *** (1.200)	4.601 *** (1.195)	3.568 *** (1.203)	4.858 *** (1.278)
GDP ₁	0.044 (0.054)	0.050 (0.506)	0.033 (0.048)	0.042 (0.049)
C ₁		-0.678* (0.341)	-0.962 *** (0.351)	-0.972 *** (0.0373)
C ₂		-0.742 ** (0.323)	-0.869 *** (0.308)	-0.859 *** (0.318)
C ₃		omitted	omitted	omitted
Density			-0.011 ** (0.005)	
Density _{>0.5}				-0.020* (0.122)
Constant	-1.701 (0.666)	-1.251 (0.691)	-1.183 (0.666)	-0.797 (0.713)
α	0.589 (0.253)	0.418 (0.223)	0.306 (0.204)	0.351 (0.211)
LR $\alpha = 0$	15.66 ***	8.13 ***	4.27 **	5.6 ***
log - likelihood	-108.217	-105.278	-103.386	-103.904
LR $\chi^2_{(d.f.)}$	12.88 ₍₂₎ ***	18.75 ₍₄₎ ***	22.54 ₍₅₎ ***	21.5 ₍₅₎ ***
No. obs. (years)	59	59	59	59

Significance levels:
* :10% ** : 5% *** : 1 %

Standard errors are in parentheses

Fuzzification parameter m = 2.2

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