WORD-OF-MOUTH VERSUS EXPERTS AND REPUTATION IN THE INDIVIDUAL DYNAMICS OF WINE PURCHASING

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The dynamics of wine purchasing behavior is studied focusing on the respective impacts of the word-to-mouth versus wine expert judgements and reputations. To investigate the problem we apply the Galam model of opinion dynamics to agents who have to select a preference about which type of wine to buy given expert judgements, individual preferences and wine reputations. It could be, for instance, a preference between Bordeaux and Burgundy. The main novelty of the work is not about the building of a new model but indeed the construction of a scheme to confront the Galam model to a specific problem of the real world. Accordingly we design a commercial strategy to hold on to a share of the wine market. It provides a novel understanding on how, given some established reputation, the competitive interplay between social interactions and expert judgments affects the market shares distribution. The financial implications of the practical implementation of these results are discussed. In particular it is found that sample distribution of bottles could be drastically reduced from the usual levels practiced by producers. We hope our results will convince some wine producers to test our predictions.

Keywords: Wine purchasing; experts’ impact; modeling; threshold dynamics; opinion dynamics.

1. Introduction

Over the last decade, sociophysics has established an active field of research among physicists with the publication of a large number of papers [1, 2]. However, up to now, most of the works are conducted solely between physicists with just a few exceptions of co-authorship with social scientists [3]. In addition the quasi-totality of the models are always describing general, qualitatively features of social trends but refrain from making explicit predictions which in turn could be tested on the ground of the real fields they aim to tackle. All these facts are not to be taken as criticism of the field, which is still, in term of its maturation, at its early stages. Nevertheless, they indicate the necessity to encourage the “risky game” of venturing
on the slippery slope so as to make solid predictions to be tested in the real world. It is the aim of the present paper to engage the reader along this path.

Accordingly, the main novelty of our work is neither about the building of a new model nor about further investigation of an existing model. It is indeed about the construction of a scheme to confront the Galam sequential probabilistic model of opinion dynamics (GSPMOD) [4] to the individual behavior of wine purchasing. Given wine expert judgements, wine reputations, and consumer preferences, we focus on the effect of the word-of-mouth practiced while sharing a bottle of wine among friends. We design an explicit commercial strategy to size a share of the wine market.

There exist several interesting other models which could be implemented to study the dynamics of individual social choices. For instance the mean field Abrams–Strogatz model [5] proposed for the competition between two languages or the diffusion model, which has been successfully used for studying the impact of a new brand entry [6] and for understanding social interactions within the established networks [7, 8]. The agent-based modeling has proved to be a useful tool for example in examining the effect of reputations exchange [9], or exploring the co-evolutionary dynamic patterns of cultural diversity [10].

However they are rather phenomenological while the Galam model suggests a microscopic mechanism to monitor the individual opinion changes in addition to the existence of some common collective background of the population.

It is worth emphasizing that the consumption of wine on the world market has remained more or less stable in the last years [11]. While declining in Europe it slightly increases in Asia. Consumers or neophytes represent more than 50% of wine buyers. An average consumer becomes less and less predetermined in his purchase and thus more sensitive towards advertising and sales campaigns. Occasional as opposed to traditional wine drinking prevails, and wine companies search for new marketing solutions to attract newcomers and create customer’s loyalty [12].

Most attention is given to the impact of wine experts and critics on the wine market [13]. In addition, blogs of wine lovers suggest personal judgments and give comments on wines they consume [14]. Social wine networks are now established and more proliferate on the internet [15]. In contrast, very little focus has been attributed to the phenomenon of discussions among drinkers which produces the so-called word-of-mouth. The process of wine purchasing is quite complex and many variables could interfere with its consideration. To calibrate the eventual opposite impacts from respectively the judgement of experts, the respective reputations of different types of wines, and the opinion of friends is therefore crucial to forecast a commercial strategy to win the choice of drinkers.

We investigate this question using the GSPMOD. In the recent past, the model has been successful to predict a few outcomes of political events as well as to explain some paradoxical outcomes of public issues. It provides a novel understanding on how the competitive interplay between social interactions and expert
judgments affects the market shares distribution, which allows evaluation of the financial implications of a practical implementation of the results. In particular, it is found that sample distribution of bottles could be drastically reduced from the usual levels practiced by producers. A few illustrations are provided. The next step is to hope our results will prompt some wine producers to apply our predictions to validate or invalidate them.

2. Setting the Problem

In today wine market, each consumer has a large spectrum of preferences among thousands of bottles available either on the shelves of supermarkets (with in France on average between 500 to 800) or in specialized wine stores or even on numerous Internet wine sites. It makes consumers hesitate when selecting wines from the shelves. It is worth underlining the fact that wine is not a product, in which the consumer can experience or even imagine its intrinsic attributes before the bottle is open. Therefore purchasing wine is not an easy process in front of the tremendous number of preferences that a consumer should make. It is a preference bound with a part of uncertainty.

What do consumers do to reduce the risk? How do they increase the expected pleasure within a price constraint? Either they tend to repurchase a bottle of wine which previously brought satisfaction, or they could trust the opinion of their friends or they follow experts’ judgment.

Over the last decade, the impact of wine experts and wine critics, as for example e-Robert Parkers’ guide [13] or Denis Dubourdieu advice on wine purchasing in France ([14]), or even simple Internet wine guides ([15]) continue to influence the world wine market. Specialized journals publish monthly expert reports of wine tasting. Internet sites accompany each bottle with an expert point of view. New technology is put in place in supermarkets to guide a consumer through experts’ views on the bottles of wines presented on the shelves, bloggers of wine lovers suggest personal judgments and give comments on wines they consume; social wine networks proliferate rapidly on the Net permitting their members to share opinions on wines.

Wine consumers possess different tastes, express different preferences, and they can be described using different characteristics, such as socio-demographic for example (age, gender, occupation, education level, monthly income, etc.) or the characteristics of involvement with wine product. It is thus worth mentioning a number of research studies regarding classification of wine consumers that have been conducted. The groundwork on wine market segmentation, which was published by McKinna ([16, 17]), distinguished connoisseurs, aspirational drinkers, beverage wine consumers, and new wine drinkers. Spawton’s classification [23] was based on consumer expectations and risk-reduction strategies; he divided consumers by cask and bag-in-the-box wine drinkers. Hall and Winchester [26] added the enjoyment-oriented segment instead of new wine drinkers.
Several different approaches have been elaborated for wine market segmentation during the last twenty years. In their review of different segmentation approaches, Bruwer, Li and Reid [18] classified the consumer group with life style and concluded that wine markets have been segmented based on nine major segmentation variables: quality, consumption, risk reduction, occasion based, cross-cultural, behavioral, involvement, geographic, and wine-related lifestyles. They came up with enjoyment-oriented social wine drinkers, fashion-image-oriented wine drinkers, ritual-oriented conspicuous wine enthusiasts, purposeful inconspicuous premium wine drinkers, and basic wine drinkers. A variety of other classifications can be discovered in the wine marketing literature — Spawton [24] indicated that the wine industry has been subject to all types of segmentation.

Each of these classifications has its own advantages and the focus here is not to compare them or prefer one to another. What is important for us is the assumption that in each step of social interactions, consumers can communicate in principle with anyone who belongs to the same social network. Although people who drink wine bottles at respectively 100 USD and at 10 USD belong to different social networks, overlaps between them may happen in particular since we are treating the problem of competition between two types of wines, each one covering a large spectrum of prices.

Our study considers a population of wine drinkers who are not solid connoisseurs but do enjoy drinking wine while eating and purchase wines within the same range of price. These drinkers — neophytes — can enjoy different types of wine like for instance within French wines, Bordeaux and Burgundy. Accordingly we aim to investigate the dynamics of individual preferences within this neophyte population during repeated dinners with wine. Given some common shared reputation for each type of wine and some sensibility to experts’ recommendation, we model the effect of word-of-mouth driven by casual discussions among friends and guests while sharing a dinner. While eating and drinking, they comment on the quality of the wine they are currently drinking.

To address the problem we apply the Galam sequential probabilistic model of opinion dynamics (GSPMOD) [19, 20, 28] developed within the field of sociophysics [1, 2]. This model was applied successfully to predict the victory of the “No” to the 2005 French referendum on the European constitution. It was a highly improbable outcome of a political vote made several months ahead of the actual vote against all predictions of polls and analyses [21, 4].

The challenge is to adapt the GSPMOD scheme to the peculiarity of the wine market. As a first step in the process of modeling we restrict the study to the competition of two types of wines, like Bordeaux and Burgundy. We do not pretend at an exact description of a complicated situation but we aim at enlightening some mainstream features, which could be decisive in gaining a substantial market share in a competitive market. It is difficult, if not almost impossible to predict the wine purchasing behavior of each consumer. And we presume that there is no need to focus on that, there is no need to understand the behavior of each individual in
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particular, although we must to be able to predict the average behavior and prove it statistically.

The results open new and counterintuitive perspective on how to gain advantages in two types of wine competition. Another point we address in our model is the prospect of minimizing producer’s costs on marketing and promotion. These issues are also embedded in the approach. In a future follow up work we will investigate the effect of introducing the existence of stalwarts, agents who are anchored to one specific type of wine like Bordeaux or Burgundy. They stay unaffected by whatever influence is applied on them. In addition, using conviviality they try to convince others along their own preferences.

3. From Physics to Wine: The Model

3.1. Main features

Both types of wine, like Bordeaux and Burgundy, are in competition with a finite population of drinkers — the neophytes. We assume that each bottle of wine competes within its own type, no matter the price range of the wine. It thus creates the possibility of overlap among various social networks. Each consumer acts and makes decision on favoring one or another type of wine being located in its own specific price range.

We consider three mechanisms which are competing in the dynamics of individual preference. The first two are external to the population of agents and act directly on them. One arises from the view of experts who set a hierarchy among the two competing types of wines like Bordeaux and Burgundy, denoted respectively A and B. Let us suppose a majority of experts view B as better than A.

The second mechanism is connected to the reputation of each type which influence the setting of the proportions of consumers who favor respectively the A type and the B type. It is driven by marketing and corresponding commercials from all brands of wine from the same type.

Those two external mechanisms combine to yield proportions \( p_0 \) and \( (1 - p_0) \) of agents who prefer respectively type A and type B. It means that in case an agent buys a bottle of wine, it will choose a bottle from the A type with a probability \( p_0 \) and with \( (1 - p_0) \) a bottle from type B. In parallel, the existence of a reputation for each type of wine yields different proportions of agents who believe that overall type A is better than type B. We denote \( k \) the proportion associated with A and \( (1 - k) \) for B. It is worth to emphasize the fact that \( p_0 \) and \( k \) are the result of influences which are connected to different a priori about each kind of wine. Accordingly, an agent might be inclined to buy a bottle from type A for its next dinner following some recently read expert view although the same agent believes that overall B type is better than A type.

The third mechanism, which is produced by the word-of-mouth among the agents, is internal to the population. It generates possible shifts of the individual preference of agents at the advantage of either A or B depending on some local
rules. When a group of friends is having dinner drinking a bottle of type either A or B, each guest gives its appreciation of the current type they are drinking. We assume that the local majority of preferences, when applicable, wins the adhesion of the minority. That process is independent of who is the agent who brought the bottle of wine. The eventual shift of preferences of some agents means that at their next buy of a bottle of wine, they will choose one from the type which gains a majority of favor during the last dinner.

In case the dinner accounts for an even size of guests which divides exactly at equality for the type of wine preference, the local group will select the preference according to the reputation of each type. It is type A with probability $k$ and type B with probability $(1 - k)$. The value of $k$ is a fixed constant susceptible to be modified from varying the external effects, i.e., the experts’ view and/or a campaign to promote one of the two types of wine.

The associated overall dynamics is monitored by the existence of a tipping point located between two attractors, each one corresponding to a total holding on the market by one type of wine, respectively A and B. It is found that the flow of the aggregated individual preferences follows a constant direction determined by the initial respective shares of A and B with respect of that tipping threshold. To start above the threshold ensures invasion of the market at zero additional cost by internal reaction/diffusion among the agents without any activated external influence.

For each type, the major issue is then to start its sales from an initial share beyond its tipping threshold since once that is achieved, the effect of word-of-mouth is sufficient to produce a “self-increase” of its share within the population.

The dynamics of the model is characterized by local specific update rules among agents when sharing a bottle of wine, keeping in mind that wine is usually drunk within small groups of people.

3.2. General formalism of the model

While in the real world three above mechanisms (experts, reputations, word-of-mouth) can be activated simultaneously, here we consider that first two are applied prior to the third one. It means that we start from some initial conditions where $p_0$ and $k$ are given. Then we turn on the internal dynamics among the wine drinkers. Drinkers are then distributed randomly within small groups of a size varying from 2 up to some value $L$ to mimic dinners where agents are drinking one type of both wine and discuss their preference. Since larger groups always break down to small subgroups of discussion the value of $L$ is rarely larger than six.

After the dinner, each local group has adopted the same type preference following the local majority rule. In case of a tie at an even size group the type A is chosen with with probability $k$ and the type B with probability $(1 - k)$. Accordingly, after one cycle of dinners with a mixture of group sizes $n$ with the probability distribution $a_n$ under the constraint $\sum_{n=1}^{L} a_n = 1$ — where $L$ is the largest group...
size and \( n \) refers to the group size, the word-of-mouth dynamics has shifted the proportion \( p_0 \) of A type preference to a new value \( p_1 \) which is obtained from the update equation,

\[
p_1 = \sum_{n=1}^{L} a_n \left\{ \sum_{j=N[\frac{n}{2}]+1}^{n} C_j^p p_0^j (1 - p_0)^{(n-j)} + k V(n) C_x^p (p_0)^{\frac{n}{2}} (1 - p_0)^{\frac{n}{2}} \right\},
\]

where \( C_j^p \equiv \frac{n!}{j!(n-j)!} \), \( N[\frac{n}{2}]+1 \equiv \text{Integer Part of} \left( \frac{n}{2} + 1 \right) \), and \( V(n) \equiv N[\frac{n}{2}] - N[\frac{n-1}{2}] \).

This implies \( V(n) = 1 \) for \( n \) even and \( V(n) = 0 \) for \( n \) odd. The proportion of B type followers is then \((1 - p_1)\).

After this one update, agents are reshuffled into new groups to account for a new experience of wine drinking and discussion. It yields a new proportion \( p_2 \) starting from \( p_1 \). Repeating the process \( t + 1 \) times we have the recursion equation

\[
p_{t+1} = \sum_{n=1}^{L} a_n \left\{ \sum_{j=N[\frac{n}{2}]+1}^{n} C_j^p p_0^j (1 - p_0)^{(n-j)} + k V(n) C_x^p (p_0)^{\frac{n}{2}} (1 - p_0)^{\frac{n}{2}} \right\},
\]

which gives the value of \( p_{t+1} \) as a function of \( p_t \).

To follow the dynamics produced by repeating Eq. (2) we solve the fixed point Equation \( p_{t+1} = p_t \) to get the various attractors. We found that \( p_A = 1 \) and \( p_B = 0 \) are the two attractors of the dynamics whatever is the distribution of group sizes \( a_n \). First one corresponds to a total invasion of type A within the full population while the second one corresponds to a total invasion from type B. In addition, there exists a tipping point \( p_c \) located in between. Accordingly \( p_0 < p_c \) leads to \( p_t < p_{t-1} < \cdots < p_1 < p_0 \) while \( p_0 > p_c \) leads to \( p_t > p_{t-1} > \cdots > p_1 > p_0 \) showing that knowing \( p_0 \), the actual value of \( p_c \) is fundamental to determine the impact of the word-of-mouth effect on the market of wine drinkers. However its value does depend on the distribution of sizes \( a_n \) contrary to \( p_A \) and \( p_B \) and cannot be solved analytically for \( L \geq 5 \). But it is easily solved numerically and is found to obey \( p_A < p_c < p_B \) with \( p_c = p_A \) and \( p_c = p_B \) for \( L = 2 \) at respectively \( k = 1 \) and \( k = 0 \).

Figure 1 shows the three typical cases with a bias in favor of type A, no bias and a bias in favor of type B, associated respectively to \( k > \frac{1}{2}, k = \frac{1}{2}, k < \frac{1}{2} \).

### 3.3. Highlights of the model

To illustrate the major features dynamics associated to Eq. (2) we select the two peculiar cases \( a_3 = 1 \) and \( a_4 = 1 \) for the size distribution. They yield respectively homogeneous groups of size 3 and 4 and the equations can be solved analytically. The first case illustrates the effect of applying local majority rules while the second case enhances the effect of the tie breaking on the majority rule dynamics.

For \( a_3 = 1 \), Eq. (2) reduces to

\[
p_{t+1} = p_t^3 + 3p_0^2(1 - p_0), \tag{3}
\]
which yields $p_c = \frac{1}{2}$. It is a “fair” dynamics with the word-of-mouth driving the initial minority towards the majority preference. However when $a_4 = 1$ the situation becomes more subtle with the equation,

$$p_{t+1} = p_t^4 + 4p_0^3(1 - p_0) + 6kp_0^2(1 - p_0)^2,$$

which yields

$$p_c = \frac{-1 + 6k - \sqrt{13 - 36k + 36k^2}}{2(-3 + 6k)},$$

with $p_c = \frac{5 - \sqrt{13}}{6} \approx 0.23$ at $k = 1$, $p_c = \frac{1 + \sqrt{13}}{6} \approx 0.77$ at $k = 0$ and $p_c = \frac{1}{2}$ at $k = \frac{1}{2}$.

The case of size 4 enlightens the dramatic effect of the experts’ view combined with the existence of different reputations. While the word-of-mouth role is basically fair since it pushes up the majority, the effect of reputation combined with experts’ influence biases drastically the fairness of the process as seen from above results. It is worth to emphasize that we are considering a situation where there is no leader among consumers, all enjoy tasting wines with no intrinsic advantage for anyone to favor one type of wine region over the other.

A generalization to any size distribution $a_n$ does not modify qualitatively the results. The main effect is on the location of the tipping point $p_c$ between the two attractors $p_A$ and $p_B$. Table 1 gives the value of the tipping point $p_c$ for discussion groups of respective sizes 2, 3, 4, 5, 6.

In real situations, agents meet simultaneously in a combination of a large spectrum of different group sizes as given in Eq. (2). In principle a calibration procedure
Table 1. Values of the tipping point $p_c$ for groups of sizes 2, 3, 4, 5, 6.

<table>
<thead>
<tr>
<th>Group size</th>
<th>$P_B$</th>
<th>$p_c$</th>
<th>$P_A$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total B</td>
<td>Tipping Point</td>
<td>1</td>
<td>none</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>$\frac{1}{2}$</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>$\frac{1}{2}$</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>$\frac{1+\sqrt{13}}{6} \approx 0.77$</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>$\frac{1}{2}$</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>$\approx 0.65$</td>
<td>1</td>
</tr>
</tbody>
</table>

to determine the values of the various coefficients $\{a_i\}$ from past market should be doable but is out of the scope of the present paper.

4. Business Implications

The opinion dynamics driven by the word-of-mouth is a threshold monotonic dynamics. Therefore the initial opinion distribution within the population is instrumental to either win or lose some share of the market for each type of wine producer. To get a winning initial position, experts’ views and advertising are the keys elements.

However to have some at least rough estimate of the value of the tipping point $p_c$ is essential, otherwise, all investments to promote one type of wine may turn useless, waved by the word-of-mouth. In such a situation a constant pressure on the consumers is required to preserve an otherwise unstable shrinking share of the market.

In parallel, even for the type of wine which is in an extreme winning position within the market internal dynamics ($k = 1$), to ignore the existence of a tipping point level can also yield to a quite expensive strategy of market penetration. The optimal strategy consists in setting the right level of investment just above the threshold $p_c$ (23.3% for groups of size 4) to enable afterwards the full market invasion driven by the word-of-mouth process. Reaching a level below the threshold is just a waste of money, on the other hand, to pass the threshold is also a waste of money.

At this stage, the key issue for each type of wine is to ensure the optimal value of $k$ to favor its spreading. Important investments to guarantee at least a balanced value of $k$ is essential. For instance if type A allows $k = 0$ by having not much expert views on its side and without efficient advertising to strengthen its reputation, $p_c$ can reach very high value making the investment to get $p_0 > p_c$ financially out of proportion.

4.1. Some illustrations

Figure 2 illustrates how dramatic a small difference in initial proportions might be in the vicinity of the tipping point. There, groups are of size 4 at $k = 1$ which yields
Fig. 2. The effect of the word-of-mouth for 5 successive updates with groups of 4 persons at 
k = 1 for the series of initial values \( p_0 = 0.20, 0.235, 0.25, 0.27, 0.30 \). The lower curve corresponds 
to \( p_0 = 0.20 \) and the upper one to \( p_0 = 0.30 \). A difference of only 10% leads to a total disappearance 
(\( p_0 = 0.20 \)) or total invasion (\( p_0 = 0.30 \)). Slightly above the tipping point (\( p_0 = 0.235 \)), second 
curve from the bottom, the word-of-mouth effect is very slow.

\[ p_c \approx 0.23. \]
In a case of \( p_0 = 0.20 \), even with the advantage \( k = 1 \), the preference 
for type A decreases quite quickly toward a total disappearance. However an initial 
share with only 10% more at \( p_0 = 0.30 \) guarantees a total invasion dynamics.

In addition, it is sufficient to only aim at being above the tipping point. The 
commercial strategy has also to calibrate according to the distance \( p_0 - p_c \) since 
indeed the word-of-mouth effect gets larger when further from the tipping point \( p_c \).

On the contrary, when close to \( p_c \), repeated updates produce a very slow increase 
of the proportion of agents in favor of type A of wine as shown in Fig. 2. There, a 
bit less of one fourth of the population who favors type A, for instance 233 persons 
in a group of 1000 consumers, does produce an increase of the share market of 
type A, but the increase is slow in terms of required number of updates. Indeed, 
from \( p_0 = 0.235 \), five updates leads to only \( p_5 = 0.26 \).

On the contrary a little above \( p_c \), like at \( p_0 = 0.27 \), four repeated updates lead 
to 56%, a gain of 29% while one more update from 56% leads to an additional gain 
of 19% at \( p_5 = 0.77 \) for a total gain of 50%. Similarly, comparing \( p_0 = 0.25 \) and 
\( p_0 = 0.27 \), shows that an initial investment of an extra 2% with respect to 25% 
permits to gain 4% at \( t = 1 \), 6% at \( t = 2 \), 10% at \( t = 3 \), 18% at \( t = 4 \), and 28% 
at \( t = 5 \).

5. A Commercial Strategy Proposal

On the producers side, the key issue is to ensure a number of consumers favorable 
towards their type of wine, either Bordeaux or Burgundy, in order to start above 
the tipping point and thus take advantage of the increase of the corresponding 
share of the market, just by the effect of word-of-mouth. It certainly requires a
significant investment in wine marketing. At this point, the question we attempt to solve is how to get maximum benefits at lowest cost of this investment using social interactions among consumers?

While our approach concerns promotion practices and aims at increasing the market share of a wine of the particular region, on the commercial ground we deal with numerous local producers of a wine in that region. The first conclusion we draw of our study in solid terms of applications is the necessity for all wine producers in the region to unify their effort to promote the wine of the region they belong to. Today most of them define their commercial strategy on their own despite the presence of interprofessional associations as CIVB in Bordeaux (Conseil interprofessionnel des vins de Bordeaux) or BIVB in Bourgogne (Bureau interprofessionnel des vins de Bourgogne); we could name Inter Rhone, Inter'Oc or InterLoire for other wine regions for example. Their promotion practices of wine rarely involve all the wine producers in the region and often focus on particular successful wine grand crus. The establishment of dynamic and active unions or wine producers’ associations to promoting the region and not the particular wine will be more profitable.

Let us illustrate a case where two producers, each one belonging to one wine region, have access to a subpart of the population of wine drinkers within some established social network of distributions where people can exchange their views. Both wineries sell all wine through this local market and do not use other channels of distribution. Our results could certainly be extended to a case with several distributions channels used by a winery.

Consider then two small wineries each producing 50,000 bottles per year. Let us assume also that the one of type A wine has launched an aggressive local campaign to promote its type making reaching $k = 1$. We are still illustrating the analysis using the case of groups of size 4.

Expenses on marketing and promotion of this wine are estimated around 5% of annual turnover; in our case in terms of the number of bottles of wine, it will be 2500 bottles. As all wineries this one uses a practice of setting aside a certain number of free bottles for different promotion activities (like wine tasting, giving bottles to importers, gifts for special honorable guests and visitors, etc.). If it is 1% of their annual sales, in our case it will be around 500 bottles. We will suppose that winery has on objective to attain 1000 local consumers as soon as possible.

On the consumer side in the range of wines comparable to the A wine sold by that winery, the assumption we make is that an average consumer buys on average one bottle per week. So, during one year a consumer buys around 50 bottles of wine. Our model suggests that it is sufficient for the winery to give 233 bottles for free to 233 consumers who will drink this wine with their friends.

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*aAccording to the estimations of several winemakers in Bordeaux region.*
Following the model, within the 10 update rounds \( (t = 10) \), 701 consumers become favorable towards the type A wine and convinced to purchase it and drink them with their friends too. Results are shown in Fig. 3.

A winery reaches its objective of 1000 customers in 15 rounds (998 customer to be exact). It is important to note that during these 15 updates the convinced consumers have been already buying the type A at least one bottle per week, by the 15th week, there will be almost 40,000 bottles sold during that period of 15 weeks as seen in Fig. 3.

Afterwards, the process continues with 1000 customers favorable towards the A wine and in the rest of the 37 weeks of the year another 36,926 bottles will be demanded, the stock of 50,000 bottles of a winery will be sold out quickly, in the next 10 weeks. Therefore in 25 weeks in total we come up with the purchase of 50,000 bottles available on the market and additional 27,356 bottles could be sold till the end of the year to meet the total demand.

Similar results are obtained with an assumption of purchasing a bottle of favored wine once in 10 days — the wine A will be sold out in 100 days and a 11,887 bottles’ demand will remain unsatisfied.

What the model also suggests is also a significant gain of benefits in the case of a very small increase of initial investment. If instead of 233 bottles given for free, a winery gives 250 bottles to 250 consumers, then social interactions brings a similar result in a period twice shorter than in a case of 233 bottles.

Therefore following the model, this observation suggests that increasing the initial investment from 233 to 250 bottles which still remains within the range of 1% of the annual sales of a winery (500 bottles), in ten rounds almost the totality of 1000 consumers (998) are convinced that the brand A is worth buying. With initial assumption of purchasing one bottle per week the wine will be sold out in total in 25 weeks.
Of course, using only groups of size 4 is artificial but considering a distribution of size \( (a_n) \) and using Eq. (2) will modify above estimates but the results and the order of magnitude will stay qualitatively similar. Our illustration does not aim at an exact prescription to a commercial strategy but to highlight guidelines to build up a successful strategy at a lower cost for the producer.

6. Conclusions and Future Practical Applications

We have defined a simple procedure which allows a winery to increase the number of loyal customers based on social interactions; this process can help increase sales and move to a particular wine segment invasion. The preference of the initial set of adept consumers (23%) who will launch the process and work with other consumers to convince them in further purchasing is certainly of importance for a winery; sommeliers and commercial representatives of wine companies can be of help in this process.

Along this line, we intend in a future follow up work to introduce the existence of stalwarts, agents who are anchored to one specific type of wine, either A or B. They stay unaffected by whatever influence is applied on them. However they do not comply with conviviality by sticking to their preference even against a local unanimity towards another preference. While, here the impact of the external influences like with newsletters of producers, information on promotion prices and advertising, were considered only to fix the initial proportions of respective drinkers of each brand, in the follow up work we plan to explore their effect also during the process of local discussions among the agents.

Although this work oversimplifies the complex reality of the cognitive process by which a wine drinker proceeds to choose the bottle to buy, it is successful in embodying several feature of the associated dynamics. In particular it provides new insight to launch a novel strategy to gain substantial shares of a wine market at some low cost investment. In particular, it singles out some unusual and novel wine marketing investment which can be put in place by a small winery in order to increase its actual share.

To include the structure of the social network of the drinkers could be also crucial for a more realistic description of the word-of-mouth “epidemic” invasion of the market by a given brand of wine. It is left as a further improvement in a future extension of the model.

To extend our model to include all wine regions within a country is in principle feasible. Considering red French wines there exist about ten different regions which is tractable, though heavy, writing of the equations which drive the dynamics. It will also require a more numerical treatment of the problem while the objective of this work is to single out the main trends of the dynamics.

In addition, our results shed a new light on how wine marketing can be optimized by defining the most beneficial way of using bottles given for free by wineries,
a current practice of today marketing. We have proposed a number of specific constraints for this practice to become an efficient factor for successful sales.

On above basis, it is hoped that this work revitalizes the potential complementary relationship between current marketing practices of wineries which, in our view, has been exploited far too sparsely in the fields of strategic wine management.

References