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The dynamics of wine tourism adoption in Chile

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ABSTRACT

The aim of this paper is to identify the key drivers of wine tourism adoption in Chile and their feedback loop structures through an extensive literature review supplemented by in-depth semistructured interviews of Chilean wine managers. We develop a model to quantitatively assess the impacts of these drivers on wine tourism adoption over time. We use a system dynamics modeling approach to simulate the effectiveness of wine adoption drivers based on data from 69 Chilean wine firms. To different degrees, five drivers affect wine tourists: word-of-mouth recommendations, product attractiveness, tourism services, information available on the internet, and tour operators' recommendations. Tour operators and tourism services are critical drivers in increasing the number of wine tourists, but product attractiveness has a stronger influence over the long term.

1. Introduction

While wine tourism has gained great importance in South America over the last 20 years (Hall, Sharples, Cambourne, & Macionis, 2009), we have relatively little insight into its resources and capabilities (for exceptions, see Kunc, 2009, 2010; Gómez, Pratt, & Molina, 2018). Hall and Macionis (1998, p. 267) define wine tourism as "visitation to vineyards, wineries, wine festivals and wine shows for which wine tasting and/or experiencing the attributes of a grape wine region are the prime motivating factors for visitors." Different authors suggest that wine tourism is an extension of the business model used in selling differentiated wines (Carlsen, 2004; Díaz-Armas, 2008); however, the wine sector in the agriculture industry (Brenes, Montoya, & Ciravegna, 2014) is the only agribusiness that has developed extensive tourism services. When wine tourism is conceptualized as a diversification strategy, the vineyard creates a new source of income that could become the center of the business model of wine producers seeking brand recognition (Torres & Kunc, 2016). To compete in the tourism industry, wineries must create multiple attractions to improve the tourist experience (Orsolini & Boksberger, 2009). Additionally, wine managers may view wine tourism as an opportunity to stimulate demand for high-quality wine (Carlsen & Charters, 2006). Wine tourism facilitates wine purchases through the client's experience of observing the winemaking process and the places in which wine is produced. Consumers remember these attributes when they repurchase products (Hall & Mitchell, 2000). Although some wine researchers have explored dimensions of wine tourism in Chile and Argentina (Kunc, 2009, 2010, Hojman & Hunter-Jones, 2012, and Torres & Kunc, 2016), no in-depth analysis of the structure of resources and capabilities involved in wine tourism and of its influence on potential consumers in these countries has been carried out (Gómez, Pratt, & Molina, 2018). In fact, there has been little quantitative analysis of the dynamic coordination of resources facilitating the delivery of wine tourism (e.g., Ganglmair-Wooliscroft & Wooliscroft, 2016). Wine tourism is an area that can be addressed from multiple perspectives: institutions (Lavandoski, Albino Silva, & Vargas-Sánchez, 2014), cultural and social exchange (Ravenscroft & Van Westering, 2001), collaboration between firms (Hall, Sharples, Cambourne, & Macionis, 2009), stakeholders (Bruwer, 2003), marketing (Carlsen & Charters, 2006), success factors for wineries (Getz, 2000), and more recently the resource-based view (Torres & Kunc, 2016; Presenza, 2010; Denicolai, Cioccarelli, & Zucchella, 2010). According to Presenza (2010:46), the capacity for a destination to attract tourists mostly depends on the range of factors at its disposal: not only natural resources, geographic positions, and morphological features but, above all, the assets represented by social resources, which are the result of the traditions and habits of the local community.

This article reports a two-stage research study combining qualitative

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methods used to uncover the resources perceived by wine managers with a quantitative model to quantify the strength of feedback structures that affect wine tourism adoption. In particular, the quantitative model, which is based on System Dynamics simulation (Sterman, 2000), focuses on conceptualizing causal relationships among drivers of tourism adoption in the Chilean wine industry. The System Dynamics approach relies on the assumption that the structure of causal relationships among variables in a system gives rise to its dynamics (behavior). Davis, Eisenhardt, and Bingham (2007) suggest that simulation approaches such as System Dynamics are useful for theory development when current theories cover only a few constructs and related propositions with modest empirical or analytic grounding. What results is that while propositions made are likely correct, they are limited by a weak conceptualization of constructs with few propositions linking these constructs together and/or using rough underlying theoretical logic. Our model indicates that the most important drivers of wine tourism adoption in Chile are tour operators and the tourism services offered by wine firms. However, the model also demonstrates that wine firms can significantly increase adoption via product attractiveness over the long term. There is a moderate effect of word of mouth, a typical driver of tourism, and word of mouth is a key mechanism in sustaining product attractiveness. Given the economic importance of tourism, the findings of this study can make important contributions to the economy and to the development of one of most globalized industries in Latin America: wine. This article contributes substantially to our understanding of the resources and capabilities involved in the Latin American wine industry (Brenes, Montoya, & Ciravegna, 2014) and to the expected dynamics of these resources in the adoption of tourism activities in rural areas (Fotiadis, Yeh, & Huan, 2016; Gómez, Pratt, & Molina, 2018; Hojman & Hunter-Jones, 2012).

This paper is structured as follows. First, we review the factors that boost wine tourism adoption by wine firms. Second, we describe the methodology used, which involves the development of a simulation model to reproduce dynamics of wine tourism adoption. Finally, we present our results, discussion and concluding remarks.

2. Literature review

2.1. Wine tourism strategies

Tourism-related services are structured as a series of interactions involved in the creation and delivery of value to the tourist. Thus, tourism can be classified as a cluster or aggregation of businesses with diverse roles that interact to generate an 'experience' (Lazzeretti & Petrillo, 2006). We adopt a resource-based view by considering strategies employed by wineries and the resources involved in the provision of wine tourism experiences. The most common resources and capabilities for developing wine tourism include incorporating wine tastings, services and wine sales into winery visits, vineyard and wine cellar tours and wine festivals (Torres & Kunc, 2016). These resources generate short-term revenue not only for wine firms but also for tour operators that offer a variety of complementary services related to the wine experience such as dinners and excursions (Kunc, 2007; Woodside & Lysonski, 1989).

In terms of resource-based strategies, Hojman and Hunter-Jones (2012) observe that wine firms in Chile use two types of strategies in exploiting resources into their business models. For the first, wineries see wine tourism as a link in a long-distance, possibly intercontinental, relationship marketing (RM) chain. This creates cultural and recreational attractions in the place where a harvest occurs (Getz & Brown, 2006) and promotes a brand image through rural legends (e.g., the Devil's Cellar of the Concha y Toro winery) or museums that combine wine history and traditions. Gómez et al. (2018) suggest that a protected denomination of origin (PDO) has a positive influence on brand value for vineyards that generate wine tourism. For the second strategy, wineries see wine tourism as their best path to survival. Hence, if wine tourists perceive wine experiences to extend beyond a simple visit, wine firms will reap benefits from recommendations that position them as entertainment services firms rather than as traditional wine firms (Thanh & Kirova, 2018). These initiatives can be associated with both cluster and individual efforts to provide customers with tourist accommodations, transportation services, advertising and sources of information (Tassiopoulos, Nuntsu, & Haydam, 2004). For example, Wargenau and Che (2006) suggest that alliances among members of different vineyard groups such as the *Southwest Michigan Wine Trail* improve industry development and marketing strategies, maximizing the growth of wine tourism. In Chile, wine routes started to appear in the 1990s to extend the wine sales business model (Zamora & Barril, 2007). The Colchagua Valley is one the most successful wine routes in Chile and is internationally recognized for its wine tourism resources, which include hotels, restaurants, museums, beaches and countryside attractions (Hojman & Hunter-Jones, 2012). Kunc (2010) recognizes that Chile has the resources and key competences to begin expanding its wine tourism industry. For example, (1) Chilean wines are world renowned, (2) the industry has the flexibility to design its services given proactive government support, (3) the government is beginning to grant funds for investments in wine routes, and (4) there is a high level of wine tourism promotion.

2.2. Wine tourism: A resource-based perspective

From a dynamic resource-based view (RBV) (Kunc & Morecroft, 2009, 2010; Torres, Kunc, & O'Brien, 2017), wine tourism involves the coordination of multiple resources and capabilities critical to implementing a sustainable strategy to attract tourists. Specifically, resources, that can be tangible (e.g., customers, staff, and production capacity) or intangible (e.g., reputation, corporate culture, and intellectual property) productive factors are the assets that an organization possesses or controls or to which it has access. Capabilities are the activities that an organization performs and that are usually generated through the interaction of resources combined with knowledge about the combination of these resources (Kunc & Morecroft, 2010). In consideration of these reasons and with the aim to operationalize a resource-based perspective, Kunc and Morecroft (2009) proposed combining traditional RBV concepts and ideas with System Dynamics Modelling principles and tools (see the Methodology section) to develop a dynamic perspective of the RBV.

Thus, an initial review of the wine tourism literature proposes five critical components of effective wine tourism: word of mouth is an intangible resource originating from consumers in response to their experiences; winery attractiveness is an intangible resource measured by international recognition and awards that provides quality signals; wine tourism services such as restaurants and hotels complement the experience of visiting wineries in a specific area and can be viewed as resources; digital channels, as an internal resource, generate the information necessary to stimulate tourist interest; and tour operators, which are resources not controlled by companies directly but can be managed through contractual arrangements, facilitate the arrival of tourists to destination. The next sections describe these resources in more detail.

2.2.1. Word of mouth

Potential wine consumers have a predisposition toward wine tourism based on a set of beliefs, experiences, and information received from other consumers or wine tourists (Sparks, 2007). A consumer who is loyal to a vineyard is not only satisfied with its services but also offers recommendations to friends (Zamora & Barril, 2007). For this reason, the image and reputation of a wine firm and wine region must be built and effectively communicated (Getz, Dowling, Carlsen, & Anderson, 1999) to positively support the word-of-mouth process. In fact, friends and relatives are relevant to decision-making processes concerning vacation destinations and may affect the adoption of wine tourism in a

particular region or place (Sparks, 2007). Wine firms that understand the importance of word of mouth continuously diffuse information about wine tourism services and the characteristics of regions in which activities are offered (Sparks, 2007). Further, tourists who have visited wine firms through exposure to specialized websites, blogs or magazines (Hall & Mitchell, 2000) highlight the role of word-of-mouth recommendations, and these recommendations reinforce the growth of wine tourism. While Wu (2016) suggests that word-of-mouth is a precursor to tourist loyalty, Aqueveque (2015) shows that word-of-mouth positively affects customers' value perceptions of wine quality, which can reinforce the number of wine tourism adopters. This feedback loop effect should be contingent on the price of wine under evaluation and on the level of consumer expertise (Aqueveque, 2015).

Proposition 1. *More recommendations for wine tourism activities made via word of mouth increase the number of wine tourists.*

Proposition 2. *More recommendations made via word of mouth increase tourists' perceptions of wine quality (product or winery attractiveness).*

2.2.2. Winery attractiveness

The current relative lack of quality standards in tourism reduces market transparency and discourages innovation (Divisekera & Nguyen, 2018). While the tourism industry uses various classifications of company quality (e.g., the number of stars given to hotels), many of these standards are poorly defined because they are more focused on facilities than on the actual quality of services (Camisón & Monfort-Mir, 2012). However, wineries can signal quality through two means: international recognition from wine awards (Kunc, 2007) and territorial brands defined by controlled designations of origin such as the French AOC system (Kunc, 2012).

Charters and Menival (2011) found that creating consumer value in a quality wine region such as Champagne not only increases brand equity and revenue for small wineries but also fosters tourism across the destination. Therefore, quality is a critical resource for wineries attempting to develop wine tourism strategies. A detailed understanding of the key attributes sought by wine tourists and the consumer values associated with those attributes are prerequisites to enhancing value in wine tourism (Carlsen & Boksberger, 2015). For this reason, some producers use wine tourism as an opportunity to capitalize on interest in unknown brands, linking them to product attributes and international recognition (Zamora & Barril, 2007). Hence, effective communication with the target segment enhances product attractiveness and wine tourism activities (Getz et al., 1999).

Proposition 3. *Higher perceived product attractiveness increases the number of wine tourists.*

2.2.3. Wine tourism services

Tourists usually visit multiple places along their travel routes rather than wineries alone. People engage in multidestination trips for four reasons: to provide variety, as they want to have other experiences; to decrease the probability of a completely unsatisfactory trip occurring; to please multiple decision-makers involved in the planning and execution of activities; and to leverage the lower marginal cost (in terms of time and money) of an additional activity as part of in a multidestination trip (Hong, Ma, & Huan, 2015). Alonso, Bressan, O'Shea, and Krajsic (2015) suggest that from a 'wine tourism supply chain' perspective, which involves various activities (cultural, recreational, and culinary activities and wine tastings) that contribute to consumers' education, the incorporation of both tangible (quality of the wine product) and intangible (service standards) elements is fundamental. However, an appropriate level of skill among wine firms is required and particularly in locations characterized by a lack of professionalism or suitable accommodation. Therefore, wine producers have begun to develop inclusive tourism centers (providing lodging and catering services) that exceed what the infrastructure of wine production can offer (Zamora & Barril, 2007). Wine cellar visits are important in developing wine tourism through the creation of museums, tourist information, and language interpretation centers (Getz et al., 1999). While wineries invest in services for tourists to boost wine tourism, successful wineries do not transform their businesses into tourism centers. Certainly, tourism services are resources necessary to complement the activities offered by wineries and thus attract wine tourists.

Proposition 4. *Greater satisfaction with wine tourism services increases the number of wine tourists.*

2.2.4. Digital channels

The tourism industry has been proactive in adopting new technologies, and Information and Communication Technologies (ICTs) constitute one of the strongest forces driving changes in tourism (Alonso et al., 2015). ICTs can support internal and external coordination and communication, digital marketing and online sales of services. The emergence of new technologies spurred created fundamental changes in the wine industry such as the development of new wine tourism products, services, and niche markets (Carlisle, Kunc, Jones, & Tiffin, 2013); further, these technologies have encouraged firms to learn from competitors' developments (Alonso et al., 2015). Technology has become a source of competitiveness, and it affects the efficiency and effectiveness of tourism information given to the consumer (Buhalis, 2003). In fact, information sent via the internet has become a mediator of tourism experiences because social media platforms allow other tourists to describe their experiences of enjoying the services provided by vineyards (Xiang & Gretzel, 2010). Many tourists have advanced skills in using search engines to find tourist destinations (Buhalis & Law, 2008). The internet provides users with an unlimited amount of information, which has a great influence on traveler behavior (Xiang & Gretzel, 2010). ICTs provides users with tools and new ways to create strategies for the adoption of wine tourism. The internet has allowed smaller companies to offer diverse and extensive services and tour packages to a broader audience. While word of mouth initially referred to personal conversations between consumers about a service, the internet has created electronic forms of word of mouth defined as "any positive or negative statement made by potential, actual, or former customers about a product or company which is made available to multitudes of people and institutes via the internet" (Hennig-Thurau, Gwinner, Walsh, & Gremler, 2004). In the context of the tourism industry, online word of mouth is helpful in decision making about experiences because it provides tourists with indirect experiences and information about services and thus functions as a recommendation (Park, Lee, & Han, 2007). O'Neill, Palmer, and Charters (2002) found that visitors' recommendations increase wine sales in Australia when opinion leaders return home and tell others about their experiences. Thus, digital media are a critical resource that provide an opportunity to engage with potential tourists (Elliott & Boshoff, 2005).

Proposition 5. *The use of more digital channels to promote wine tourism increases the number of wine tourism adopters.*

2.2.5. Tour operators

Tour operators manage the day-to-day operations of a package and bring together the core elements of a tourism experience such as transport and accommodation (Mill & Morrison, 1992). Lumsdon and Swift (1999) suggest that tour operators in South America act as a catalyst of demand, which means that they are involved in prospecting and design and often collaborate with a larger brand name to offer a tourism experience. Collaboration or networks are necessary for the development, implementation, diffusion, and ongoing success of tourism experiences (Carlsen, 2004). Martinez-Fernandez (2004) suggests that collaboration is a decisive factor in collective learning and innovation. Collaboration facilitates the use of local knowledge, which

together with partners' knowledge facilitates well-informed decisions and adds value for firms by gathering information, thus building on the accumulated knowledge, practices, experiences, and capabilities of stakeholders in coproducing integrated tourism services and improving the attractiveness of tourism packages and tourist destinations (Bramwell & Broom, 1989; Wang & Fesenmaier, 2007). The wine tourism literature has identified tour operators and travel agencies as important actors in tourists' decision-making processes. The relationship between wine firms and tour operators has become very important in the development of the wine industry (Kunc, 2009; Telfer, 2001). In fact, the long-term benefits of route development, vineyard relationships and tour operators help strengthen consumers' brand loyalty to vineyards (Kunc, 2009, 2010). In effect, larger vineyards have aggressively created alliances with tour operators (Telfer, 2001). Tour operators have two important functions related to wine tourism: (1) they provide relevant information on the destination and on wine tourism services (Kunc, 2009, 2010) and (2) they extend services and amenities offered by a vineyard through tour packages (Baloglu & Mangaloglu, 2001). In fact, collaboration among tour operators, government actors and vineyards boost the growth of wine tourism activities (Jamal & Getz, 1995) as Carlisle, Kunc, Jones, and Tiffin (2013) suggest with regard to other types of tourism in developing countries. While tour operators are not internal resources to a winery, such collaborative arrangements serve as critical intangible resources that drive tourists toward wineries.

Proposition 6. *A large number of tourism operators in a winery's location increases the number of wine tourism adopters.*

3. Methodology

Simulation is becoming an increasingly significant methodological approach to theory development in the literature on strategy and organizations (e.g., Torres, Kunc, & O'Brien, 2017; Davis, Eisenhardt, & Bingham, 2007; Harrison, Lin, Carroll, & Carley, 2007). The current study models wine tourism within the context of a globally recognized wine-producing country, Chile, whose wine tourism industry is still underdeveloped relative to its potential and to investments undertaken by Chilean wineries in recent years. We use a simulation-based approach based on System Dynamics Modeling, which has previously been used to study dynamics of wine tourism adoption in Chile (Kunc, 2009) and to evaluate the interaction of resources to deliver strategies (Torres, Kunc, & O'Brien, 2017). Computer-based system modeling offers decision makers an alternative tool for decision support inquiry (Pagani & Otto, 2013). System Dynamics Modeling focuses on discovering and representing feedback processes that, along with stock and flow structures, time delays, and nonlinearities, determine the dynamics of a system (Sterman, 2000). This approach offers at least three main advantages over other modeling approaches. First, it enables the researcher to maintain one-to-one correspondence between the verbal descriptions of real-world wine experts and the set of equations used in a computer program to simulate dynamics of wine tourism adoption. Second, causal loop diagrams[1] (CLDs) used to explain cause-and-effect factors of wine tourism serve as excellent vehicles for communicating with wine experts and mapping out their understanding of the business. Third, the iterative nature of System Dynamics conceptualization helps researchers understand unexpected behaviors that arise from interactions among key drivers of adoption. System Dynamics Modeling represents a complex situation in a visual conceptual model and in matching equations (Morecroft, 2015). The model and its equations must be calibrated with available knowledge. The approach uses two formal validation procedures to test a simulation model: (1) structural validity and (2) behavior validity (Barlas, 1989; Forrester & Senge, 1980; Qudrat-Ullah & Seong, 2010; Sterman, 2000). Model structure tests build confidence in the model by demonstrating that its concepts and relationships are consistent with observations about structures and policies obtained from a mental database of people who know a business well (Morecroft, 2015). We use an extensive literature review supplemented by in-depth-semistructured interviews held with Chilean wine managers to test for structure validity. Model behavior tests are also used to assess how well the model reproduces the dynamic behaviors of interest. Finally, we use information from a National Chilean survey about wine tourism to analyze whether our model simulations correspond with observed historical behavior.

3.1. Model structure

We first conducted a literature review to identify a set of propositions to formalize our simulation model. We compared our theoretical propositions to the results of interviews held with Chilean wine tourism managers. We sent 20 letters inviting the managers of the largest Chilean wine firms that offer tourism activities to participate in the study. We received four formal acceptance letters from these wine firms. We selected interviewees with the following characteristics in common: they knew about the wine tourism business, they oversaw wine tourism activities, and they managed resources related to wine tourism activities. The firms involved included Viña Concha & Toro, Viña Tarapacá, and Viña Santa Rita. Additionally, we interviewed the Executive Director of Wine Tourism Chile, an organization that analyzes the wine tourism industry in Chile, to triangulate information obtained from the literature and interviews. Table 1 provides descriptions of the interviewees.

The interviews followed a face-to-face protocol with semistructured questionnaires through which the interviewees described processes around the wine tourism activities of Chilean wine firms. In these interviews, we showed preliminary causal loop diagrams to all interviewees related to different propositions made in the literature. This approach has been validated in previous studies of the wine business (e.g., Hwang & Kunc, 2015). The interview protocol followed three steps similar to those used by Torres, Kunc, and O'Brien (2017):

1. Step 1. Discussion of the knowledge and experiences of the interviewees: We expected the interviewees' experiences to help us understand the main strategies employed to implement wine tourism activities by Chilean firms.
2. Step 2. Elicitation of managers' cognitive representations of the drivers responsible for wine tourism in their firms: We asked each interviewee to identify the factors they believed to be critical to explaining wine tourism in their firms. We drew a causal loop diagram from the list of factors and their interrelationships.
3. Comparison of managers' cognitive representations with theory: We compared the causal map depicted by each manager with information obtained from the literature review. The idea was to perform a robustness analysis to confirm or eliminate causal relationships. Appendix A summarizes propositions supported by the literature and interviews.

Fig. 1 shows the final causal loop diagram that formalizes the propositions into a causal model. In the causal loop diagram, dotted lines indicate that a relationship was inferred only from the interviews, and solid lines indicate that a relationship is supported by theory. Fig. 1 shows that the drivers are perceived to have a positive impact on wine tourism adoption (the links have positive signs at the ends of arrows). The model of Chilean wine tourism dynamics suggests six positive loops (R1, R2, R3, R4, R5 and R6) that reinforce the accumulation of wine tourism adopters. The model indicates that service capacity controls the growth of tourism activities and the number of tour operators via two

[1] Causal loop diagrams are mental representations that help the modeler to define basic cause-effect relationships and feedback structures to explain behavior observed in reality (Morecroft, 2015).

Table 1
Interviewee profiles.

Name	Organization	Job position	Tenure
Claudia Díaz	Viña Tarapaca	Communication Manager	8 years
Francisca Muñiz	Viña Santa Rita	Tourism Manager	3 years
Guillermo Vergara	Viña Concha y Toro	Tourism Manager	7 years
Gonzalo Rojas	Enoturismo Chile	Head of Research	11 years

customers. This relationship further reinforces wine tourism adoption (R4 and R5). However, two balancing loops (B1 and B2) reduce the growth of wine tourism adopters. As a wine firm receives more tourists, service capacity erodes in the short term, as tourists must wait longer for wine tastings or there are not enough spaces to accommodate them. If the wine firm does not invest in maintaining and increasing its service capacity and facilities, the firm will not be able to fulfill tourists' expectations in the long term. Unfulfilled expectations reduce the number

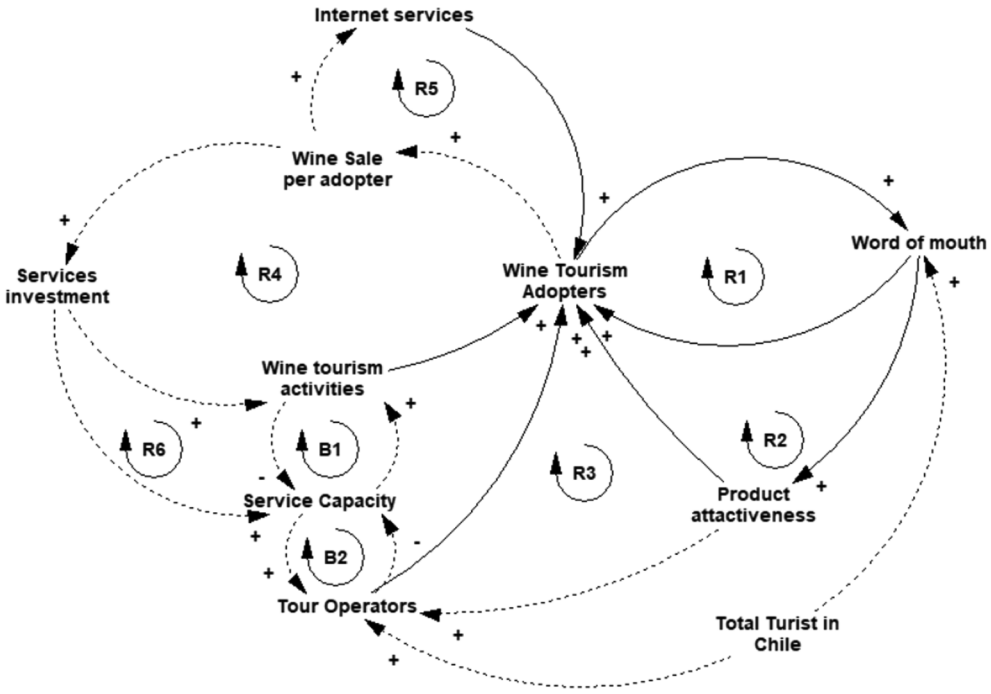

Fig. 1. Dynamics of wine tourism adoption. The causal loop diagram shows the interconnections among variables. For example, wine tourism adopters positively affect (increase) word of mouth, and word of mouth positively affects (increases) wine tourism adopters.

self-balancing loops (B1 and B2).

The causal loop diagram shows that tourists may visit a wine firm when tour operators encourage a visit or when a friend who previously visited the wine firm shares his/her positive experiences. Further, some tourists become wine tourism adopters, which are shown as reinforcing loop R1 (word of mouth) and reinforcing loop R3 (tour operator), as they repeat their experience. The word of mouth mechanism can also increase product attractiveness, which means that the brand of the visited wine firm becomes more attractive in supermarkets or wine shops. Reinforcing loop R2 (product attractiveness) is highlighted because it has a two-way effect: the attractiveness of a wine brand, e.g., through its quality or label, increases the probability of a tour occurring. Product attractiveness (e.g., a famous wine brand) increases not only the adoption rate but also the number of tour operators that offer visits to a vineyard, as tourists will be more open to such tours than to those of unknown wineries.

Tourism adopters engage in wine tourism activities and buy wine bottles during their stay, which increases average sales per person. With higher revenues, wine firms can invest in additional tourism or internet services (e.g., social media). Both wine tourism activities and internet services increase the number of wine tourism adopters further. internet services promote wine tourism adoption because tourists expect to find information about the wine, winemaking process and location (reinforcing loop R5). On the other hand, when investment in services increases, the resulting increase in revenues supports the improvement of vineyard facilities (wine tourism activities and service capacity). Managers suggested that nicer facilities improve the relationship between the wine tourism destination (e.g., the wine region) and potential of wine tourists, which further reduces wine sales per adopter and the ability to invest in services for tourists.

3.2. Mathematical representation

We developed a stock-and-flow model from the causal loop diagram presented in Fig. 1. The stock-and-flow model formulates causal relationships into levels and rate equations (Sterman, 2000) and represents all variables and feedback structures that explain the behavior of wine tourism firms based on the collected data.

We represent the number of wine tourists (WT_i) at time t as the initial number of adopters (A_0) plus the integral of new adopters over time ($A_i(t)$):

$$WT_i(t) = A_0 + \int_{2005}^{2016} A_i(t)dt \quad (1)$$

Flow variable new adopters $A_i(t)$ at time t is a function of the five adoption drivers (the resources and capabilities discussed in section 2) that affect it: $(D_1(t), D_2(t), \cdots, D_5(t))$.

$$A_i(t) = f(D_1(t), D_2(t), \cdots, D_5(t)) \quad (2)$$

We define every adoption variable (D_i) as the number of adopters from each driver i at time t: adopters from word of mouth (D_1), adopters from product attractiveness (D_2), adopters from internet sources (D_3), adopters from tour operators (D_4), and adopters from wine tourism activities (D_5).

We model adoption from word of mouth (D_1) based on the classical diffusion model developed by Bass (1969):

$$D_1(t) = ciP_t\frac{W_t}{N} \tag{3}$$

where parameter c is the contact rate, parameter i is the adoption fraction, variable P_t is the potential number of adopters at time t, and parameter N is the total tourist population in Chile. We estimate all parameters by initially assuming that the average of each parameter in 2007, 2008, 2009, 2012, and 2013 is a constant value in the simulations. We use the total population of tourists in Chile from 2016 statistics reported by the Chilean National Tourism Service available online at the following link: http://www.sernatur.cl/estadisticas/ (accessed December 2016). We model adoption from product attractiveness (D_2) as follows:

$$D_2(t) = beP_t\frac{W_t}{N} \tag{4}$$

where parameter b is the contact rate of potential tourists interested in visiting a specific vineyard, and parameter e is the adoption fraction of this product attractiveness. The number of adopters from internet sources (D_3) was modeled as follows:

$$D_3 = f \bullet P_t \tag{5}$$

where parameter f is the ratio of internet effectiveness. However, we introduce the effect of service capacity on the adoption fraction from tour operators (D_4) and tourism activities (D_5):

$$D_4 = d \bullet \alpha \bullet P_t \tag{6}$$

Parameter d is the ratio of tour operator effectiveness multiplied by parameter α, which represents the effect of service capacity on the tour operator's affiliation.

$$D_5 = \tau \bullet \beta \bullet P_t \tag{7}$$

Parameter τ, the ratio of service effectiveness, is multiplied by parameter β, which represents the effect of service capacity on new available services. Parameters α and β relate to the function of service capacity. We represent service capacity (SC_t) at time t as the initial value of service capacity (C_0) plus the integral of new capacity investment ($NCI_i(t)$) minus the used capacity ($UC_i(t)$) over time:

$$SC_t(t) = SC_0 + \int_{2005}^{2016} NCI_i(t) - UC_i(t)dt \tag{8}$$

Investment in new capacity depends on the desired service capacity level and the current service capacity level (SC_t). We estimate a fixed desired level of service capacity γ for the whole simulation period. The used capacity ($UC_i(t)$) depends on the occupation rate of wine tourists at time t and the maximum service capacity. We estimate a maximum level of service capacity σ for the whole simulation period. All equations and their interpretations are presented in Appendix B.

3.3. Model calibration and behavior validity

We collected information to calibrate the simulation model with secondary sources (e.g., websites, annual reports from the companies and other documents). The key source used for data calibration is a national survey of resources and practices of wine tourism in Chile: the "Diagnóstico del Enoturismo en Chile 2013."[2] We collected the following information: (1) general vineyard information (company name, website, contact information, etc.), (2) vineyard infrastructure (available bathrooms, modes of access, catering services, etc.), (3) the number of people hired to supply wine tourism services (staff member occupations, average age, salary, etc.), and (4) wine tourism services and demand (media, offered services, number of monthly visitors, etc.). Additionally, for each vineyard, we collected the number of tours provided; the number of official tour operators used; the number of languages tours are available in; and all services provided, including restaurant areas, picnic spaces, wine cellar visits, and infrastructure available to tourists. Overall, 69 firms had records of annual visitor demand (78.2% of the surveyed vineyards had records of how many bottles each tourist purchased during tours). We used global wine sales for 2013 as a measure of wine demand. We also collected data from all digital media used by the vineyards to promote wine tourism offers as well as statistics provided by the Chilean Tourism National Service for 2005 to 2016. Table 2 provides summary statistics for the data, which include 69 Chilean firms engaged in wine tourism activities.

Then, we compared the simulated data to information collected from past iterations of the "Diagnóstico del Enoturismo en Chile" (2007, 2008, 2009, 2012 and 2013). We interpolated missing values for 2005, 2006, 2010 and 2011, in which the survey was not fielded. We used these data to estimate model parameters by applying the maximum likelihood method during partial model tests and full model estimations using the Markov chain Monte Carlo (MCMC) method (Pierson & Sterman, 2013). We used the MCMC method to simulate the distribution of the log-likelihood payoff surface given joint changes in the adoption parameters. We simulated the model using VENSIM DSS software. We performed a partial correlation analysis to measure the degree of association between some proxy variables for the drivers. Table 3 presents the results of the partial correlation analysis of variables that affect wine tourism adoption drawn from the "Diagnóstico del Enoturismo en Chile 2013" survey. The correlation analysis shows that demand is significantly correlated with all drivers affecting wine tourism adoption as described in the literature.

Fig. 2 shows the simulation fit to historical trends for 2005 to 2013. The simulation shows a good degree of agreement with the real data. The results indicate a good fit between the model simulation and historical patterns (Sterman, 2000). The R-squared values of total tourists and wine tourists are 0.84 and 0.91, respectively. Hence, the simulated data for the two key variables of the model are close to the historical data. Although the mean squared error (MSE) of total wine tourism adopters is relatively low (159,023.1 over 9 years), inequality statistics show that unequal covariation (U^C) explains 63.3 percent of the MSE due to point-by-point differences caused by unexplained cyclicality in the data. Unequal variation (U^S) explains 23.7 percent of the MSE, showing that the two series (simulated and historical) match on average and are highly correlated; however, the magnitude of the variation for the two around their common mean differs slightly. Finally, the bias (U^M) is 9.8 percent, which means that there is no significant difference between the model and the real data. Regarding the number of wine tourists, the inequality statistics show that 87.8 percent of the MSE (U^c) is associated with point-by-point differences. The U^M and U^C statistics for the number of wine tourists are 2.2 and 9.8 percent, respectively.

4. Simulation of Chilean wine tourism adoption

Fig. 2 shows that over the 10-year simulation period, the number of wine tourists increased by 159%, and from 2014 to 2015, annual simulated growth was 17%, which is similar to the 16% estimated by the 2013 wave of the "Diagnóstico del Enoturismo en Chile" survey. Fig. 3 displays the simulated dynamics of the five analyzed resources: internet services, product attractiveness, tour operators, wine tourism services, and word of mouth. Fig. 3 suggests that tour operators and wine tourism activities were the most important resources in accelerating the growth of wine tourism in Chile over the study period. Both drivers had annual growth rates of over 7% over the simulation period while the other drivers had growth rates of less than 5%. After 2012, growth stagnated as a result of the consolidation of service capacity in wine firms (balancing loops B1 and B2). Internet service (Proposition 5) trends have a slight impact on wine tourist adoption of nearly 10% during the simulation period. Between 2005 and 2012, adoption via product attractiveness, tour operators and the internet explain more

[2] The "Diagnóstico de Enoturismo en Chile 2013" project was funded by the Chilean government through two national agencies: CORFO and the National Tourism Service.

Table 2
Summary Statistics of the Sample by Chilean Valley.
Source: Original calculations based on data collected in 2013. Sample size: 69 firms. "n" means number. "USD" means US dollars.

	Summary statistics (Mean) by valley					
Valley	Firms (*n*)	*Average* Full-Time Employees (*n*)	*Average* Price (USD)	*Average* Sales (Bottlesx10e6)	*Average* Tours (*n*)	Wine Cluster Routes (*n*)
Aconcagua	5	5.9	14.5	77.7	3.4	2
Casablanca	12	22.4	36.2	255.9	4.7	1
Colchagua	11	15.8	10.2	182.7	3.5	4
Cachapoal	5	10.2	7.6	73.1	3	1
Itata	3	3.8	5.14	15.1	1	1
Maipo	21	17.3	17.1	221.6	2.8	2
Maule	6	4.5	8.2	57.6	2.1	1
Others	6	3.67	8.1	31.36	1.8	0

Table 3
Summary statistics of the variables and correlation analysis of data collected in 2013.

		Mean	Std dev	1	2	3	4	5	6	7
1	Wine Demand (USDx10^6)	172.6	27.96	1						
2	No. Media used by wine firms	2.04	0.87	0.212***	1					
3	No. of Tour activities	3.37	1.98	0.298*	0.222	1				
4	No. of Tour operators	13.57	19.71	0.530*	0.211	0.461*	1			
5	No. of Languages in tours	3.39	0.81	0.246**	−0.101	0.319*	0.361*	1		
6	No. of Services	5.50	1.31	0.286*	0.148	0.260**	0.261**	0.062	1	
7	Area (M2) of facilities	9.31	2.56	0.257**	0.368*	0.400*	0.437*	0.148	0.507*	1

P-Pearson coefficients. Two-tailed P-Values: *p < 0.05; **p < 0.01; ***p < 0.001. Source: Original calculations based on data collected in 2013. Sample size: 69 firms.

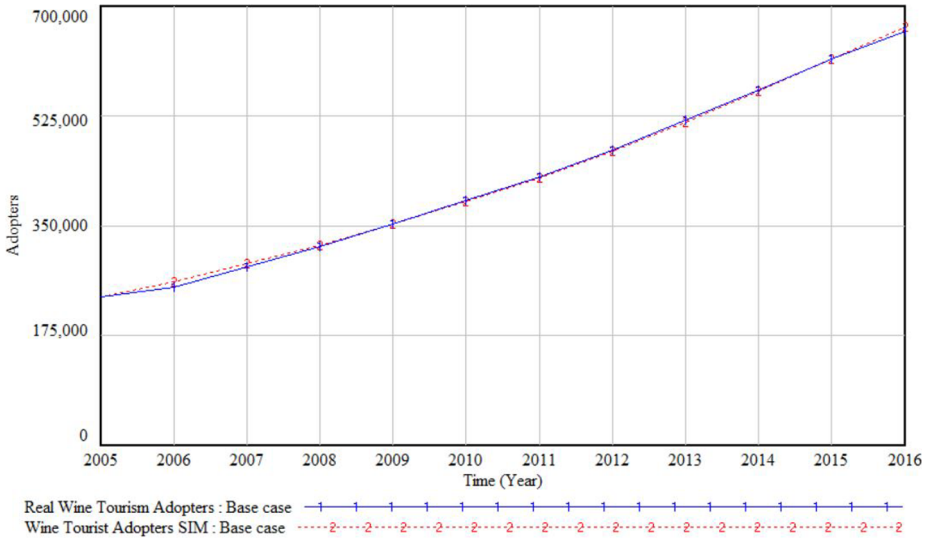

Fig. 2. Simulated and historical wine tourism adoption rates.

than 70% of total adoption. However, between 2012 and 2016, product attractiveness grew dramatically (nearly 30%) and was triggered by the diffusion effect (word of mouth) (Proposition 2). In fact, product attractiveness (Proposition 3) explains more than 26% of the total number of wine tourism adopters for 2012 to 2016. This result suggests that product attractiveness has a long-term effect on adoption. Wine firms with higher levels of investment in tourism services (Proposition 4) and tour operators (Proposition 6) increase their adoption via product attractiveness over the long term. These findings suggest that wine tourists visit Chilean wine firms not only for their facilities but also for their well-known wines. Although the effect of word of mouth on adoption is lower over the simulation period, our results suggest that word of mouth is a key mechanism for improving long-term product attractiveness (Proposition 1). Without the word-of-mouth, adoption via product attractiveness is significantly lower.

A System Dynamics approach allows modelers to design and evaluate business strategies (Torres, Kunc, & O'Brien, 2017). Therefore, following the existing literature, we explore the effectiveness of investing in wine firm capacity (supply strategy) and wine tourism demand (demand strategy).

We simulate the effect of a strategy designed to double the service capacity of wine firms offering tourism activities. Fig. 4 reports the number of tourism adopters between 2005 and 2016 after implementing business strategy 1 (Simulation 1) and without implementing any strategies (benchmark case). Simulation 1 assumed a strategy in which wine firms doubled their 2005 service capacity, which means that wine firms invested only in increasing their capacity to supply wine tourism activities. The simulation suggests that although there is a slight difference between Strategy 1 and the benchmark case for after 2011, adoption via supply capacity is very limited, making it

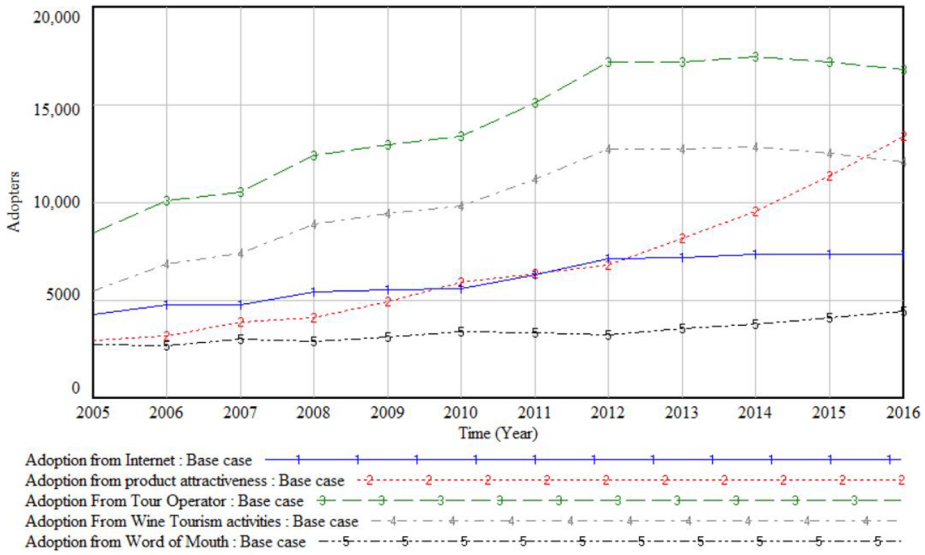

Fig. 3. Dynamics of wine tourism adoption between 2005 and 2016: Evolution of the drivers.

an expensive strategy. Implementing Strategy 1 between 2005 and 2016 yields 133,166 new tourists, which amounts to 11,097 new tourists annually over the simulation period. Dividing the number of new tourists per year among the 69 wine firms used to calibrate the model produces 161 new wine tourists per firm annually.

We also assessed the impact of two demand strategies on wine tourism adopters. First, we simulated a strategy, Simulation 2, in which wine firms doubled the 2005 contact rate of tourists through word-of-mouth recommendations. Then, we simulated Strategy 3 (Simulation 3), where we hypothesized that Chilean wine firms doubled their 2005 product attractiveness effectiveness. Fig. 5 shows the number of tourism adopters for 2005 to 2016 after implementing Strategies 2 (Simulation 2) and 3 (Simulation 3); it also reports the benchmark case (simulation without any strategy). Strategies 1 and 2 perform similarly and better than the benchmark case, supporting the effectiveness of implementing customer behavior strategies. Over the simulation period, Strategies 2 and 3 produce 599,390 new wine tourists and 645,401 new wine tourists, respectively. Implementing both strategies yields an additional 724 tourists (Strategy 2) and 779 tourists (Strategy 3) for each firm per year. However, when we analyze the cost of implementing Strategies 2 and 3, doubling the contact rate of customers via word-of-mouth recommendations is less expensive than doubling the rate of new tourist adopters who visit a particular wine firm only because they know of and prefer its wine products. Our results provide strong support for initiatives that stimulate customer behaviors via word-of-mouth recommendations such as wine education and lifestyle experiences (Byrd, Canziani, Hsieh, & Debbage, 2016; Charters & Ali-Knight, 2002).

5. Discussion

Hjalager (2010) suggests that limited empirical knowledge (especially quantitative knowledge) of the innovation process and its impact on the adoption of tourism innovations is a major obstacle to the development of appropriate strategies for facilitating innovation in tourism. In this study, we have made some contributions to the literature on tourism through the use of a resource-based framework adopting a mixed method approach. First, interviews helped validate the structure of the theoretical model of wine tourism adoption

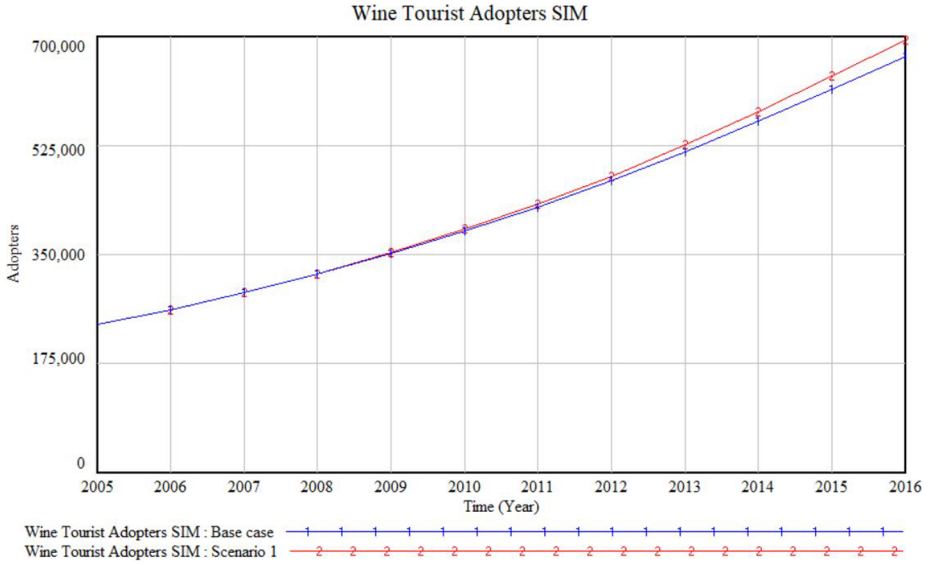

Fig. 4. Simulation of the number of tourism adopters between 2005 and 2016 after implementing business strategy 1 (Simulation 1) and without implementing any strategies (benchmark case).

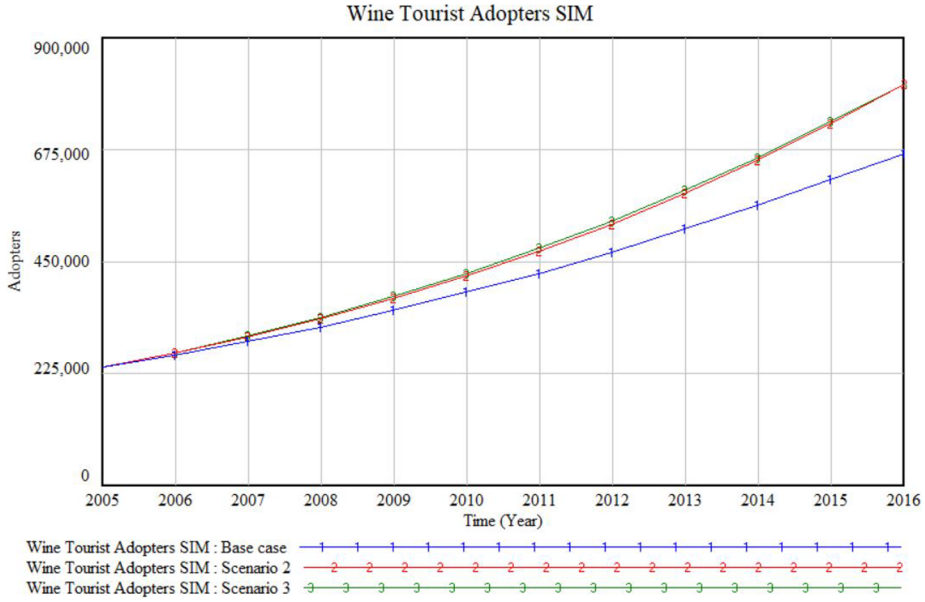

Fig. 5. Simulation of the number of tourism adopters between 2005 and 2016 after implementing Strategies 2 (Simulation 2) and 3 (Simulation 3), and the benchmark case (simulation without implementing any strategy).

originating from the combination of resources and capabilities (see Fig. 1). Torres, Kunc, and O'Brien (2017) suggest that managers find it difficult to identify strategic resources relevant to their growth strategies. Hence, our research approach developed a causal loop diagram from the literature to facilitate an elicitation process with wine managers and to reveal the structure of resources involved in supporting wine tourism strategies. Then, a set of resources was confirmed with empirical evidence of their contributions to growth in the number of wine tourists. In this sense, we contribute to managerial decision making on how to develop strategies related to wine tourism.

Second, our results also suggest that strategies focused on enhancing customer experiences and behaviors perform better than strategies to increase firm service capacity. Although prior research (Carlsen & Charters, 2006; Hall & Mitchell, 2000; Hojman & Hunter-Jones, 2012; Hong, Ma, & Huan, 2015; Thanh & Kirova, 2018) acknowledges the benefits of implementing both types of strategies to increase the number of wine tourists, none of these studies quantify their effects. With the present study, we contribute to this literature providing empirical evidence of the robustness of different strategies.

Third, quantitative data (e.g., simulation analysis) suggest that wine tourism services and tour operators have the greatest influence in increasing the number of wine tourists in Chile. This finding suggests that wine managers should encourage the development of comprehensive services related to wine tourism not only to boost sales but also to increase brand equity (Zamora & Barril, 2007; Carlsen & Charters, 2006; Tassiopoulos, Nuntsu, & Haydam, 2004; Hall & Mitchell, 2000; Getz et al., 1999). Our simulations also support the ideas of Getz and Brown (2006), who suggest that wine tourists who live far away from a wine region prefer to travel to places offering a broad range of tourism services and outdoor attractions because they want to combine the wine-tasting experience with other tourism activities. Our findings with respect to tour operators confirm previous evidence of the importance of networks and collaboration in tourism (Bruwer, 2003; Hall, Sharples, Cambourne, & Macionis, 2009).

We also found that product attractiveness is a key driver in accelerating the adoption of wine tourism. Thus, we confirm findings of previous studies showing that the frequency of visits to wine firms, the amount of time that people spend engaged in tourist activities, and the number of bottles bought are related to the attractiveness of a wine brand (Galloway, Mitchell, Getz, Crouch, & Ong, 2008). Well-known wine firms, (e.g., Concha y Toro) have advantages in the Chilean wine tourism industry because the product attractiveness of these firms increases wine tourism adoption faster than that of competing firms. Nonetheless, small wine firms may benefit from the product attractiveness generated by large firms if that product attractiveness is also associated with their shared geographic location and work with relevant tour operators. Bruwer (2003) suggests that the development of wine routes allows small wine firms to obtain revenues at low costs. In fact, tour operators can increase wine tourism adoption in particular wine regions because they operate along wine routes, and they can ensure that people know about wine tourism activities beyond those of main attractions: large, well-known wine firms.

Finally, our simulations show that word of mouth recommendations serve as a very powerful RM tool for generating tourism adoption via product attractiveness over the long term; however, most Chilean wine firms do not have action plans to invest in these types of initiatives. Word of mouth affects tourism adoption when people recognize a well-known wine firm. This evangelization process can foster wine firm growth and sustain competitive advantages. Quintal, Thomas, and Phau (2015) highlight the importance of wine services, trained staff and complementary products in shaping tourists' attitudes toward wine firms. Byrd, Canziani, Hsieh, and Debbage (2016) argue that wine firms can offer services such as customer service, wine clubs, socializing and wine education not only to increase customer value but also as an alternative business model. Our framework suggests that word of mouth has a positive long-term effect on the number of wine tourists when services are considered as part of a complete tourism package (Carlisle, Johansen, & Kunc, 2016; Chevalier & Mayzlin, 2006). To conclude, following Brenes, Montoya, and Ciravegna (2014), our study confirms that resources such as digital channels, reputation and tourism services are key drivers that set apart an agribusiness firm that competes using a differentiated strategy. Managers of agribusiness and especially those in Latin America should invest more in these types of resources rather than pursuing cost advantage strategies to sell commodities.

6. Concluding remarks

Wine tourism is an industry that has grown rapidly over the last few years. This is partly because wine firms can extend the direct-sales business model by offering tourism services at their vineyards. In fact,

the synergy created between wine production and wine tourism is key to increasing the profits of business production and assets. Our study provides wine firms with mechanisms for simulating tourism policies and for measuring the long-term impacts of wine tourism adopters. Our simulations show that directing resources toward demand-based strategies, and especially (due to its cost effectiveness) toward encouraging word-of-mouth recommendations, is likely to have the greatest impacts on the rate of wine tourism growth. This appears to be more effective than a supply side focus on the provision of more services.

Our results have some theoretical implications for resource-building decisions on wine firm performance. In traditional strategic analysis, firm resources are strengths that firms can use to conceive and implement their strategies (Barney, 1991). Chilean wine firms compete mostly in environments with finite and non-difficult-to-imitate resources; hence, differentiation is difficult and wine firms are forced to cooperate to attract wine tourism. Our research contributes to resource-based view theory by showing that wine firms should create heterogeneity in accumulated resource positions relative to rivals to achieve positive and strong performance in the tourism industry. Understanding the causal linkages between the management of resources and performance outcomes is at the core of the development of dynamic capabilities (Teece, 2007) and especially when there may be nonlinear relationships between the amount of resources accumulated at firm and industry levels and their effects on performance (Kunc & Morecroft, 2010). Helfat and Peteraf (2003) state that within the resource-based view there are few conceptual models that explain how resource heterogeneity arises. The microfoundation of dynamic capabilities has assumed greater importance in solving such a puzzle by searching for factors at the level of individual managers. Our two-stage research design shows how behavioral simulation models can be used to understand the dynamics of resources in the wine tourism industry, which addresses one of the shortcomings of the microfoundation of dynamic capabilities (Ployhart & Hale, 2014). In fact, our approach allows wine tourism researchers to understand the dynamics that result from the orchestration of key resources of wine tourism adoption and to evaluate ways to enhance wine firm performance.

As a managerial implication of our findings, the coordination of key resources should be considered when wine firms plan tourism activities. For example, wine firms and tour operators should consider intensifying joint-work via the internet to capitalize on an increase in wine tourists after wine firms or their locations receive recognition and awards from overseas. While the managers of Concha & Toro and Santa Rita recognize the importance of working closely with tour operators to contact potential tourists, both ignore potential benefits of competitors' wine attractiveness in enhancing their wine tourism adoption.

Our simulation-based approach presents some limitations related to assumptions used to build the model, data available to calibrate the model, and descriptions taken from a limited group of well-known wine managers in Chile. Our model may ignore some variables that explain wine tourism adoption such as the attractiveness of small wine producers or the beauty of winery surroundings. Future research could develop a broad range of policy rules for specific niche markets and well-known wine regions to evaluate the robustness of the tourism strategies developed by wine firms seeking to increase wine tourism adoption. Variables, such as size and location, can be considered scenario variables (Kunc & O'Brien, 2017) in simulations that provide wine firm executives with opportunities to assess strategies and to learn from simulated performance.

Another limitation lies in our attempt to evaluate one simulation model. Cognitive and behavioral differences among managers can help explain why some managers have more effective capabilities than others in anticipating, interpreting, and responding to the demands of an evolving environment (Helfat & Peteraf, 2015). Unfortunately, our simulation model cannot reveal whether our interviewees offer better representations of the wine tourism industry. Future research could explore how top executives analyze challenging and counterintuitive scenarios by simulating them in internal training sessions (Torres, Kunc, & O'Brien, 2017). On the other hand, future investigations must seek to quantify the impacts of the best practices of wine regions or countries and to observe changes in the elasticity of the five drivers explored here. For example, an extension of this study could involve measuring the scale impact of word-of-mouth recommendations and of the services that induce these recommendations. Other studies could extend this analysis to the effects that public policies related to this sector have on the expansion or internationalization of product attractiveness.

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Appendix A. Summary of the model's drivers and their causal relationships supported by interviews and academic articles. Fig. 1 shows these causal relationships as solid lines

Articles	Wine Firms (Interview)	Causal relationship
Zamora and Barril (2007), Sparks (2007), Carlsen and Charters (2006), Getz et al. (1999)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Word of mouth → (+) Wine tourism adoptersWine tourism adopters → (+) Word of mouth
Zamora and Barril (2007), Getz et al. (1999)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Product attractiveness → (+) Wine tourism adopters
Hojman and Hunter-Jones (2012), Kunc (2010), Zamora and Barril (2007), Carlsen and Charters (2006), Tassiopoulos, Nuntsu, and Haydam (2004), Hall and Mitchell (2000), Getz et al. (1999), Sparks (2007)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Wine tourism services → (+) Wine tourism adopters
Carlisle, Kunc, Jones, and Tiffin (2013), Xiang and Gretzel (2010), Buhalis and Law (2008), Buhalis (2003)	Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Internet services → (+) Wine tourism adopters
Kunc (2007), Baloglu and Mangaloglu (2001), Telfer (2001), Jamal and Getz (1995), Woodside and Lysonski (1989)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Tour operators → (+) Wine tourism adopters
Zamora and Barril (2007), Kunc (2010), Hojman and Hunter-Jones (2012)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Internet services → (+) Wine tourism activities
Aqueveque (2015), Zamora and Barril (2007), Getz et al. (1999)	Viña Tarapaca, Viña Concha y Toro, Viña Santa Rita, EnoturismoChile	Word of mouth → (+) Product attractiveness

Appendix B. Equations and variables of the system dynamics model (Stock-and-flow diagram)

Formulation and comments	Units
Wine Tourist Adopters (WMA)	Person
WMA $= \boldsymbol{P}(0) + \int_{2005}^{2016} \boldsymbol{Newadopters}(x)\,dx$	
The stock of wine tourist adopters, WMA, increases as new tourists arrive in Chile; "New Adopters(x)" reflects the rate at which wine tourist adopters increase per year; P(0) is a given value to represent the initial population of wine tourists, which was estimated based on the "Diagnóstico del Enoturismo en Chile 2013"[1]	
Word of Mouth	Person
$\boldsymbol{D}_1(\boldsymbol{t}) = \mathbf{ciP_t}\frac{\mathbf{W_t}}{\mathbf{N}}$	
We model adoption from word of mouth ($\boldsymbol{D}_1$) based on the classical diffusion model developed by Bass (1969). The parameter c is the contact rate, the parameter i is the adoption fraction, the variable P_t is the potential number of adopters at time t, and the parameter N is the total tourist population in Chile. We estimate all parameters by initially assuming that the average of each parameter in 2007, 2008, 2009, 2012, and 2013 is a constant value in the simulations. We use the total population of tourists in Chile from the 2016 statistics reported by the Chilean National Tourism Service available online at the following link: http://www.sernatur.cl/estadisticas/ (accessed December 2016).	
New adopters	Person
$\mathbf{A_i(t)} = \mathbf{f(D_1(t), D_2(t), \cdots, D_5(t))}$	
The flow variable new adopters $\mathbf{A_i(t)}$ at time $\mathbf{t}$ is a function of the five adoption drivers affecting it: ($\mathbf{D_1(t)}$, $\mathbf{D_2(t)}$, $\cdots, \mathbf{D_5(t)}$). We define every adoption variable ($\boldsymbol{D_i}$) as the number of adopters by each driver $\boldsymbol{i}$ at time t: adopters from word of mouth ($\boldsymbol{D}_1$), adopters from product attractiveness ($\boldsymbol{D}_2$), adopters from the internet ($\boldsymbol{D}_3$), adopters from tour operators ($\boldsymbol{D}_4$), and adopters from wine tourism activities ($\boldsymbol{D}_5$).	
Product attractiveness	Person
$\boldsymbol{D}_2(\boldsymbol{t}) = \mathbf{beP_t}\frac{\mathbf{W_t}}{\mathbf{N}}$	
The parameter $\boldsymbol{b}$ is the contact rate of potential tourists who are interested in visiting a specific vineyard, and the parameter $\boldsymbol{e}$ is the adoption fraction of product attractiveness.	
Internet Services	Person
$\boldsymbol{D}_3 = \boldsymbol{f} \bullet \boldsymbol{P_t}$	
The parameter f is a ratio of internet effectiveness that reflects the number of people that become wine tourists because they found advertising or travel promotions for visiting the vineyard.	
Services Investment	Dimensionless
The investment in new capacity depends on the desired service capacity level and the current service capacity level ($\boldsymbol{SC_t}$). We estimate a fixed desired level of service capacity γ for the whole simulation period. The used capacity ($\mathbf{UC_i(t)}$) depends on the occupation rate of wine tourists at time t and the maximum service capacity. We estimate a maximum level of service capacity σ for the whole simulation period.	
Tour operators	Person
$\boldsymbol{D}_4 = \boldsymbol{d} \bullet \alpha \bullet \boldsymbol{P_t}$	
The parameter d is the ratio of tour operator effectiveness multiplied by the parameter α, which represents the effect of service capacity on the tour operator's affiliation.	
Tourism Activities	Person
$\boldsymbol{D}_5 = \tau \bullet \beta \bullet \boldsymbol{P_t}$	
The parameter τ the ratio of service effectiveness multiplied by the parameter β, which represents the effect of service capacity on new available services. Parameters α and β relate to the function of service capacity.	
Service Capacity	
$\boldsymbol{SC_t}(\boldsymbol{t}) = \mathbf{SC}_0 + \int_{2005}^{2016} \boldsymbol{NCI_i}(\boldsymbol{t}) - \mathbf{UC_i(t)}\boldsymbol{dt}$	
We introduce the effect of service capacity on the adoption fraction from tour operators ($\boldsymbol{D}_4$) and tourism activities ($\boldsymbol{D}_5$); We represent service capacity ($\boldsymbol{SC_t}$) at time $\boldsymbol{t}$ as the initial value of service capacity ($\mathbf{C}_0$) plus the integral of new capacity investment ($\mathbf{NCI_i(t)}$) minus used capacity ($\mathbf{UC_i(t)}$) over time.	

[1]The "Diagnóstico de Enoturismo en Chile 2013" project was funded by the Chilean government through two national agencies: CORFO and the National Tourism Service.

References

Alonso, A. D., Bressan, A., O'Shea, M., & Krajsic, V. (2015). Perceived benefits and challenges to wine tourism involvement: An international perspective. *International Journal of Tourism Research, 17*(1), 66–81.

Aqueveque, C. (2015). The influence of experts' positive word-of-mouth on a wine's perceived quality and value: The moderator role of consumers' expertise. *Journal of Wine Research, 26*, 181–191.

Baloglu, S., & Mangaloglu, M. (2001). Tourism destination images of Turkey, Egypt, Greece, and Italy as perceived by US-based tour operators and travel agents. *Tourism Management, 22*, 1–9.

Barlas, Y. (1989). Multiple tests for validation of system dynamics type of simulation models. *European Journal of Operational Research, 42*(1), 59–87.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*(1), 99–120.

Bass, F. (1969). A new product growth model for consumer durables. *Management Science, 15*, 215–227.

Bramwell, B., & Broom, G. (1989). Tourism development action programmes: An approach to local tourism initiatives. *Insights, A6*, 11–17.

Brenes, E. R., Montoya, D., & Ciravegna, L. (2014). Differentiation strategies in emerging markets: The case of Latin American agribusinesses. *Journal of Business Research, 67*(5), 847–855.

Bruwer, J. (2003). South African wine routes: Some perspectives on the wine tourism industry's structural dimensions and wine tourism product. *Tourism Management, 24*, 423–435.

Buhalis, D. (2003). *eTourism: Information Technology for Strategic Tourism Management* (1st ed.). England: Pearson Education.

Buhalis, D., & Law, R. (2008). Progress in information technology and tourism management: 20 years on and 10 years after the Internet—The state of eTourism research. *Tourism Management, 29*, 609–623.

Byrd, E., Canziani, B., Hsieh, Y., & Debbage, K. (2016). Wine tourism: Motivating visitors through core and supplementary services. *Tourism Management. 52*, 19–29.

Camisón, C., & Monfort-Mir, V. M. (2012). Measuring innovation in tourism from the Schumpeterian and the dynamic-capabilities perspectives. *Tourism Management, 33*(4), 776–789.

Carlisle, S., Kunc, M., Jones, E., & Tiffin, S. (2013). Supporting innovation for tourism development through multi-stakeholder approaches: Experiences from Africa. *Tourism Management, 35*, 59–69.

Carlisle, S., Johansen, A., & Kunc, M. (2016). Strategic foresight for (coastal) urban tourism market complexity: The case of Bournemouth. *Tourism Management, 54*, 81–95.

Carlsen, P. J. (2004). A review of global wine tourism research. *Journal of Wine Research, 15*, 5–13.

Carlsen, J., & Charters, S. (2006). *Global Wine Tourism: Research.* Cabi: Management and Marketing.

Carlsen, J., & Boksberger, P. (2015). Enhancing consumer value in wine tourism. *Journal of Hospitality & Tourism Research, 39*, 132–144.

Charters, S., & Ali-Knight, J. (2002). Who is the wine tourist? *Tourism Management, 23*, 311–319.

Charters, S., & Menival, D. (2011). Wine tourism in Champagne. *Journal of Hospitality & Tourism Research, 35*(1), 102–118.

Chevalier, J. A., & Mayzlin, D. (2006). The effect of word of mouth on sales: Online book reviews. *Journal of Marketing Research, 43*, 345–354.

Davis, J. P., Eisenhardt, K. M., & Bingham, C. B. (2007). Developing theory through simulation methods. *Academy of Management Review, 32*, 480–499.

Denicolai, S., Cioccarelli, G., & Zucchella, A. (2010). Resource-based local development and networked core-competencies for tourism excellence. *Tourism Management, 31*(2), 260–266.

Díaz-Armas, R. J. (2008). Potencialidad e integración del "turismo del vino" en un destino de sol y playa: el caso de Tenerife. *(Special Issue) Número Especial Turismo gastronómico y enoturismo Gastronomic and wine tourisme, 6*, 199.

Divisekera, S., & Nguyen, V. K. (2018). Determinants of innovation in tourism evidence from Australia. *Tourism Management, 67*, 157–167.

Elliott, R., & Boshoff, C. (2005). The utilisation of the Internet to market small tourism businesses. *South African Journal of Business Management, 36*(4), 91–104.

Fotiadis, A., Yeh, S. S., & Huan, T. C. T. (2016). Applying configural analysis to explaining rural-tourism success recipes. *Journal of Business Research, 69*, 1479–1483.

Forrester, J. W., & Senge, P. M. (1980). Tests for building confidence in system dynamics models. System dynamics. *TIMS studies in management sciences, 14*, 209–228.

Ganglmair-Wooliscroft, A., & Wooliscroft, B. (2016). Diffusion of innovation: The case of ethical tourism behavior. *Journal of Business Research, 69*, 2711–2720.

Galloway, G., Mitchell, R., Getz, D., Crouch, G., & Ong, B. (2008). Sensation seeking and the prediction of attitudes and behaviours of wine tourists. *Tourism Management, 29*, 950–966.

Getz, D. (2000). *Explore Wine Tourism: Management, Development and DestinationsE.* New York: Cognizant Communication Corporation.

Getz, D., & Brown, G. (2006). Critical success factors for wine tourism regions: A demand analysis. *Tourism Management, 27*(1), 146–158.

Getz, D., Dowling, R., Carlsen, J., & Anderson, D. (1999). Critical success factors for wine tourism. *International Journal of Wine Marketing, 11*, 20–43.

Gómez, M., Pratt, M. A., & Molina, A. (2018). Wine tourism research: A systematic review of 20 vintages from 1995 to 2014. *Current Issues in Tourism, 1*, 1–39.

Hall, C. M., Sharples, L., Cambourne, B., & Macionis, N. (2009). *Wine Tourism Around the World* (1st ed.). London: Routledge.

Hall, C. M., & Macionis, N. (1998). Wine tourism in Australia and New Zealand.

Hall, C. M., & Mitchell, R. (2000). Wine tourism in the Mediterranean: A tool for re-structuring and development. *Thunderbird International Business Review, 42*, 445–465.

Harrison, J. R., Lin, Z., Carroll, G. R., & Carley, K. M. (2007). Simulation modeling in organizational and management research. *Academy of Management Review, 32*(4), 1229–1245.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: Capability lifecycles. *Strategic Management Journal, 24*(10), 997–1010.

Helfat, C. E., & Peteraf, M. A. (2015). Managerial cognitive capabilities and the micro-foundations of dynamic capabilities. *Strategic Management Journal, 36*(6), 831–850.

Hennig-Thurau, T., Gwinner, K. P., Walsh, G., & Gremler, D. D. (2004). Electronic word-of-mouth via consumer-opinion platforms: What motivates consumers to articulate themselves on the internet? *Journal of Interactive Marketing, 18*(1), 38–52.

Hjalager, A. M. (2010). A review of innovation research in tourism. *Tourism Management, 31*, 1–12.

Hojman, D. E., & Hunter-Jones, P. (2012). Wine tourism: Chilean wine regions and routes. *Journal of Business Research, 65*, 13–21.

Hong, T., Ma, T., & Huan, T. C. T. (2015). Network behavior as driving forces for tourism flows. *Journal of Business Research, 68*, 146–156.

Hwang, J., & Kunc, M. (2015). Business dynamics of on-premise wine trade: Cases from South Korea. *International Journal of Wine Business Research, 27*(3), 239–254.

Jamal, T. B., & Getz, D. (1995). Collaboration theory and community tourism planning. *Annals of Tourism Research, 22*, 186–204.

Kunc, M. (2007). A survey of managerial practices in the small to medium Chilean wineries. *Journal of Wine Research, 18*, 113–119.

Kunc, M. (2009). Forecasting the development of wine tourism: A case study in Chile. *International Journal of Wine Business Research, 21*, 325–338.

Kunc, M. (2010). Wine tourism: A review of the Chilean case. *International Journal of Tourism Policy, 3*, 51–61.

Kunc, M. (2012). Creating and sustaining a competitive advantage over time: Managing a delicate balance between value creation and value appropriation as a regional capability. In S. Charters (Ed.). *The Business of Champagne: A Delicate Balance*. Routledge.

Kunc, M. H., & Morecroft, J. D. (2009). Resource-based strategies and problem structuring: Using resource maps to manage resource systems. *Journal of the Operational Research Society, 60*(2), 191–199.

Kunc, M., & Morecroft, J. D. (2010). Managerial decision making and firm performance under a resource-based paradigm. *Strategic Management Journal, 31*(11), 1164–1182.

Kunc, M., & O'Brien, F. A. (2017). Exploring the development of a methodology for scenario use: Combining scenario and resource mapping approaches. *Technological Forecasting and Social Change, 124*, 150–159.

Lavandoski, J., Albino Silva, J., & Vargas-Sánchez, A. (2014). *Institutional theory in tourism studies: Evidence and future directions (No. 2014–3)*. CIEO-Research Centre for Spatial and Organizational Dynamics, University of Algarve.

Lazzeretti, L., & Petrillo, C. S. (2006). *Tourism Local Systems and Networking* (1st Ed.). New York: Routledge.

Lumsdon, L. M., & Swift, J. S. (1999). The role of the tour operator in South America: Argentina, Chile, Paraguay and Uruguay. *International Journal of Tourism Research, 1*(6), 429–439.

Martinez-Fernandez, C. (2004). Regional collaboration infrastructure: Effects in the Hunter Valley of NSW. *Australian Planner, 41*(4), 66–73.

Mill, R. C., & Morrison, A. M. (1992). *The Tourism System, an Introductory Text.* Englelwood Cliffs: Prentice Hall Int.

Morecroft, J. D. (2015). *Strategic modelling and business dynamics: A feedback systems approach.* John Wiley & Sons.

O'Neill, M., Palmer, A., & Charters, S. (2002). Wine production as a service experience–the effects of service quality on wine sales. *Journal of Services Marketing, 16*(4), 342–362.

Orsolini, N., & Boksberger, P. (2009). Wine and Tourism-How can a tourist experience be created? In paper presented to the 4th Interdisciplinary and International Wine Conference Bacchus goes Green (Dijon, 8–10 luglio 2009) (pp. 12).

Pagani, M., & Otto, P. (2013). Integrating strategic thinking and simulation in marketing strategy: Seeing the whole system. *Journal of Business Research, 66*(9), 1568–1575.

Park, D. H., Lee, J., & Han, I. (2007). The effect of on-line consumer reviews on consumer purchasing intention: The moderating role of involvement. *International Journal of Electronic Commerce, 11*(4), 125–148.

Pierson, K., & Sterman, J. D. (2013). Cyclical dynamics of airline industry earnings. *System Dynamics Review, 29*, 129–156.

Ployhart, R. E., & Hale, D., Jr (2014). The fascinating psychological microfoundations of strategy and competitive advantage. *Annu. Rev. Organ. Psychol. Organ. Behav. 1*(1), 145–172.

Presenza, A., et al. (2010). Managing Wine Tourism in Italy. *Journal of Tourism Consumption and Practice, 2*(1), 46–61.

Qudrat-Ullah, H., & Seong, B. S. (2010). How to do structural validity of a system dynamics type simulation model: The case of an energy policy model. *Energy policy, 38*(5), 2216–2224.

Quintal, V. A., Thomas, B., & Phau, I. (2015). Incorporating the winescape into the theory of planned behaviour: Examining 'new world' wineries. *Tourism Management, 46*, 596–609.

Ravenscroft, N., & Van Westering, J. (2001). Wine tourism, culture and the everyday: A theoretical note. *Tourism and Hospitality Research, 3*(2), 149–162.

Sparks, B. (2007). Planning a wine tourism vacation? Factors that help to predict tourist behavioural intentions. *Tourism Management, 28*, 1180–1192.

Sterman, J. D. (2000). *Business Dynamics. System Thinking and Modeling for a Complex World.* Boston, US: McGraw Hill.

Thanh, T. V., & Kirova, V. (2018). Wine tourism experience: A netnography study. *Journal of Business Research, 83*, 30–37.

Tassiopoulos, D., Nuntsu, N., & Haydam, N. (2004). Wine tourists in South Africa: A demographic and psychographic study. *Journal of Wine Research, 15*, 51–63.

Teece, D. J. (2007). Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance. *Strategic Management Journal, 28*(13), 1319–1350.

Telfer, D. J. (2001). Strategic alliances along the Niagara wine route. *Tourism Management, 22*(1), 21–30.

Torres, J. P., Kunc, M., & O'Brien, F. (2017). Supporting strategy using system dynamics. *European Journal of Operational Research, 260*, 1081–1094.

Torres, J. P., & Kunc, M. (2016). Market Opportunity Recognition in the Chilean Wine industry: Traditional versus Relational Marketing approaches. *Journal of Wine Research, 27*, 19–33.

Wargenau, A., & Che, D. (2006). Wine tourism development and marketing strategies in Southwest Michigan. *International Journal of Wine Marketing, 18*, 45–60.

Wang, Y., & Fesenmaier, D. R. (2007). Collaborative destination marketing: A case study of Elkhart county, Indiana. *Tourism Management, 28*(3), 863–875.

Woodside, A. G., & Lysonski, S. (1989). A general model of traveler destination choice. *Journal of Travel Research, 27*, 8–14.

Wu, C. W. (2016). Destination loyalty modeling of the global tourism. *Journal of Business Research, 69*(6), 2213–2219.

Xiang, Z., & Gretzel, U. (2010). Role of social media in online travel information search. *Tourism Management, 31*, 179–188.

Zamora, J., & Barril, M. E. (2007). Turismo y vino: Un estudio formativo sobre la evolución de las rutas del vino en Chile. *Estudios yPerspectivas en Turismo, 16*, 173–194.