Experiencing information asymmetries in tourism

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4th ADVANCES IN TOURISM MARKETING CONFERENCE (ATMC)
Maribor, Slovenia, 6th - 9th September, 2011.

Conference themes:

Research methods; Modern ICT and social media; Service production and consumption; Strategy

Abstract

Tourism has long been described as an information asymmetric market. In this situation, as well known, consumers are unable of fully assessing the quality of the product they are going to acquire and, in the long run, the space available for high quality products is greatly reduced. The large diffusion of Internet and e-commerce functions had let hope to represent a solution to this problem, but this expectation has not always been fully satisfied. Today, however, the new wave of Web 2.0 functionalities has given a vast population powerful methods to better judge products and services. It is then possible to envisage circumstances in which a consumer is better informed than a supplier about the real value of the products on the market. By using a set of agent-based numerical simulations this paper discusses the differences between the two possible asymmetric market conditions. These results are discussed with respect to possible strategies to be adopted by both buyers and sellers in order to re-balance satisfaction (customers) and earnings (suppliers).

Keywords
information asymmetry; tourism market; tourism experience; products and services; strategy and policy; agent-based modeling; numerical simulations

Introduction and background

It is well known that "experience" (from a consumer point of view) is an important factor influencing the growth (or even the survival) of a firm. This is even more important in markets where information, more than tangible objects, play a vital role. Information flows are central to many economic activities and represent a major factor for the stability and efficiency of markets. Many of these are characterized by imperfect information and, in particular, by *asymmetric information* where sellers of a product know its true characteristics and value while potential buyers do not. Akerlof (1970) highlighted how such a situation could spoil the proper functioning of a market by preventing profitable transactions from taking place and thus generating inefficiencies in the market. In extreme cases, the consumer's inability to assess the real quality and value of goods could lead to a significant reduction in their quality and eventually to the collapse of the market.

Tourism has long been recognized to be an asymmetric information market (Cohen, 1979; Smeral, 1993). Travelers are able to only partially assess the quality features of the package they were considering before experiencing the trip on the basis of information made available by providers and intermediaries. The advent of the Internet had aroused the idea that this asymmetry could have been relieved (in some way) by providing consumers with more opportunities to collect details about their travel destinations and the products and services offered (Schwabe et al., 2008; Sirgy et al., 2006; Werthner & Klein, 1999). Actually, this asymmetry seems not to have been decreased by much, and the strong presence of online intermediaries has in some way perpetuated known situations (Chen & Schwartz, 2006; Fernández-Barcala et al., 2010). The promise of reduction in uncertainty, that the spread of easy-to-use information technologies should have improved, has not been fully satisfied, and some authors argue that, in the case of online markets (Lin et al., 2010: 2): "*despite the rapid growth of these markets that bring together atomistic buyers and sellers, the 'virtual' nature of these markets further exacerbates issues of information asymmetry and the likelihood of opportunistic behaviors*".

The environment known as Web 2.0 has modified the scenario by making readily available an immense quantity of information on practically any aspect of human life. For a long time the connections of an individual, and the possibility to share experience and information about products and services, had been limited to a small number of close friends or relatives. The utility of this type of information was diminished due to the small probability of engaging with someone having had the same (or even similar) experience. In tourism, Web 2.0 environments have generated the possibility to consult a massive number of sources where destinations, providers, products and services are discussed, compared, commented and evaluated. These sources have rapidly changed the way individuals face the problem of gathering information about trips, make choices or anticipate experience (Inversini et al., 2009; Jones & Yu, 2010; Xiang & Gretzel, 2010; Zehrer et al., 2010; Zhang et al., 2009). Web 2.0 services and functions greatly

facilitate this opportunity by significantly widening the concept of friendship, thus multiplying the quantity of information sources available to any single individual.

In this environment it is thus possible to envisage a situation in which the buyer is more informed than the seller. The information asymmetry is still present but is swapped. A recent paper names this a "market for gems" (Dari-Mattiacci et al., 2010). In this work, the authors describe the consequences of an *inverse adverse selection mechanism* (the mirror image of Akerlof's lemons model). Despite the symmetry between the two models, the authors find that the two problems generate asymmetric consequences for real-life markets where different solutions and different strategic approaches are required. While for the lemons problem, signaling and screening appear to be the best practical solutions, for the gems problem auctions seem to be the way to go, the authors conclude.

Objectives of the work

The main objective of this exploratory work is to provide a model that is able to represent the two market configurations (i.e. market for lemons and the market for gems) in a tourism environment. With such a model we look at how different levels and types of asymmetries influence the functioning of the tourism market. This may allow deriving guidelines for the attitudes a tourism operator (or a destination) might have in order to attain the best possible performance and improve profitability while not decreasing the satisfaction of the tourists with regard to their experience. To do so, analytical approaches risk to be too complicated and not fully solvable, therefore a numerical simulation approach is taken and an agent-based model is implemented.

The rest of this paper is organized as follows. Next section briefly describes the information asymmetry issue, then we describe the methods used and present the results of the simulations performed. Finally we interpret these outcomes deriving the implications for the tourism sector.

Information asymmetry: lemons and gems

The ideal world studied by classical economic theories is a world in which the different actors behave in a rational way having full information on the products and the market in which they are embedded. This perfect market involves a configuration of production and exchange in which optimal outcomes are realized efficiently without the need for intervention by external (nonmarket) actors. As George Soros states (1987: 12): *"Economic theory […] introduces the assumption of rational behavior. People are assumed to act by choosing the best of the alternatives, but somehow the distinction between perceived alternatives and facts is assumed away. The result is a theoretical construction of great elegance that resembles natural science but does not resemble reality. It relates to an ideal world in which participants act on the basis of perfect knowledge and it produces a theoretical equilibrium in which the allocation of resources is at an optimum."*

Today, an increasing awareness of the complexity of economic systems, with the associated nonlinearities, emergent and self-organizing features and extreme sensitivity to certain classes of events, has modified this dream of a system evolving towards equilibrium and stability (at least under certain conditions) (Arthur, 1999; Foster, 2005). From this dream, at least for what concerns the *perfect knowledge*, economists were

awakened by three American economists in the early 1970'. Akerlof, Spence and Stiglitz analyzed, form different perspectives, an economic market from a more realistic perspective: the one in which information about the different products is not evenly distributed and the supply or demand side have some lack of knowledge about the quality of the products in relation to the price at which they are offered (Akerlof, 1970; Rothschild & Stiglitz, 1976; Spence, 1973).

Let us describe a simple case such as the one discussed by Akerlof (see for example Varian, 1992). Assume that in a market a number of suppliers offer a range of products (Akerlof refers to used cars, but the argument is obviously valid for any product) whose quality can be expressed by q, $q \in [0,1]$. If q is uniformly distributed over [0,1], then its expected value is $E(q)=0.5$. A number of buyers are willing to pay a price kq ($k \geq 1$), a number of sellers are willing to accept some price: $p(q) \in (kq,q)$. If the consumers cannot fully assess the quality, the consumers would estimate it as the average quality $\langle q \rangle$ of products offered on the market, therefore they will be willing to pay a price $p=k\langle q \rangle$. In this situation only sellers whose products are of quality $q \leq p$ will offer them for sale (for the other sellers p is less than their minimum price q). Since quality is uniformly distributed in $[0,p]$, the average quality is $q=p/2<0.5$. Buyers, then, are only prepared to pay $kq=k(p/2)=(k/2)p<p$. Thus, no products will be sold at price p. Since p is chosen arbitrarily, no product is sold at any price $p>0$, and the equilibrium price is $p=0$. In other words demand and supply is zero. Asymmetric information thus destroys the market for the products considered.

The consequences and the possible remedies for this issue have been extensively analyzed by the economic literature (Kirmani & Rao, 2000), and tourism studies are no exception (Calveras & Orfila, 2007; Crase & Jackson, 2000). Less analyzed is the symmetric but opposite problem: the one in which sellers have less information than buyers. The situation is described by the work of Dari-Mattiacci et al. (2010). The authors find that also in this *inverse adverse-selection* setting the market tends to disappear, but it disappears *from the bottom* rather than from the top. In other words, the high-value products (termed *gems*) remain on the market longer than the low-value ones (Akerlof's *lemons*). Table 1 provides a comparison between the two situations.

Table 1: Dualities in information asymmetric markets (adapted from Dari-Mattiacci et al., 2010)

	Adverse selection (lemons market)	**Inverse adverse selection (gems market)**
Buyer	Uninformed	Informed
Seller	Informed	Uninformed
Market	Disappears for high-value goods	Disappears for low-value goods
Goods on market	Low-value goods (lemons)	High-value goods (gems)
Buyer's surplus	Zero	Positive
Seller's surplus	Positive	Zero

Besides the obvious symmetry, the two problems have different consequences for a market. The main difference highlighted is the fact that while informed sellers could be easily detected: buyers accumulate experience with time and they can try to force

sellers to release more information or find ways to protect themselves (for example by asking for warranties), better informed buyers are difficult to identify because their knowledge is private, is built upon personal experience and it is not possible to force a disclosure or to enforce legal protections. In summary, uninformed sellers are at bigger disadvantage and can be in situations in which they may never understand they sell at prices too low.

In the lemon case possible circumventions are known: signaling (forcing the seller to communicate the real quality), screening (filtering incorrect information) or legal protections (warranties). In the gems case Dari-Mattiacci et al. (2010) find that the only feasible way is to auction the product, leaving the competition between buyers improve the quality/price ratio.

Methods

Agent-based modeling (ABM) is used to simulate the various configurations of a market. Sellers and buyers are characterized by a parameter defining their informational content level. In this way both the classical lemons and the new gems markets can be simulated. The ABM approach allows exploring the structural and dynamic characteristics of systems which may prove difficult to handle with analytical methods, and let the researcher to define even a large set of parameters and vary them with more ease that in the case of analytical methods.

From a methodological point of view the results obtained are sound and reliable since care has been taken of considering all the issues related to the use of ABM in the study of social and economic systems, and the software tools employed are stable and verified (Galán et al., 2009; Garson, 2009; Mollona, 2008). The model is built according to the most important methodological specifications and guidelines, and run in order to provide the simulation outcomes (for a discussion on ABM in tourism see Baggio, 2011).

The model considers N_d suppliers (destinations) and N_t consumers (travelers). At each time-step a traveler chooses its destination based on his expected quality given by the information the traveler has been able to gather and the price set by the destination. More precisely, a traveler will assess its decision to travel to a specific destination if and only if the price offered by the destination (p_d) is lower than the price a traveler is willing to pay for that specific destination (p_t).

Prices are computed by weighting the quality by the information available to both destinations and travelers. The quality of the N_d facilities (q_d) is determined at the beginning of every simulation and is randomly distributed in the interval [0, 1] (uniformly). The price set by a destination p_d is given by the quality of the destination, weighted by the destination's information level: $p_d = q_d * i_d$, while the price a traveler is willing to pay depends on the quality perceived: $p_t = q_d * i_t$.

At each time-step an individual looks for those destinations that comply with the rule outlined above ($p_d < p_t$) and chooses randomly between a suitable destinations. Table 2 summarizes symbols, variables, and parameter values used in the simulation.

Table 2: Model parameters

Symbol	Variable Name	Values
N_d	Number of destinations	10
N_t	Number of travelers	100
q_d	Quality of destinations	random uniform ∈ [0, 1]
i_d	Level of information destinations have on themselves	[0, 0.25, 0.5, 0.75, 1]
i_t	Level of information travelers have on destinations	[0, 0.25, 0.5, 0.75, 1]

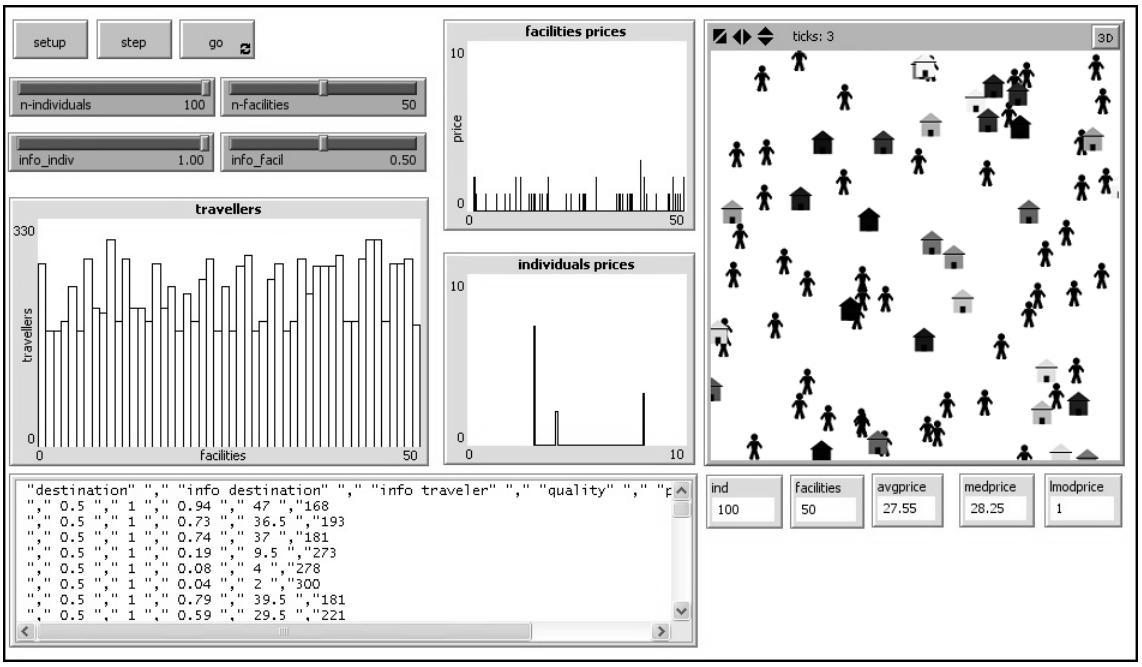

Figure 1 NetLogo model implementation

Two series of runs were performed. The first one simulates the *lemon* problem: destinations have complete information about themselves (i_d = 1), while travelers' knowledge is limited (i_t ∈ [0, 0.25, 0.5, 0.75, 1]). The second series reverses the situation: travelers have full information while destinations suffer from information asymmetry (i_t = 1 and i_d ∈ [0, 0.25, 0.5, 0.75, 1]). Every run (thus with the same set of controlling parameters) was simulated 100 times for 100 time-steps. At the end the prices and the cumulative number of travelers that chose the different destinations were recorded. The model (Figure 1) was implemented by using the NetLogo simulation environment (Wilensky, 1999).

Results and discussion

Figure 2 shows the main result of the simulations. For the two cases examined (lemons and gems) the boxplots represent the cumulative number of travelers who have chosen the different destinations with respect to the *real* quality levels.

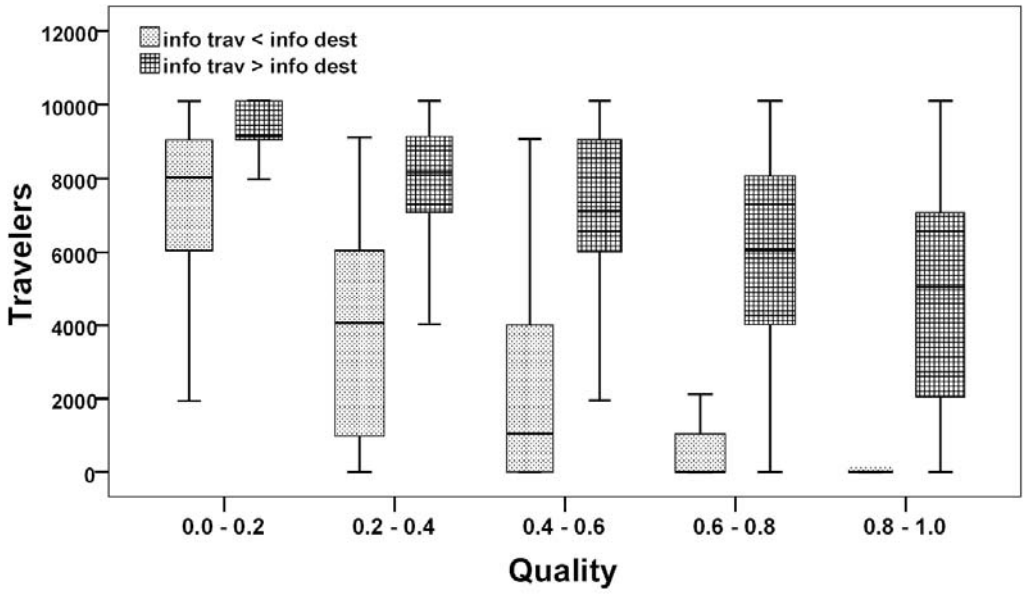

Figure 2 Cumulative number of travelers vs. destination quality for the two cases examined (outliers were been removed for clarity)

As can be seen, when the information asymmetry affects travelers, the market shrinks towards low-quality destinations, while the opposite happens when the level of information travelers have on destinations is higher than that destinations have on themselves.

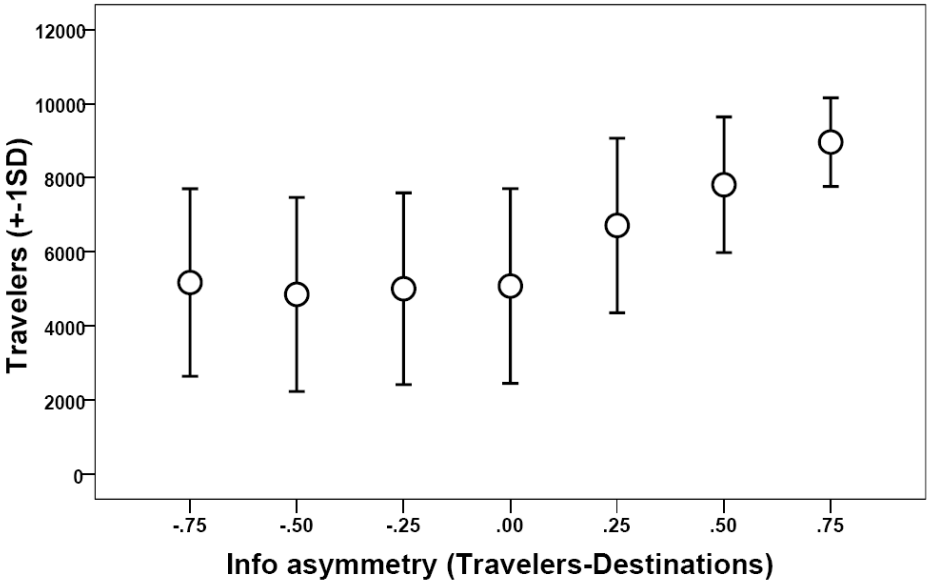

Figure 3 Cumulative number of travelers vs. information asymmetry: $i_t - i_d$ (error bars represent 1 SD)

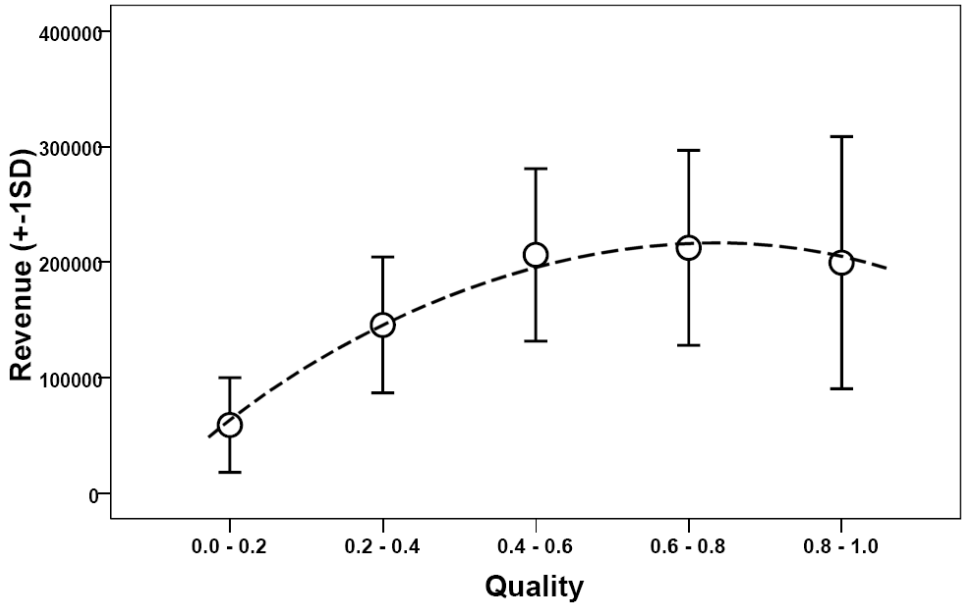

Figure 4 Revenue vs. Quality when travelers are more informed than destinations (error bars represent 1 SD; the dotted line is only intended to guide the eye)

This result is in agreement with the theoretical predictions and testifies the validity of the model implementation. It is interesting to notice then that the difference in information levels affects significantly the size of the market along with the direction of the asymmetry. In fact (Figure 3) as long as the difference in information levels is negative (travelers know less than destinations) the number of travelers is rather constant and starts increasing when travelers begin to be more informed. Also notice that the dispersion decreases, thus reinforcing the effect.

Considering the price a traveler is willing to pay it is possible to calculate potential revenue for the different destinations when travelers are more informed ($i_t - i_d > 0$). As Figure 4 shows (the dotted line is only intended to guide the eye and does not represent a fit), a growing quality generates growing revenue, but at higher values the growth flattens clearly indicating that destinations are missing out on their capabilities to generate economic revenues.

In conclusion: a negative information asymmetry (travelers less informed) shrinks the marked towards low-quality offers, creating a distortion and, in the long term, risking to expel all suppliers of high-quality products. On the other hand, positive information asymmetry (travelers more informed) generates a distortion in the market, not allowing suppliers offering high-quality products to fully exploit their capabilities. The agent-based model presented here is the initial step of a line of research which, in the future, will explore more deeply this phenomenon by better defining (and widening) the parameter space and by adding different types of social structures to the market considered. As Izquierdo and Izquierdo (2007) have shown, the topology of the set of relationships existing in the social group formed by the buyers can strongly affect the efficiency and the functioning of a market.

Governing asymmetric tourism markets

Information asymmetries are a natural feature of many markets including tourism. While in the case of the one affecting consumers the literature offers a range of possible remedies such as those briefly recalled previously (signaling, screening or legal protections), the reverse case is more difficult to handle. The only *practical* solution seems to be the one of Dari-Mattiacci et al. (2010) concerning auctions. However, besides the technical and theoretical peculiarities (Krishna, 2009), this path does not seem to have attracted much the tourism industry. The few examples known use auctions mainly as a marketing and promotional instrument to raise awareness in case of new products or services.

The real solution to this issue rests in improving the efforts directed to obtain a better and deeper knowledge of the market and the customers with their preferences, beliefs and behaviors. Under certain conditions, a buyer can achieve better results by dealing with an individual seller rather than turning to some kind of mass procurement (Manelli and Vincent, 1995). In a sense, this is what happens today when buyers make extensive use of online sources in order to choose the better offer for a specific product or service.

A number of applications are today available that allow to track the *sentiment* travelers and tourist express on practically every aspect of their journeys and may give an incredible wealth of information about features, characteristics, equipments, services offered[1]. Moreover, these tools can provide a better assessment of the perceived value of a product when this is embedded in a certain context, even beyond the *intrinsic* value of the product itself. A good and realistic use of these tools, then, seems to be the only practical option for destinations, companies or organization to better communicate with their customers, to make them better aware of the peculiar values of their proposals and to increase the perception of value by the travelers. Although difficult and still under study with uncertain results, the complex issue of monetizing promotional activities on online social networks starts to provide some initial guidelines (Clemons, 2009). The literature shows that a good appreciation of the quality of the products offered allows producers to position correctly (i.e. with the *right* price) their products on the market. Low information levels lead to low knowledgable subjects who, as Rob and Sieben demonstrate (1992) have systematically lower price limits. The clarity of the information provided, and thus an improvement of a continuous bidirectional communication may prove critical for high quality destinations. Thus, as Hu et al. point out (2000), tourist destination should not only focus on improving the satisfaction of existing customers, but also on improving the customer's perception of overall quality. This allows a correct positioning of the destination, especially when increasing information on high quality offers has negligible costs (Daughety & Reinganum, 2008).

Concluding remarks

We have presented an agent-based model for the study of tourism markets in which information on the products is not evenly distributed between the supply and the demand side. As shown throughout the paper and confirmed by the literature (see the references cited in the introduction), information asymmetry plays an important role in

[1] examples are: Klout (klout.com), Radian6 (www.radian6.com) or Twitalyzer (www.twitalyzer.com)

shaping the tourism market. When consumers, as today happens, have an incredibly vast and trusted source of information about all aspects of the products and services offered, high quality suppliers (destinations, organizations or companies) need to improve their ability to effectively communicate their quality to travelers in order to see recognized their efforts through an even pricing.

This work is a first step towards a full assessment of the economic role of information in the tourism sector. Future work will improve the model presented in this paper by exploring more numerous and complex parameter spaces and assessing how different social structures may influence the outcomes discussed here.

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