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# Bridging Information Gaps: Public Sector Intervention in Tourism Promotion during Crises – A Game Theory Approach

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**Abstract:** The present study applies Game Theory to study public investment at tourist destinations to determine the ‘best action’ for tourist destinations in competitive scenarios. This study proves that the higher the probability that the public sector of the destination will invest in tourism promotion, the greater the expected financial benefits for the destination. Furthermore, the research results show that the higher the probability of tourists traveling to the destination, the greater the expected financial return for the Destination’s Public Sector (DPS) investing. Notably, the findings prove the positive impact of reducing information asymmetry between tourists and destinations. Results from applying Game Theory to the tourist industry show that spending on advertising may be motivated by more than just increasing visitor numbers. Finally, this article’s main contribution is offering a theoretical-mathematical framework applicable to any tourist destination.

**Keywords:** public investment; tourism promotion; information asymmetry; Game Theory; tourism recovery.

## 1 Introduction

Tourism has emerged as a critical industry that supports and fosters local economic and human activities on several levels. Before the occurrence of COVID-19, tourism contributed 10.4 % to the global GDP and was the generator of 334 million jobs worldwide (WTTC, 2021). With the slowing down, to some extent, of the negative effects of COVID-19 in 2021 (CNBC, 2021), destinations and local attractions found themselves at a crossroads facing a hard recovery amid extremely challenging

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times. In such context, communication and promotion of destinations represent fundamental activities for timely communicating with users, for instance, about the latest updates, safety rules, and measures on COVID-19. Examples include; communicating disease control levels, and informing potential users of specific tourism organizations or the wider destination about regulations or restrictions for visiting attractions or entering the country or area (Han et al., 2020). Therefore, disseminating information represents a critical activity in phases of tourism recovery from crises such as the COVID-19 pandemic (Fotiadis, Polyzos, & Huan, 2021). In particular, if asymmetric information, intended when one party has more information than the other, occurs in such scenarios of tourism activity recovery, it is likely to negatively affect the desired results of destination managers and the industry.

One of the key matters here is that the private sector, in particular, faces the so-called ‘free-rider’ issue associated with public investment in advertising or communication initiatives (Lundtorp, 2003). This means that individual private organizations may not be disposed to allocate resources aimed at promotion activities independently as, while the cost of such investment is typically on the individual organization, other organizations – including competitors – may benefit from such initiatives. In this regard, Moral-Moral (2021) asserted that the public sector should invest in promoting tourist destinations to reduce asymmetric information between tourism offers and demand. Most importantly, in the specific setting of tourism recovery from the COVID-19 havoc, the reduction of information asymmetry plays a key role in increasing the sense of security of potential tourists and decreasing uncertainty. If a specific tourist destination does not invest in promotion during or following such critical times, other destinations may also indirectly benefit from it.

For instance, when a visitor decides to visit destination X, this impacts destination Y because they are mutually exclusive; that is, a visitor cannot be in both destinations simultaneously. Therefore, there is a strategic interdependency scenario among destinations. These tourism scenarios offer a suitable ground for the application of the theoretical framework proposed by the Game Theory since the action results of one destination will not only depend on its action but also the actions performed by other destinations in terms of tourism promotion activities. This assertion is supported by the Game Theory definition mentioned by Mansfield and Yohe (2004), which is deemed a suitable tool for understanding decision-making processes in competition scenarios.

Therefore, the study’s purpose is to use a simple Game Theory model to study the relationship between public investment and competition among tourist destinations, i. e., to identify the best action to be taken in a scenario of competition among destinations. Models with a simplified structure are essential for generating insights in any area of study, which justifies their presence in this work. In support of that, several sophisticated models used today were derived from relatively

simple models which were improved over time (Dogru, Bulut, & Sirakaya-Turk, 2019; Hanafiah & Zufikly, 2019). The study has particular significance in a context of uncertainty dictated by sustained health and safety concerns and political conditions such as the latest major events of the Russia-Ukraine war and the COVID-19 health emergency. Finally, the main contribution of this study is offering a theoretical-mathematical framework applicable to any destination, as its development is not based on a case study that may limit its scope but rather on a mathematical framework leading to broader application and generalization.

## 2 Theoretical Framework

### 2.1. Asymmetry of information in tourism

Tourism has long been described as an information-asymmetric market (Baggio & Baggio, 2011). Several studies have also pointed out that tourists are more prone to cutting down travel plans in a scenario of uncertainty (e. g. Sharma, 2021). Typically, information symmetry between market participants is related to efficient market prices. For example, Crase and Jackson (2000) showed that the proportion of uninformed tourists could create price dispersions at a specific location. Moreover, among the causes of the information asymmetry, Ivanova (2016) identifies the following: a) the variability of the environment (changes in consumer preferences); b) the obsolescence of information; c) the unreliability of its sources; d) the inability to access all existing information in large quantities and respectively to process it for further use. For these reasons, Crase and Jackson (2000) pointed out that public tourism departments are key in addressing information symmetry issues.

Based on these premises, investing in tourism promotion plays a major role in scenarios of crisis recovery. Destination promotion is the set of creative and dynamic activities to launch, maintain and develop the image of a tourism product or service through appropriate and efficient techniques, such as publicity and public relations, with the ultimate task being attracting potential consumers and an increase of tourist flows (Bonham & Mak, 1996). Thus, tourism promotion is seen as an important tool for tourist destinations to build brand image and raise consumer awareness (Sanz-Marcos, 2020). However, Vargas (2020) pointed out that the nature of promotion activities should differ from that previous to COVID-19. According to Martín-Critikián et al. (2021), following major disruptive events such as COVID-19, the main objective of tourism promotion should not only focus on advertising activities, i. e., disseminating messages with commercial and one-way communication purposes, but also communicating a sense of safety as part of the branding features of a destination.

## 2.2 Public Investment in Tourism Promotion

Tourism promotion activity is one of the determinants of tourists' choices at peculiar times as in the case of the Spanish Government's announcement in May 2021 about the relaxation of restrictions to travel to the main Spanish tourist destinations. A few days after the announcement, the search for hotels and other hospitality services within Spanish borders increased by 142% – according to Hostelur (2020). In addition, the reopening of Portugal to Brazilians announced on 1<sup>st</sup> September 2021 encouraged tourists to pack their bags. In the first 24 hours after announcing the restrictions, Latam, the leading airline in Brazil, registered a 300% increase in searches for airline tickets to Lisbon (VEJA, 2021).

Public investment levels should reflect tourism's importance in the regional economy, including for promotion or advertising. If government resources are scarce, investing in tourism promotion must consider the local economic impact as a criterion for resource allocation. One of the most appropriate manners to measure the effects is the return on tax amount (ROI) for every dollar spent on promotion as already adopted by several North American states. For example, the ROI of tourist advertising in California was calculated at US \$20 local tax revenue per ad dollar and \$17 in North Carolina (US Travel Association, 2014). Visit Florida's public marketing spending in 2015 was associated with an investment of \$1 million in tourism promotion generating \$3.2 million in the same year in tax revenue (EDR, 2015). A study by the Tourism Council of Western Australia (TCWA, 2016) also showed that the economy earns an extra AUS \$20 for every dollar the State government invests in tourist promotion. Therefore, empirical evidence amply supports the worthiness of investing in tourism given the financial benefits (Kulendran & Dwyer, 2009).

## 2.3 Game Theory and Tourism

One of the grounds for Game Theory is the existence of a strategically interdependent scenario, i. e., a situation in which the result for an agent depends not only on his actions but also on those of other agents. Therefore, the results, such as an increase in revenues, profits, customer satisfaction, and a fall in the government's approval rating by its voters among countless other examples, are the consequences of the player's actions (Tavares, 2022). As a result, the application of Game Theory in tourism studies has shown a stable and varied presence spanning the past two decades as shown in Table 1.

**Table 1:** Game Theory applied to research in tourism.

Authors	Application	Year
Sheng	Regional competition and sustainability	2011
Van Zyl	Tourist marketing in art festivals	2012
Buckley	Social-Benefit Certification	2013
Tavares, Tomazzoni, & Mores	Touristic promotion by the public sector	2014
Arenoe, van der Rest, & Kattuman	Pricing models in hotel revenue management	2015
Xuan et al.	Travel Accommodation Report	2016
Tan et al.	Protection of tourist consumers' rights	2017
Liang & Ma	Tourist shopping process in tourism destination	2018
Aznar, Maspera, & Quer	Airbnb and hotels competition	2019
Keskin & Ucal	Model For Tourism Supply Chains	2020
Kopf & Hsu	Game Theory, Tourism and Land Ethics	2021
Yuval	Intermunicipal Management of Overtourism	2022
Nogueira et al.	Game Theory and governance of protected areas	2023
Ahmad & Al-Fajih	Travel behaviour and Game Theory	2024

Source: Authors

The results of using strategies are also known as returns, while a game can be static or dynamic. In the static game, players do not know the choices made by others, which is represented in the Normal or Strategic form. In its simplest form, this game has two players and two strategies for each player. In a dynamic game, the movements are sequential so that every player knows the actions previously made by other players when they are called to make a decision. The resolution is carried out through backward induction. When this does occur, it becomes an imperfect information game (Ganzfried & Sandholm, 2022). Thus, the information set indicates that the player was involved in a previously unknown game history. When all the players know each other, payments become a game with complete information (Bonanno, 2018). Regarding the level of knowledge of the player's outcome (revenue), the game is considered to have complete information when all participants know their and their competitors' earnings.

## 3 Methodology

### 3.1 Static game of complete and imperfect information

This study uses two Static Games of Complete Information, each with two players (1 and 2). The fact that there are only two players does not limit the usefulness of the model since a multitude of scenarios in real life involve competition between two agents (Biggar & Shames, 2023; Li et al., 2023; Peña & Noldeke, 2023). As the games

are simultaneous, a decision taken by player 1 is unknown by player 2 and vice-versa (known as imperfect information).

- a) The first game is characterized by the following:
- Player 1: destination's 1 public sector ('D1PS')
  - Player 2: destination's 2 public sector ('D2PS')
  - Players 1 and 2 strategies: 'to invest in tourist promotion' ('INV') and 'not invest in tourist promotion' ('NINV')
  - Payoffs: Return on Investment (ROI) to Players 1 and 2
  - Normal Form (Figure 1):

		D2PS	
		INV	NINV
D1PS	INV	X; X	Y; Z
	NINV	Z; Y	W; W

**Figure 1:** First game.

- The payoffs' rules are  $X > Z$  e  $Y > W$  (for both players). According to Tiainen (2013, p. 7), "investment is a spending to capital and financial assets that are made by private or public organizations or governments in the expectation of getting future returns". Tourism investments in tourist destinations are thus made to support the global capacity and satisfy tourist demand (Dwyer, Forsyth, & Dwyer, 2020). Over time, facilities and local infrastructure suffer natural wear and tear and need repairs, in tourist addition, of course, to technological changes that end up requiring new investments. Therefore, our payoff assumptions are based on such premises.
- b) The second game is characterised by the following:
- Player 1: destination's public sector ('DPS')
  - Player 2: tourist (TOUR)
  - Player 1's strategies: 'to invest in tourist promotion' ('INV') and 'not invest in tourist promotion' ('NINV')
  - Players 2's strategies: 'to travel' ('TRAV') or 'not to travel' (NTRA).
  - Payoffs: Return on Investment (ROI) to Player 1 and Satisfaction level (scale formed by the natural numbers) to Player 2.
  - Normal Form (Figure 2):

		TOUR	
		TRAV	NTRA
DPS	INV	A; B	E; F
	NINV	C; D	G; H

Figure 2: First game.

The payoffs’ rules are  $A > C$  and  $G > E$  (player DPS) and  $B > F$  and  $H > D$  (player TOUR). Our payoff assumptions are based on the statement that it is necessary “improving tourism infrastructure to increase the attractiveness of the destination is an essential factor in attracting tourists” (Nguyen, 2021, p. 131).

- To clarify why the payoff structure was presented in this way, we offer the justification for one of the interactions, namely, when the tourist travels (TRAV) and the public sector invests in tourism (INV). A is greater than C because, given that the tourist has already decided to travel to the destination (TRAV) – although the destination is not yet sure of this, as it is a simultaneous game – investing in tourism (INV) is expected to generate greater satisfaction for the tourist. This fact results in greater chances of returning to this destination as well as other benefits such as word-of-mouth being considered a powerful marketing tool.

## 4 Results

The results of the two games are reported as follows:

a) First game

The resolution of this game is shown below (Figure 3):

		D2PS	
		INV	NINV
D1PS	INV	$\textcircled{X}$ ; $\textcircled{X}$	$\textcircled{Y}$ ; Z
	NINV	Z; $\textcircled{Y}$	W; W

Figure 3: First game’s resolution.

The game's solution is found in the Nash Equilibrium (X; X) as the strategy 'INV' is dominant precisely for both players (Nash, 1950). This means that playing the 'INV' strategy is always the best to adopt, regardless of the other fate's strategy. This type of strategy will always offer the highest payoffs for the destination. The existence of a dominant strategy for each player does not undermine the analysis's importance since it arises from the payoff structure of both players, not limited to one. In other words, competitor payoffs also influence whether or not the dominant strategy occurs for a given player.

b) Second game:

The resolution of this game is shown below (Figure 4):

		TOUR		
		TRAV	NTRA	
DPS	INV	(A); (B)	E; F	$P_{INV}^{DPS}$
	NINV	C; D	(G); (H)	$1 - P_{INV}^{DPS}$
		$P_{TRA}^T$	$1 - P_{TRA}^T$	

Figure 4: Second game's resolution.

where,

$P_{INV}^{DPS}$  = Public Sector's probability of playing INV

$1 - P_{INV}^{DPS}$  = Public Sector's probability to play NINV

$P_{TRA}^{TOUR}$  = Tourist's probability of playing TRAV

$1 - P_{TRA}^T$  = Tourist's probability of playing NTRA

This game must be solved through probabilities because of two Nash Equilibria. In this case, we can find the expected payoff for the tourist ( $EP^{TOUR}$ ) in two situations: when the Tourist (TOUR) plays TRAV or NTRAV and when the Destination's Public Sector (DPS) plays INV or NINV.

The first situation is as follows: TOUR

a) TRAV

$$EP^{TOUR} = B \cdot P_{INV}^{DPS} + D \cdot (1 - P_{INV}^{DPS})$$

b) NTRA

$$EP^{TOUR} = F \cdot P_{INV}^{DPS} + H \cdot (1 - P_{INV}^{DPS})$$

Considering the rule defined before,  $B > F$  and  $H > D$ , we can conclude that:

1. There is only one  $P_{INV}^{DPS}$  that keeps the tourist indifferent between playing TRAV and NTRAV.
2. The higher the  $P_{INV}^{DPS}$ , the greater will be the expected gain from the tourist if it decides to travel.

The second situation is presented as follows: DPS

a) INV

$$EP^{DPS} = A \cdot P_{TRA}^{TOUR} + E \cdot (1 - P_{TRA}^{TOUR})$$

b) NINV

$$EP^{DPS} = C \cdot P_{TRA}^{TOUR} + G \cdot (1 - P_{TRA}^{TOUR})$$

Considering the rule defined before, i. e.  $A > C$  and  $G > E$ , we can conclude that:

1. There is only one  $P_{TRA}^{TOUR}$  that keeps the DPS indifferent between playing INV and NINV.
2. The higher the  $P_{TRA}^{TOUR}$ , the greater the expected gain from the DPS if it decides to invest.

## 5 Conclusion

This study proves through the theoretical framework of Game Theory that the higher the probability that the public sector of the destination (DPS) invests in tourism promotion, the greater the expected return of tourists who travel to it. Moreover, the results showed that the higher the tourist's probability of traveling, the greater the expected gain from the DPS if it decides to invest. Both results demonstrate the positive effect of information asymmetry reduction between tourists and tourist destinations. These results align with Crompton (1992), namely that uncertainty is relevant for destination choice as it can arise when tourists are exposed to an overload of information that they are not able to process.

In contexts of global uncertainty aggravated by political events and further complicated by social phenomena such as the threat of misinformation (Williams et al., 2022; Fedeli, 2020), public agents need to invest in tourism promotion to

reduce asymmetric information between potential users and destinations regarding, for instance, health and safety regulations and traveling restrictions. Finally, it is equally important to note that the main limitation of this study is given by not determine precisely the DPS's probability to invest ( $P_{INV}^{DPS}$ ) that keeps the tourists indifferent between engaging in traveling (TRAV) and not (NTRAV), as well as the probability of tourists traveling ( $P_{TRA}^{TOUR}$ ) that keeps the DPS indifferent between investing (INV) or not (NINV) in the promotion.

## 6 Contribution of Study

This study contributes to the existing literature by revealing the complex dynamics involved in promoting tourism and providing some valuable insights into the complex concept of information asymmetry in the tourism industry during times of crisis. The contributions are deemed both of practical and theoretical nature. As this study examines the strategic choices made by various stakeholders, such as the public sector, private enterprises, and consumers, it delves into the intricate interplay of incentives and decision-making processes among these entities. The findings offer valuable insights into the strategic role of the public sector in addressing information disparities and promoting collaboration among stakeholders. Finally, a contribution of this study is also to offer simplified theoretical-mathematical modeling that is easy to interpret by a larger group of readers. This model applies to any destination, as its development is not based on a case study that may limit its scope. Thus, it contributes to the existing theoretical frameworks in tourism studies and provides insights for policymakers and industry participants who aim to strengthen the resilience and collaborative capacity of the tourism sector during times of crisis.

## 7 Study Implications

The findings of this study have broad implications that are relevant for both academic research and practical policy-making. Firstly, the findings highlight the important role of the public sector in addressing information asymmetry during crises. This emphasizes the importance of proactive and strategic interventions to bridge communication gaps and build trust among stakeholders. This understanding is crucial for policymakers who are looking to develop effective crisis management strategies in the tourism sector. In addition, the study's use of Game Theory offers a fresh analytical framework that improves our comprehension

of the strategic behaviors of different actors involved, providing a more realistic and nuanced depiction of decision-making dynamics during challenging periods. Further, it enables more informed and collaborative decisions to navigate crises and sustain the tourism industry by providing practical insights that can be used to develop evidence-based policies and practices for investment and promotion decisions in tourism during times of crisis.

## 8 Recommendation for Future Research

Expanding upon the findings, this study presents several opportunities for further research. Firstly, it is important to thoroughly examine the specific mechanisms and channels that the public sector can use to effectively share information during crises, taking into account advancements in communication technologies and changing media landscapes. In addition, further research could explore the cross-cultural implications of information asymmetry in the tourism industry. This would involve examining how cultural factors can impact interactions and decision-making among stakeholders. Additional investigation into the impact of digital platforms and social media on information dissemination and public perception during times of crisis could offer valuable insights into the current dynamics of tourism promotion.

In addition, conducting longitudinal studies that track the long-term effects of the public sector's interventions in managing information asymmetry during crises would provide a more comprehensive understanding of the lasting impacts on the tourism industry. Ultimately, conducting comparative analyses across various crisis scenarios and geographical regions can provide a more comprehensive understanding of how the public sector's effectiveness in promoting tourism is influenced by information challenges in different contexts. Exploring these avenues for future research can enhance our comprehension of the intricate relationship between information dynamics, the public sector, and crisis management in the tourism industry. Therefore, as a suggestion for future work, we recommended to identify such probabilities, allowing a more precise set of public investment levels to tackle better potential asymmetric information between potential travelers and the destination.

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