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MODELLING ECONOMIC STRUCTURE: THE PERSPECTIVE OF TOURIST CITIES

This study uses a theoretical method and also mathematical programming (MP) models to assess the polarisation of Macao's tourism industry in terms of economic realism, with Las Vegas as a reference. The industrial polarization of Macao's gaming industry has led to a serious imbalance in the development of the city's industrial structure. The author posits that market structures in the two locations vary in significant ways. Due to diverse market circumstances, including tourist amenities and consumer preferences, push forces are prominent in Macao, whereas pull forces are essential in Las Vegas. As such, Macao cannot and should not endeavour to reach the same level of diversification as Las Vegas due to the possible adverse consequences of being economically non-viable because of differences in market circumstances. These theoretical implications have been validated in reality in recent years. Indeed, the emergence of up-to-date resort assets have reinforced, rather than alleviated, the specialisation of Macao's hospitality sector. The results suggest that casino tourism in Macao will continue to expand in a polarised fashion. The purpose of this study was to determine whether Macao's diversification, although politically mandated, is economically realistic. With the implementation of policies such as the Guangdong–Hong Kong–Macao Greater Bay Area and the Guangdong–Macao In-Depth Cooperation Zone in Hengqin, it is hoped that the study's policy relevance will become increasingly apparent in the coming years.

Keywords: polarisation, diversification, tourism structure, casino hospitality

JEL Classification: R11, R58

DOI: 10.15611/aoe.2022.2.07

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Quote as: Sheng, L., Yin, Y., Zhang, A., Wu, J. (2022). Modelling economic structure: the perspective of tourist cities. *Argumenta Oeconomica*, 2(49).

1. INTRODUCTION

Macao was ranked 10th in the world in terms of tourism revenue in 2020 (UNWTO, 2021), confirming the city's status as one of the world's foremost tourism

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and hospitality centres. The city's economic diversification has long been the focus of attention as a result of the negative externalities associated with casino gaming (Sheng, 2017a). Indeed, Beijing has mandated Macao to pursue economic diversification to mitigate the social consequences of gambling addiction in mainland China (Sheng & Wan, 2017). Las Vegas is frequently referred to as the 'pin-up' of tourist cities' economic diversification, and its success story has spurred Macao to follow suit (Sheng, Li and Wang, 2017). Unfortunately, after years of effort, Macao has made little progress in diversifying its tourism offering. The purpose of this research was to determine whether Macao's diversification, although politically mandated, is economically realistic. What has hindered Macao from becoming the next Las Vegas? Gaming and hospitality experts reveal two key criteria. The first is the Chinese people's unquenchable passion for gaming. Despite the slump of 2014, single table games in Macao casinos yield more than US\$12,000 in daily income, more than twice the amount generated in Las Vegas casinos, with the VIP sector in Macao contributing up to US\$21,000 per game each day. The second element is Macao's monopoly of the market as China's foremost casino destination, with no direct challengers (Bumazhny, 2015). In comparison, 41 of the 50 states in the USA now permit various types of casino gambling (American Gaming Association, 2019), effectively forcing Las Vegas to diversify.

A review of the literature reveals that Macao would find it difficult, if not impossible, to catch up with the Las Vegas combination of non-gaming and gaming tourism. However, there is a distinct lack of academic work or theoretical evidence to support this inference. For example, it neglects a critical feature of Macao: the city's land area is too small to accommodate the Las Vegas-style variety; indeed, Macao is a tiny fraction of Las Vegas in terms of geographical size. To determine whether Macao can and should diversify to the same extent as Las Vegas, the author used mathematical programming (MP) models to analyse these two tourist destinations with contrasting market circumstances and economic structures. The push forces associated with visitor sources, and the pull forces associated with a travel destination, are two factors prevalent in the tourism/hospitality literature (Bumazhny, 2015). These push variables include economic growth and consumer habits on the demand side of a tourist industry, while the pull variables include tourism attractions on the supply side. This study demonstrates that the push variables outweigh the pull variables in the case of Macao, whereas the reverse is true for Las Vegas. This paper explores the influence of market conditions on the industrial structures of Las Vegas and Macao, and suggests possible ramifications for other tourist cities.

The author makes three distinct contributions. First, although tourist demand is extensively examined in the literature (Witt & Witt, 1995; Gössling et al., 2012; Li et al., 2017; Kolodko, 2021), less attention is paid to the function of tourism supply,

as highlighted by field research on the subject (Smeral, 2012). This study addresses this gap in the literature by emphasising the economic implications of the interactions between a destination and its source markets. Following Smeral (2018), the author posits that such interactions must be assessed, as there is a strong correlation between external business cycles and local tourism cycles. Moreover, the literature analyses the economic consequences of casino gambling by integrating partial equilibrium (PE) findings for tourist markets into a general equilibrium (GE) framework (Sheng, Li, & Gao, 2019). For simplicity, these studies are mostly undertaken using diagrammatic models. This research involved formal MP models with the purpose of conducting a thorough examination of economic diversification across tourist cities. These models elucidate the varied impacts of pull and push factors on the economic well-being and industrial structure of a range of popular tourist destinations, including Macao and Las Vegas. Finally, the study's main results suggest ramifications for governance and commercial activity in tourist spots such as Macao. The most obvious finding to emerge from the analysis is that Macao's main characteristic as a micro open economy leaves the city open to external shocks, which results in regularly occurring extreme economic volatility. While the structure of tourism may evolve in response to rising demand, or even become more divided, driving up unsustainable growth should not present an issue as long as demand remains robust and durable, irrespective of short-term volatility. The Chinese government should therefore consider the following two suggestions: allow the market to exert its 'invisible hand' without government interference, and avoid mimicking Las Vegas-style diversification (Sacramento, 2022; Hausner, 2020; Sheng, 2016).

The remainder of this paper is structured as follows. Section 2 offers remarks on Macao and Las Vegas, as well as a short review of the literature. Section 3 features a PE study of tourism markets modelled on Macao. Section 4 details the GE analysis of the sectoral structure and economic well-being of well-known tourist destinations such as Macao. Section 5 assesses the diversity of tourism in Las Vegas. Finally, Section 6 brings the study to a close.

2. REAL-WORLD OBSERVATIONS

Macao has an established tourism economy that is overly reliant on casino hospitality. This small-scale economy was trapped in a long period of severe deflationary downturn after the Asian financial crisis of 1997-1998. The local economy did not recover until 2003, when mainland China (MC) implemented its Free Travel Policy (FTP), which enables mainland residents to travel to Macao to gamble, an activity that is illegal in MC. In 2006, Macao surpassed Las Vegas to become the world's top casino resort in terms of gross gaming revenue (GGR), a feat

that took just three years to achieve. Macao has recently garnered an enormous GGR, amounting to approximately US\$36.43 billion in 2019, more than three times that of Las Vegas (US\$12.03 billion). According to the World Bank database, in 2013 Macao achieved the world's highest global GDP (PPP), surpassing Qatar, with US\$153,610.9. Macao retained this rank until 2019 (World Bank, 2020).

However, Macao's economic success is heavily reliant on casino gambling, mostly carried out by tourists from MC. Macao's Dutch disease phenomenon is manifested in the extraordinary profitability of the city's gaming sector, while leading to the decline of other industries. The resulting polarized sectoral structure could render the economy more susceptible to exogenous shocks (Li & Sheng, 2018; Sheng, 2012, 2014). This issue was indicated for Macao in 2008-2009, when MC tightened the FTP to clamp down on the pathological gambling of mainland Chinese visitors, and again in 2014-2016, when MC stepped up China's anti-corruption campaign. As a consequence, GGR plummeted by 34.3% and GDP fell by 21.5% in 2015 (DSEC, 2021). This unprecedented economic instability has sparked widespread concern about the city's reliance on tourism for economic growth, reaffirming the need for industry diversification.

Las Vegas, in contrast, has enjoyed tremendous success in diversifying its economy through tourism. Beginning in the late 1980s, the resort industry boom in Las Vegas augmented Las Vegas's luxury offerings, luring visitors from all over the world. Ultra-lounges, mega-nightclubs, world-class restaurants, and magnificent stadiums, alongside the development of ever-larger and more lavish resorts, have all contributed to the city's success. When tourists tire of casino gaming, attractions such as hotels with garden greenery, tiger habitats, spectacular aquaria, and a mirage volcano, provide augmented luxury resort experiences. The Las Vegas valley is home to a wide range of entertainment options, including amusement parks, spectacular performances including Broadway shows, musicals, plays, and concerts, and world-class facilities for conferences and gatherings of all sizes. Las Vegas has also rebranded itself as an outdoor/adventure destination by making use of the city's tremendous natural resources. Through these initiatives, non-gaming activities have grown in importance in Las Vegas, with their contribution increasing from 39% of the city's total income in 1990 to 63% in 2014 (Bumazhny, 2015). According to the Nevada Gaming Control Board, in 2020, the total gaming revenue of Las Vegas accounted for 36.8%, while non-gaming revenue (rooms, food, beverage and other) accounted for 63.2% of the city's total income (Nevada Gaming Control Board, 2021). This shift is in line with Americans' waning appetite for casino gaming and the rise in popularity of other forms of entertainment, such as shows, events, concerts, attractions, and sports activities.

Years of attempting to follow the Las Vegas model have done little to assist Macao in building a diversified economy. Despite the city's proactive attempts at

diversification, Macao's non-gaming businesses amounted to only 10.4% of its total tourism earnings in 2019 (DSEC, 2020). Diversification has been pursued on both the horizontal and vertical scales. The former category entails establishing businesses that have little to do with tourism and hospitality. For example, Hengqin Island, outside Macao, has been designated as a venue for economic and trade cooperation between Macao and Portuguese-speaking nations. Diversification in the casino industry also means improving non-gaming aspects, such as gourmet restaurant offerings and hotel rooms, as well as shopping malls, entertainment facilities for conferences, and retail outlets. Although these non-gaming activities are not particularly lucrative, casinos do use them strategically to encourage more people to gamble. As a result, Macao's diversification has served to further concentrate the local economy around casino gaming.

Why has Macao been unable to diversify to the same degree as Las Vegas? The author developed a theoretical framework to answer this question, which has been surprisingly neglected by other researchers.

3. LITERATURE REVIEW

This section evaluates the relevant literature to emphasise the significance of this work not simply as an essential pilot study, but also as a major contribution to the field of tourism economics. In light of the rising significance of tourism in a variety of global economies, including Macao, the relation between tourism and economic development has emerged as a prominent research topic. The economic analysis of tourist destinations, a relatively new field of enquiry, was spearheaded by Guthrie (1961). The business of tourism possesses certain qualities that differentiate it from other economic activities with regard to supply and demand. To the best of the author's knowledge, Eadington and Redman (1991) were the first to establish a comprehensive account of the evolution of tourist economics. The elasticity of demand and the modelling methods used to predict it, market structure, and economic effect, are some of the main phenomena featured in their work. Sinclair (1998) provided a review of the literature from the previous two decades, noting several advances such as the system of equations for demand analysis, and the computable general equilibrium (CGE) model for economic effect assessment. These advances reinforced Eadington and Redman's (1991) earlier comments. It is common practice in tourism economics to use an expanded CGE model with partial equilibrium (PE) to identify the economic influence of specific variables, such as devaluation, the source of the traveller, and the purpose of the journey. Nevertheless, few studies have analysed tourism destination economies in relation to the effect of tourist preferences (Dwyer et al., 2003). Regrettably, while some studies do discuss the causal relationships between tourism demand variables across multiple

destinations utilising the vector autoregression model, intrinsic origins that are not included in the model have yet to be revealed (Torraleja et al., 2009). A substantial body of economics research uses GE modelling from neoclassical theory, which hinges on the assumptions of commodity theory and the separability of preferences (Smeral & Weber, 2000). Based on such studies, the author built a distinct GE framework to analyse the influence of pushing variables on tourism-oriented economies, which were used to develop a PE–GE framework that examines the economic structure of Macao’s tourism sector.

The concept of demand analysis is commonly used in the assessment of the tourism clusters’ equilibrium, contributing to the advancement of research methodologies in the subject area (Sheng, 2017b). Studies also stress the predominance of demand analysis (Sinclair et al., 2003). However, while considerable research was conducted on the demand side of tourism (Witt & Witt, 1995; Guizzardi & Mazzocchi, 2010), little attention has been paid to the interplay between demand and supply (Brouder, 2020). The majority of tourism supply research concentrates on issues at business and industry levels (Leiper, 1990, 1992). This study seeks to develop a theoretical solution for these research shortfalls by delving into the details of hospitality services production in order to conduct a thorough analysis of the tourism industry.

Despite some recent progress, there are still few examples of appropriate economic models in the tourism development field that conduct accurate and precise analyses of the dynamics of the industry. Most studies in the field of tourism and hospitality focus on empirical evidence rather than theoretical analysis (Gunter & Smeral, 2016; Moore & Whitehall, 2005; Smeral, 2008). This study posits that as the world’s largest casino resort, Macao faces a practical problem that should be assessed theoretically using MP models. The author systematically demonstrated that despite Las Vegas success in diversifying its tourism offerings, a similar effort in Macao would be both unfeasible and inadvisable, suggesting two reasons for this difference. First, Macao’s limited land resources and lack of natural amenities make the development of outdoor sightseeing facilities difficult. Second, tourists mainly visit Macao to gamble. Thus, the author addressed the practical aspects and gained valuable insights into the so-far underdeveloped literature on tourism and hospitality economics.

In addition, like any small and open economy, Macao is highly vulnerable to external shocks. While a range of studies empirically assessed the effects of global business cycles on tourism flows and local economies (Bronner & de Hoog, 2017), this study established a theoretical basis for such empirical analysis. In the author’s assessment, casino gaming is not inherently unsustainable if tourism is vulnerable or the economy is unstable. Based on these findings, Macao’s polarized gaming

expansion is technologically irreversible but financially tolerable, a trend that has also been seen in other destinations (Suess & Mody, 2016).

4. THEORETICAL ANALYSIS OF MACAO'S TOURISM STRUCTURE

4.1. Partial equilibrium of a tourism market

Regarding tourism demand, a representative tourist from a source market obtains satisfaction $U_T = C^a X^B$, where $a > 0$ and $B = b\gamma$, where $b > 0$ and $\gamma > 1$, via the consumption of composite commodities C in their home community and the enjoyment of total time X spent in all their travelling sites. Tourism is driven by push factors including a tourist's income level m and travel enjoyment level b , as well as pull factors γ that can be attributed to the tourist attractions available at the destinations. Increasing the tourist's income level m increases their travel X at cost p , and thus their consumption C at price p_c , where their expenditure is governed by the budget constraint $p_c C + pX \leq m$. Given $\left\{ \max_{(C,X)} U_T = C^a X^{b\gamma}, \text{ s.t. } p_c C + pX = M \right\}$, when choosing between consumption and travel, the tourist makes the following optimal choice

$$X^* = \frac{b\gamma}{a + b\gamma} \frac{m}{p} = X^D(p). \tag{1}$$

According to the Cobb–Douglas method, a typical tourism firm as a firm whose products/services cater mostly to tourists uses labour L and capital K to produce hospitality services X on the basis of $X = \gamma L^\alpha K^\beta$, where $\alpha > 0$, $\beta > 0$ and $\gamma > 1$. Decreasing returns to scale $\alpha + \beta = \theta < 1$ are estimated to satisfy the second-order condition for maximizing profit. The production cost C of a firm is affected by the wage rate w as well as the user cost of capital r . Given $\left\{ \min_{(L,K)} C = wL + rK; \text{ s.t. } \gamma L^\alpha K^\beta = X \right\}$, one can determine its conditional factor demand (L^*, K^*) and cost function C^* as indicated below

$$L^* = l \left(\frac{X}{\gamma} \right)^{\frac{1}{\alpha+\beta}}, K^* = k \left(\frac{X}{\gamma} \right)^{\frac{1}{\alpha+\beta}} \text{ and } C^* = C(X) = c_o \left(\frac{X}{\gamma} \right)^{\frac{1}{\alpha+\beta}}, \tag{2}$$

where

$$l = \left(\frac{\alpha r}{\beta w} \right)^{\frac{\beta}{\alpha+\beta}}, \quad k = \left(\frac{\alpha r}{\beta w} \right)^{\frac{-\alpha}{\alpha+\beta}}, \text{ and } c_o = \left[\left(\frac{\alpha}{\beta} \right)^{\frac{\beta}{\alpha+\beta}} + \left(\frac{\alpha}{\beta} \right)^{\frac{-\alpha}{\alpha+\beta}} \right] (w^\alpha r^\beta)^{\frac{1}{\alpha+\beta}}.$$

As such, by providing hospitality services to its market, the firm is able to maximize its profit Π from tourism activities, and can now theoretically look at the following optimal output X^* , as shown below

$$X^* = \gamma^{\frac{1}{1-\theta}} \left(\frac{\theta p}{c_o} \right)^{\frac{\theta}{1-\theta}} = X^S(p). \quad (3)$$

One can derive the equilibrium of a tourism market as illustrated below

$$p^* = \left(\frac{c_o}{\theta \gamma} \right)^{\theta} \left(\frac{bm}{a + b\gamma} \right)^{1-\theta} = p(b, m; \gamma), \quad (4)$$

$$X^{**} = \gamma^{1+\theta} \left[\frac{bm\theta}{(a + b\gamma)c_o} \right]^{\theta} \quad \text{and} \quad R^{**} = p^* X^{**} = \frac{b\gamma \cdot m}{a + b\gamma}.$$

The equilibrium tourism price p^* , rises when push factors (b, m) increase, but drops as a result of a reduced cost C^* , brought about by higher pull factors γ . Positive changes in the push and pull factors can increase the destination's sales revenue R^{**} . Here one can offer a PE analysis that focuses on the tourism market alone.

4.2. General equilibrium (GE) analysis of Macao as a tourism economy

X_1 is designed to cater to tourists, while X_2 serves local customers for a wide range of goods. The economy's production possibility frontier (PPF) refers to the maximum output points (X_1, X_2) that can be produced by the travel destination. PPF is determined by the degree of technological advancement and resource provision. Based on two production functions, output capability is suggested as: $X_i = \gamma_i l_i^{\alpha_i} K_i^{\beta_i}$ for $i = \{1, 2\}$, where $\alpha_i > 0$, $\beta_i > 0$, $\alpha_i + \beta_i = \theta_i < 1$, $\gamma_1 = \gamma > 1$ and $\gamma_2 = 1$. There are two types of endowment constraints associated with production: $L_1 + L_2 \leq \underline{L}$ and $K_1 + K_2 \leq \underline{K}$, where \underline{L} and \underline{K} are the labour force and capital stock of the destination, respectively.

$$L_i^* = l_i \left(\frac{X_i}{\gamma_i} \right)^{\frac{1}{\alpha_i + \beta_i}}, \quad K_i^* = k_i \left(\frac{X_i}{\gamma_i} \right)^{\frac{1}{\alpha_i + \beta_i}} \quad \text{and} \quad C_i^* = C_i(X_i) = c_{io} \left(\frac{X_i}{\gamma_i} \right)^{\frac{1}{\alpha_i + \beta_i}}, \quad (5)$$

where

$$l_i = \left(\frac{\alpha_i r}{\beta_i w} \right)^{\frac{\beta_i}{\alpha_i + \beta_i}}, \quad k_i = \left(\frac{\alpha_i r}{\beta_i w} \right)^{\frac{-\alpha_i}{\alpha_i + \beta_i}}, \quad c_{io} = \left[\left(\frac{\alpha_i}{\beta_i} \right)^{\frac{\beta_i}{\alpha_i + \beta_i}} + \left(\frac{\alpha_i}{\beta_i} \right)^{\frac{-\alpha_i}{\alpha_i + \beta_i}} \right] \left(w^{\alpha_i \beta_i} \right)^{\frac{1}{\alpha_i + \beta_i}},$$

with the same input prices (w, r) across sectors.

The PPF equation can be expressed as follows:

$$c_{1o} X_1^{\frac{1}{\theta_1}} + c_{2o} \gamma^{\frac{1}{\theta_1}} X_2^{\frac{1}{\theta_2}} = A_o. \quad (6)$$

The destination's total assets are defined as $A_o = \gamma^{V\theta_1} (wL + rK)$ which include natural amenities as well as human resources and physical resources. Equation (6) can be converted into the PPF function $X_2 = f(X_1)$, where $dX_2 / dX_1 < 0$, $d^2X_2 / dX_1^2 < 0$, resulting in a downward slope and a concave shape influenced by total assets A_o , cost factors c_{io} and output elasticities θ_i . To accomplish this transformation, limited resources (L, K) may be reallocated (L_i^*, K_i^*) according to equation (5), where L_i^* and K_i^* are dependent on sectoral output X_i .

A relative price line (RPL), a product price function (PPF), and an index of constants (ICs) are integrated to design a GE analysis for this small, open economy that is influenced by inbound tourism (Copeland, 1991). Analysis of the determinants of changes in the sectoral structure and economic well-being of travel destinations was carried out by accounting for the PE result in equation (4), and the GE model in equation (7), constructed as follows

$$\max_{X_1, X_2} U_D = V(X_1) + X_2, \text{ s.t. } pX_1 + p_2X_2 = p_1X_{1o} + p_2X_{2o}, \quad (7)$$

$$\text{where } (X_{1o}, X_{2o}) \in \arg \left\{ \max_{X_1, X_2} p_1X_1 + p_2X_2, \text{ s.t. } c_{1o} X_1^{\frac{1}{\theta_1}} + c_{2o} \gamma^{\frac{1}{\theta_1}} X_2^{\frac{1}{\theta_2}} = A_o \right\}$$

for $p_1 = p^*$ and $p_2 = 1$. In this sense, there are two parts to this problem, each of which must be solved separately.

Proposition 1: An improvement in a travel destination's TOT as the ratio of export prices to import prices caused by favourable changes in the push factors of the tourism source markets, indicated by equation (4), suggests an imbalance in sectoral structure. Increasingly, tourism structures concentrate around exportable sectors (e.g. tourism and hospitality), making the pursuit of economic diversity impossible.

Proof: This point serves as the sole solution to the first part of equation (7).

$$X_{1o} = \sqrt{\frac{A_o}{c_{1o} + c_{2o} \gamma^2 (C_o / p^*)^2}} \text{ and } X_{2o} = \frac{C_o}{p} X_{1o}, \quad (8)$$

where $C_o = c_{1o} / (c_{2o}\gamma^2)$.

The equation $X_{1o} / X_{2o} = p^* \gamma^2 c_{2o} / C_{1o} (=1/\tau)$ can be simply inferred from the above solution in equation (8). Without being reversed, this situation could inadvertently lead to a polarized sectoral structure, as is the case of Macao. In other words, unbalanced sectoral development in a travel destination is largely the result of external forces (i.e. tourism source markets) and the rational response of the destination to these external forces. Destinations such as Macao exhibit polarized sectoral structures as a result of economic interactions between market participants. The government can rarely, if ever, alter such a market consequence. Now one needs to ask whether seeking a balanced economic structure, as described below, would be useful for a destination like Macao.

Proposition 2: When push factors are favourable and improve the TOT, the economic welfare of the destination is enhanced. As such, deviating from market equilibrium by diversifying the industry is not recommended. Indeed, local governments are often reluctant to diversify in an inefficient way.

Proof: The second part of the problem in equation (7) can be summarised by the following pair of equations: $\{MRS(X_1, X_2) = -p^*$ and $X_2 = X_{2o} - p^*(X_1 - X_{1o})\}$.

$$X_1^0 = \frac{1}{p^*}, X_2^0 = \left(\frac{C_o}{p^*} + p^* \right) \sqrt{\frac{A_o}{c_{10} + c_{2o}\gamma^2 (C_o / p^*)^2}} - 1 \text{ and}$$

$$U_D^0 = V(X_1^0) + X_2^0 = U(p^*) \quad (9)$$

for the case of $\theta_1 = \frac{1}{2} = \theta_2$.

Hence a balanced trade equation would be written as follows: $p^*(X_{1o} - X_1^o) = X_2^o - X_{2o} (>1)$, indicating that the export of goods and services for tourism activities is merely sufficient to cover the costs of importing various products for domestic use:

$$U'(p^*) = X_{1o} \left[1 - \frac{C_o}{p^{*2}} - \frac{1}{p^* X_{1o}} + \left(p^* + \frac{C_o}{p^*} \right) \frac{C_o}{p^* (p^{*2} + C_o)} \right].$$

The polarization of the economy is therefore conducive to greater economic welfare, as evidenced by Macao's fast-growing tourism industry. Thus, it may be prudent for local governments to refrain from intervening in tourism markets, and, crucially, from diversifying sectoral structures, as doing so is detrimental to the

creation of local wealth. Therefore, the author proposes that any attempt at industrial diversification by a destination is not only ineffective but also ill-advised.

5. TOURISM DIVERSITY IN LAS VEGAS

As a result of Macao's low non-gaming tourism revenue relative to its gaming revenue, the economy features unbalanced growth, reflected in its ever-increasing ratio of gaming revenue to GDP. Given Macao's small geographical size, amenities γ are of minor importance to the tourism sector. In contrast, Las Vegas's well-functioning diversification is manifested by an annual increase in the proportion of non-gaming tourism Y_1 . The development of natural amenities has rendered Las Vegas a destination featuring a significant increase in γ . As a result of stronger demand for non-gaming tourism in Las Vegas, the price of non-gaming tourism relative to casino gaming (i.e. q_1 / q_2) shows an encouraging increase.

From the previous notations, the cost function $C_i(Y_i)$ of the two (gaming and non-gaming) tourism sectors $i = \{1, 2\}$ can be assigned to Las Vegas, and $w\bar{L} + r\bar{K} = R_o$ represents the total value of physical and human capital used by the Las Vegas's tourism industry, allowing to derive the following simplified solution of the constrained optimisation problem

$$\max_{Y_1, Y_2} \Pi = q_1 Y_1 + q_2 Y_2 - R_o, \text{ s.t. } (Y_1, Y_2) \in PPF_T. \quad (10)$$

The above illustrates that innovations and expansions of amenities and facilities are vital in making non-gambling tourism more attractive (γ) and raising the relative price (q_1 / q_2). Las Vegas has witnessed an economic shift away from casino gaming as a result of developments in the family vacations sector. Taking Propositions 1 and 3 together for comparison, it is evident that there are distinct patterns of tourism structure and of economic diversity within various travel destinations that depend on varying customer preferences and access to natural attractions. While the majority of tourists travelling to Macao opt for indoor casino gaming, tourists arriving in Las Vegas spend significant amounts of time outdoors. In comparison with Las Vegas, Macao has a relatively small land area, and natural attractions are few and far between as a result. Hence, Macao has limited natural attractiveness, while Las Vegas benefits from a high level of natural attractiveness. Macao relies heavily on push factors, whereas Las Vegas relies on pull factors. In light of these observations, it is understandable that these differing outcomes have resulted from economic diversification in these two regions. The findings of this study hold true for many regions around the world, particularly when comparing travel destinations in Asian and Western countries.

CONCLUSION

The author used an MP framework to investigate the polarisation of tourism in Macao's casino gaming sector, and the diversification of casino-hotel businesses in Las Vegas (consisting in both gaming and non-gaming activities). In comparing these two destinations, the study proposed reasons as to why Las Vegas has been able to achieve diversification successfully, while this level of success appears impossible in Macao. Two important issues distinguish the two locations as far as market conditions were concerned. Whereas many people visit Las Vegas for a variety of reasons and often gamble with small stakes, customers visit Macao exclusively to gamble in casinos. Moreover, Macao is a small city with few natural resources, requiring most gaming activities to take place indoors in high-rise buildings. Las Vegas also features a wealth of non-gaming resources that can be leveraged for numerous entertainment activities other than casino gaming. As a result of these significant differences between the two destinations, push factors are most important in Macao, whereas pull factors are more important in Las Vegas, hence Macao's pursuit of diversity in the vein of Las Vegas is not only impossible but also inadvisable. According to the author's forecast, Macao's casino tourism/hospitality sector will grow in a polarised way.

The findings of this study have the following four policy implications. First, considering that vulnerability is a structural feature of a tourist resort and volatility is the norm for the economy of a tourist destination, such vulnerability and volatility are unlikely to arise due to structural polarisation. For instance, despite increased levels of non-gaming tourism since 2001, Las Vegas tourism industry is also prone to wild fluctuations. Moreover, Macao has no reason to fear the unsustainable growth of tourism characterized by short-term fluctuations. The likelihood of growth remains high as long as long-term upward trends can be maintained, regardless of these fluctuations. Chinese customers are known for their love of casino gaming, and thus Macao should continue to benefit from strong push factors, as China's income growth is much higher than that of the USA. Considering the size of the Chinese gaming market, Macao's dominance is unlikely to be challenged by rivals in Japan, Korea, Malaysia, Singapore, and Vietnam (Sheng, 2012, 2013; Sheng & Zhao, 2016). Third, Macao should not pursue vertical diversification, which the author's theory indicates as a futile and impractical initiative that will only result in the misallocation of resources. To reduce the occurrence of money laundering, reckless gambling, and the social costs associated with the gambling industry in Macao, the government should instead encourage responsible gambling in local casinos. Finally, Macao needs to pursue horizontal diversification, which is both economically viable and politically attractive. The city has accumulated over US\$63 billion of savings through fiscal surpluses, 70% of which have been deposited in Hong Kong banks,

where nominal deposit rates are lower than local inflation rates, resulting in significant annual losses. Therefore, the author urges Macao to expedite the process of setting up a sovereign wealth fund with savings from public sources, while investing for potential profits in developing the Hengqin Free Trade Zone and the South China Greater Bay Area, and allowing market forces to guide tourism growth.

To better understand how tourism structures differ in various destinations, this research could be carried out in a more comprehensive way in future studies, by laying a solid foundation for the review of these three extensions, including modelling and derivation, focusing on the differences in factor price, and revising the assumptions. As a first step, factor prices (w , r) were considered exogenous variables in this study. However, a truly general GE analysis can only be achieved when these factors are endogenously determined. Despite the complexity and tediousness of modelling and derivation, future research should pursue the same direction. Second, mainstream economics assumes that each factor price across all sectors of the local economy is identical. By contrast, wage rates in the gaming sector are considerably higher than in other sectors. For a more realistic analysis in future studies, the assumptions used in this study should be revised, although any revision would probably increase its complexity.

On a final note, gaming hospitality analysts view Macao's high gaming tax rate as a potential hindrance to the destination's successful diversification. The analysts claim that low taxes in Las Vegas have allowed the city to provide free gifts to tourists (US\$1.5 billion in hotel rooms, food and beverages) from its 63% non-gaming mix (Sheng, 2013). At the same time, they fail to acknowledge that US casino operators in Macao enjoy a three times higher net profit rate than their Las Vegas counterparts. This tax effect was explored in the economics literature on casino tourism (Sheng, 2011, Sheng, 2017, Sheng & Tsui, 2009), yet the implications for tourism structure remain ambiguous and require further study.

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Received: February 2020, revised: November 2021