Understanding visitor–resident relations in overtourism: developing resilience for sustainable tourism

Ka Shing Cheung & Ling-Hin Li

To cite this article: Ka Shing Cheung & Ling-Hin Li (2019) Understanding visitor–resident relations in overtourism: developing resilience for sustainable tourism, Journal of Sustainable Tourism, 27:8, 1197-1216, DOI: 10.1080/09669582.2019.1606815

To link to this article: https://doi.org/10.1080/09669582.2019.1606815

Published online: 14 May 2019.

Submit your article to this journal

Article views: 2980

View related articles

View Crossmark data

Citing articles: 14 View citing articles
Understanding visitor–resident relations in overtourism: developing resilience for sustainable tourism

Ka Shing Cheung\textsuperscript{a} and Ling-Hin Li\textsuperscript{b}

\textsuperscript{a}Department of Property, The University of Auckland Business School, Auckland, New Zealand; \textsuperscript{b}Department of Real Estate and Construction, University of Hong Kong, Hong Kong, Hong Kong

ABSTRACT

While almost all travel destinations seek to increase tourists, less attention is paid to balancing the growth in tourists against consequent visitor–resident irritants, which is essential if the objective is to make tourism more sustainable. Overlooking the carrying capacity of a destination is a common mistake committed when formulating travel visa policies. Overtourism is a term recently used to contextualize this potential hazard to many popular tourist destinations worldwide. One notable case in point is the “multiple-entry permit” policy implemented in Hong Kong which is causing conflicts between mainland Chinese visitors and Hong Kong residents. To investigate the overtourism phenomenon in Hong Kong we develop a hysteresis model. We hypothesized that ceteris paribus, the implementation of a “multiple-entry permit” policy would lead to an overwhelming growth in day-trippers and cause a permanently negative cointegrating relationship with residents’ sentiment. We confirmed our hypothesis by using the bound tests of Autoregressive-Distributed Lag (ARDL) models. Our findings suggest that policymakers should note that the deterioration in visitor–resident relations from overtourism may exhibit a significant hysteresis effect that will persist far beyond the original stimulus. “Developing resilience in tourism” and “exploring sustainable degrowth” are discussed as potential strategies for long-term tourism growth.

Introduction

In recent years, the term “overtourism” has started to be used to contextualize the potential hazards of a massive and uncoordinated influx of tourists to popular destinations worldwide. The term overtourism describes those destinations “where hosts or guests, locals or visitors, feel that there are too many visitors and the quality of life in the area or the quality of the experience has deteriorated unacceptably” (Goodwin, 2017). Many destinations have been experiencing overtourism: Paris, Berlin, California, Hong Kong, Rio de Janeiro, and Venice are good examples (Colomb & Novy, 2016). In a few of these places there have been demonstrations against tourists, some of which have involved low levels of threat and a few extreme cases of violence. In all of these cases the social impacts of overtourism are jeopardizing visitor–resident relations as portrayed in Doxey’s (1975) Irritation Index (or “Irrindex”) model. In this context, tourism researchers have recently, as a way of finding a pathway towards sustainable tourism, initiated discussions about tourism degrowth (Büscher & Fletcher, 2017). The concept of degrowth includes calls
to (re-)build societies and economies around principles of commons creation and governance, care and conviviality (Dietz & O'Neill, 2013; D’Alisa, Demaria, & Kallis, 2014). Other researchers have taken another approach to the overtourism problem, and instead of focusing on degrowth have applied the concept of resilience to examine sustainable tourism development (Butler, 2017; Cheer & Lew, 2017). In this article, we aim to contribute to these debates by connecting discussions of overtourism and the literature on social impact assessment in tourism in an examination of the concept of hysteresis (i.e., irreversible impact) in tourism, specifically its implications for visitor–resident relations.

In the past, community or social impacts research in tourism has been criticised for being “exploratory in nature and primarily descriptive” (Ap, 1992; Faulkner & Tideswell, 1997). These criticisms suggest that in this area of tourism research, theory is absent, as are proven methodologies to measure non-economic impacts. The result is a lack of a substantial empirical foundation upon which to base policy decisions (Liu & Var, 1986). As a consequence, the search for impactful methodologies in sustainable tourism research remains a high priority (Font & McCabe, 2017). This research aims to contribute one such methodology by theorizing and applying the concept of hysteresis in the study of sustainable tourism. Using the case of Hong Kong to describe the irreversible influence of past decisions on visitor–resident relations we examine how an unquestioned and taken-for-granted expansionary tourist growth policy is having negative impacts long after that policy has been rescinded. Our research challenges the traditional view that negative influences on visitor–resident relations can be relatively easily repaired. Our study also advances the methodological aspects of the sustainable tourism literature. It represents the first attempt in the field to use the Autoregressive-Distributed Lag (ARDL) model (i.e., a more generalized form of the vector error correction model) to confirm a long-run relationship between visitor–resident irritants and tourist growth.

Our article will be structured as follows. First, we will review the literature on social impact assessment in tourism. Second, we will reformulate Doxey’s (1975) Irridex model and derive the possibility of a permanent deterioration (i.e., hysteresis) in visitor–resident relations under a system of difference equations (Göcke, 2002). Using Hong Kong as our case study, we will develop a refutable hysteresis hypothesis of visitor–resident relations and test it. Our hysteresis hypothesis is that ceteris paribus, a sudden increase in same-day in-town tourists (i.e., day trippers) will, in the long run, negatively and permanently influence visitor–resident relations. Third, we will contextualize and justify the use of Hong Kong as an important case study. Fourth, we will test the hysteresis hypothesis in visitor–resident relations using an ARDL model to confirm that the increase in the same-day in-town tourists from China has a cointegrating relationship with the decline in public sentiment. Finally, in the Conclusion, we will discuss a need for developing resilience in tourism as it relates to questions of hysteresis in “overtourism.”

**Literature review on community perception of tourism impacts**

Residents play a vital role in developing sustainable tourism, as they are the cultural agents and the social group through and in which tourism is delivered (Muler Gonzalez, Coromina, & Gali, 2018). Understanding residents’ attitudes towards tourism and engaging communities in sustainable tourism development are essential in social impact research (Faulkner & Tideswell, 1997; Vargas-Sánchez, Porras-Bueno, de, & Ángeles Plaza-Mejía, 2011). In recent years, due to a disproportionately large influx of tourists, overtourism has become an imminent threat for residents in many popular destinations (Oklevik et al., 2019). The continued rapid growth in tourist arrivals in destinations, and associated problems of crowding, localized inflation and pressure on housing, have created substantial public debates regarding the desirability of a tourism system based on a growth model (WTO, 2018).
“Understanding the social impacts of tourism on communities [in particular visitor-resident relations] is extremely important for government at all levels so that action can be taken to reduce the likelihood of a community backlash against tourists and tourism development” (Deery, Jago, & Fredline, 2012, p. 64). Over the years, studies of communities’ attitudes to tourism have flourished, reflecting the importance of residents’ involvement in tourism and the roles they can play in the creation of sustainable pathways for the industry (Choi & Sirakaya, 2005; Diedrich & Garcia-Buades, 2009; Nunkoo, Smith, & Ramkissoon, 2013; McGehee & Andereck, 2004).

Despite the importance of understanding the social impacts of tourism, many social impact studies have been criticised for lacking strong theoretical bases and methodological approaches. A longitudinal content analysis of 140 articles on residents’ attitudes to tourism (Nunkoo et al., 2013) revealed that the majority of these social impact assessments were atheoretical in nature. The authors suggest that there is a need for more “innovative studies on residents’ attitudes to tourism that advance the level of theoretical and methodological sophistication of sustainable tourism” (Nunkoo et al., 2013, p. 21). Improved research on residents’ attitudes that is relevant to sustainable development requires that tourism researchers and scholars should recognise the legitimacy of a variety of research tools that could be applied to residents’ attitude studies (Leech & Onwuegbuzie, 2007) and hence improve the rigour of the analysis. Oppermann (2000) argues that tourism researchers, rather than conducting further place-specific research of limited value, should engage in new types of research that systematically add knowledge to the field.

This study aims to help fill these gaps in the social impact assessment literature. Although many classical stage-based tourism models have been developed to conceptualize residents’ changing reactions to tourism (Doxey, 1975; Butler, 1980; Doğan, 1989; Ap & Crompton, 1993), these models are unidirectional, typically representing a decline in residents’ attitudes as tourism grows (Hunt & Stronza, 2014).1 The unidirectional nature of these conceptual models limits our capacity to interpret residents’ attitudes from one stage to another and essentially overlooks the long-term dynamics of residents’ reactions to tourism. Based on these traditional stage-based tourism models, one would presume, for example, that a simple exit strategy from the stagnation stage of Butler's (1975) life-cycle model or the retreatism phase of Doğan's (1989)'s model would be simply to reduce the number of tourists in a locality and that this would lead to improvements in residents’ attitudes to tourists. This fails to take into consideration the irreversible nature of residents’ attitudes once they have been adversely affected.

Among these classic visitor–resident models, Doxey’s irritation index model (1975) simply and effectively interprets the negative sociocultural impacts of tourism that lead in turn to irritation in the local community. The model asserts a relationship whereby the impacts of tourism increase, a community passes through a predictable sequence of reactions toward tourism. This sequence involves a series of stages from euphoria through apathy and irritation to antagonism. Doxey’s model serves as a useful framework for understanding the changing resident attitudes and developmental stages of a destination, which is particularly pertinent to our empirical context. As one may recognize in the ensuing discussion, the sense of overtourism created by Chinese day-trippers in Hong Kong is related to the social costs of tourism development outweighing the economic benefits. A deteriorating attitude (or irritation) among the local population in Hong Kong towards Mainland Chinese visitors is mainly attributable to the too rapid and uncoordinated growth of Chinese day-tripper numbers under an expansionary visa policy. That is the reason why in this study we wish to develop the hysteresis effect in relation to Doxey’s Irridex model.

While Doxey’s model is currently considered as one of the most important theoretical models in visitor–resident relations, it has certain limitations. Pavlić and Portolan (2016) pointed out that irriderx is a concept not supported by any detailed empirical research. The model also assumes a degree of homogeneity and a linear relationship between residents’ attitude change toward tourists, and it ignores the multidimensionality of tourism impacts within a host community.
(Cordero, 2008). Also, like Butler’s (1980) Tourism Life-Cycle Model it does not involve the time dimension and this therefore constrains its usefulness in explaining visitor–resident relations over time. Nonetheless, the model serves as a useful framework for understanding changing resident attitudes amidst the growing numbers of tourists in a destination. As Pavlić and Portolan (2016) added, the “applications [of the irridex model] in tourism research need further academic attention … and future research could shed light on the model from comparative and empirical perspectives” (p. 495). This article intends to fill this research gap by theorizing the hysteresis effect of overtourism on the visitor–resident irritants with the extension of Doxey’s irridex framework. Simply put, we introduce a time dimension to the traditional downward sloping irridex curve and relax the static assumptions of the model to derive the long-run equilibrium of visitor–resident relations. More importantly, we characterize the hysteresis (irreversibility) of such long-run visitor–resident relationships, akin to how economists are applying hysteresis effects to explain economic phenomena such as unemployment and international trade (Cross, 1993).

The notion of hysteresis is pertinent to the evolving discourse of overtourism in recent years. Given that global growth in tourist arrivals appears to be reaching their limits, an emerging question arises: Should rapidly growing destinations continue to pursue volume growth strategies (Gössling, Ring, Dwyer, Andersson, & Hall, 2016)? Governments setting their travel visa policies, rather than optimising existing tourism systems to create more profitable, stable, resilient and sustainable entities, often seek to maximize tourism growth. While many tourism destinations have experienced rapid improvement in their living standards, especially those in small island countries; it is questionable whether such benefits can last in the long run (Marsiglio, 2015, 2017, 2018). Often, significant and uncoordinated growth in tourist arrivals exceeds destinations’ capacity, and the adverse impacts of “too many tourists” therefore lead to a considerable deterioration of the locals’ quality of life, and trigger visitor–resident irritants (Doxey, 1975).

Saarinen (2006) emphasizes that it is increasingly important to understand the limits of growth and how these limits are approached and evaluated. Whenever necessary, stronger governmental policies are required to limit tourism growth. Many governments retain significant control of their travel visa policies as a management tool for regulating the tourism market. Alternative options may include caps or limits, de-marketing, and the application of departure taxes to increase revenue and limit arrivals growth (Hall, 2014), that is, initiatives that have been applied to selective frequented destinations (such as Machu Picchu, Peru), but not to entire destinations. Neuts and Nijkamp (2012, p. 2149) concluded that “prevention of tourist visitation during periods of high use by season spreading of tourist flows might prove a workable solution to decrease crowding pressure.”

Büscher and Fletcher (2017) initiated discussions of the potential of “degrowth” to function as a pathway towards sustainable tourism. Commentaries on the concept of degrowth include calls to (re-)build societies and economies around principles of commons creation and governance, care and conviviality (D’Alisa et al., 2014). This is a proposal also advocated by Herman Daly and others (Dietz & O’Neill, 2013) that allows for a period of planned economic contraction leading eventually to the type of steady-state economy at a sustainable level of aggregate throughput. The process of degrowth seeks to call attention to the inherent unsustainability of a business-as-usual capitalist economy predicated on continual expansion.

The burgeoning literature addressing degrowth has started to address the global tourism industry. From the demand side, questioning tourism development implies questioning the discontent generated from the intensive competition. From the supply side, challenging mass tourism involves questioning hegemonic economic structures, the provision of jobs, and increases in the prices of land/housing. Essentially, the concept of degrowth challenges tourism development as constructed in terms of the capitalist productive model and its growth imperative.

Instead of addressing the overtourism problem through “degrowth” (Büscher & Fletcher, 2017), “slow” (Fullagar, Markwell, & Wilson, 2012) or “steady-state” tourism (Hall, 2010), authors such as Butler (2017) and Cheer and Lew (2017) have examined sustainable tourism
development by applying the concept of resilience. This concept offers a coherent interpretation of linked human and environmental processes and is being progressively accepted as a framework for understanding tourism development (Cochrane, 2010). Resilience theory was used initially in the early 1970s to model fluctuations in ecological systems and was later applied to a range of anthropogenic contexts, including recent applications to tourism (Butler, 2017; Cheer & Lew, 2017). Tourism is an excellent example of a complex adaptive system and lends itself to the integrative, interdisciplinary and non-linear approach to interpreting the world which is fundamental to resilience theory (Farrell & Twining-Ward, 2004).

Although our study may not be able to offer a definite answer about whether a destination should address the overtourism problem by “exploring sustainable degrowth” or “developing resilience in tourism,” the hysteresis effect of overtourism on visitor–resident irritants is a good reason for developing long-term strategic plans for sustainable urban tourism growth. These plans have the capability to help deal with the various adverse impacts of tourism on the host economy, including damage to the environment, erosion of cultural heritage, negative sociocultural effects, excessive infrastructure demand, and congestion around attractions acting, all of which have been widely documented (Pattullo, 2005; Seraphin, Sheeran, & Pilato, 2018).

The theory of hysteresis in visitor–resident relations

Our discussion on visitor–resident relations so far follows the traditional tourism economics and sustainable tourism literature. In the long run, providing tourist numbers do not exceed the carrying capacity of the tourism destination, the host–guest relations will revert to a threshold without any substantial changes in visitor–resident relationships (Ruhanen, Weiler, Moyle, & McLennan, 2015). But is the residents’ attitude on tourism indeed reversible by simply adjusting tourist arrivals? In labor market studies, it is shown that unemployment does not fall to its former level but stays at the higher level even after the initial stimuli that lead to a rise in unemployment have disappeared (Cross & Hutchinson, 1988). In foreign trade, after a temporary strong exchange rate fluctuation, a country’s trade position may not return to its former level (Baldwin, 1988). In the tourism context, we are concerned to determine whether the temporary events will lead to permanent changes in residents’ attitudes on tourism.

Perhaps oversimplifying the analysis, it is helpful to visualise hysteresis using a two-dimensional diagram (see Figure 1). A formal derivation of the hysteresis model on overtourism is enclosed in an Appendix for interested readers’ reference. As Figure 1 shown, at time $t_1$, a

![Figure 1. Hysteresis in expansionary travel visa policies plotted against time. Note: Hysteresis works either positively or negatively. If a stimulus is reduced for a limited time, a permanent decline in residents’ attitudes may result; subject to the phase of Doxey’s model a destination is situated at.](image)
positive tourist growth stimulus, such as a relaxation of travel-visa policy occurs. The net effect of tourism (i.e., as manifested by positive/negative residents’ attitude to tourism in the Doxey’s irridex model) worsens. At time $t_2$, the stimulus goes back to its original level, but residents’ attitudes stay at the lower level. It is worth noting that the level of resident’s attitude here could be higher at the time when the destination is at the Doxey’s *euphoria* stage. The difference is called *remanence*, which can be full or partial and decaying over time. But, for hysteresis to occur, that difference will not die out but will remain in the system permanently.

This challenges the traditional interpretation of reversible visitor–resident relations by suggesting that overtourism phenomenon may permanently affect visitor–resident relations in the long run; and, more importantly, maybe *irreversible* in nature. The *hysteresis effect* is the term used to describe the long-lasting influence of history on such worsened visitor–resident relations, despite the initial causes of the deterioration being removed. Indeed, there are a number of mechanisms through which rapid expansion in tourism creates such permanent scars on visitor–resident relations. An overwhelming development in the tourism sector can have long-lasting detrimental impacts on local people’s sentiment towards tourists. For instance, locals may blame incoming day-trippers for unceasing inflation and the consequent lowering of their quality of life even after the expansionary policy ends. In addition, an extended period of uncoordinated tourist influx may cause people to develop stereotyped attitudes toward visitors.

Another potential way in which rapid tourist growth can permanently affect the retail sector is by changing the products sold. In general, retailers will chase the tourists’ preferences, specializing in selling certain products favored by tourists without considering residents’ needs. Many local businesses may be crowded out by the change in customers’ preferences. Some more recent tourism research even tries to assess the tourism impact not just at the micro-level, but also from a broader perspective including the total global resources consumed by tourism (Gössling & Peeters, 2015). In essence, it is crucial to sustainable tourism studies to make holistic social impact assessments of tourism.

**Hysteresis in overtourism with the case of Hong Kong**

Faced with the deteriorating local economy after the epidemic outbreak of Severe Acute Respiratory Syndrome (SARS) in Hong Kong, the government hoped for a “quick fix” by tapping into the prosperous Chinese economy. A new scheme, known as the Individual Visit Scheme (IVS) was put in place with an objective of making travel to Hong Kong easier for Chinese tourists. On 28 July 2003, the IVS was initially introduced in three Guangdong cities (i.e., Dongguan, Zhongshan and Jiangmen) to attract more Mainland tourists and their related expenditure. Even after Hong Kong become a Chinese city in 1997, there was still border control between Hong Kong and the rest of the Mainland. Mainland Chinese residents were not allowed to travel to Hong Kong freely without special permission. Under the IVS arrangement, however, residents of these cities could visit Hong Kong much more easily. After this pilot scheme, in 2007 the coverage of the IVS was expanded to many other cities, 49 in total. Under the IVS, Chinese residents who have registered households in these 49 cities are eligible to apply to their local respective municipal authorities for an entry permit to Hong Kong. Such a visa is usually valid for 3–12 months, within which a maximum of two visits to Hong Kong are approved. Tourists admitted under this scheme can stay in Hong Kong for no more than 7 days on each visit.

In 2009, the IVS was modified in Shenzhen so that eligible residents with a Shenzhen household registration could apply for a "multiple-entry" permit. This means that these qualified residents in Shenzhen can undertake unlimited multiple trips to Hong Kong within a year. The travel visa policy makes day-trip visits to Hong Kong by these Mainland residents of Shenzhen for leisure and shopping activities more convenient and flexible. This is known in Hong Kong as
the “multiple-entry permit” (MEP) policy. In 2012, the “multiple-entry permit” policy scheme was further expanded to include Shenzhen residents without a Shenzhen household registration, so virtually all residents in Shenzhen (i.e., over 10 million residents) could apply for such a multiple-entry permit.

At the beginning of this new multiple entry permit policy, most of the Mainland Chinese tourists were interested in typical tourist activities such as sight-seeing and cultural exploration rather than shopping. Given Hong Kong’s colonial background; the city remained a very new and exciting tourist experience for most Mainlanders. Meanwhile, these newly admitted tourists saw Hong Kong as a source of high-quality goods, especially in the food and drugs categories and in high-end merchandise such as jewellery and electronic appliances. Due to the prevalence of counterfeiting in China, Hong Kong-sourced products and daily necessities are preferred for their perceived quality. Many so-called “parallel traders” therefore take advantage of the multiple-entry permit policy to import goods from Hong Kong to Mainland China. This shopping-based travel became even more appealing from 2002, as the Chinese currency, the Renminbi, rose steadily against the Hong Kong dollar, causing shopping in Hong Kong to become a cheaper option for many Chinese tourists.

As more and more Shenzhen residents joined in this parallel trade and progressively snatched business away from the local retailers, the related social disturbance and conflicts between the two locations started to intensify. For instance, Sheung Shui, a border district in Hong Kong heavily frequented by day-trippers, has become a distribution center for parallel goods. Numerous parallel traders gather daily around the railway station, encroaching on pavements and roads. These traders create congestion problems, adding pressure to immigration control points. They also drive up commodity prices. Parallel trading has triggered inflation and caused a severe shortage of goods such as infant formula. The resentment among Hong Kong residents towards Mainland parallel traders, and also to same-day in-town visitors, has escalated. Many Hong Kong residents regard Mainlanders as marauders. Social media users have expressed their discontent by portraying Mainlanders as “locusts” (Sautman & Yan, 2015). In essence, the multiple-entry permit policy has triggered a public outcry over concerns that Hong Kong cannot handle such overtourism. This is despite the massive expenditure by the Chinese cross-border shoppers.

Consequently, the impact of these tourists on retail properties and in particular on their rental movements becomes more and more focused and substantial. Shops with lower attraction value to these specific IVS tourists, such as traditional grocery shops or low-end restaurants are being displaced and replaced at an unprecedented rate by shops such as chain stores that can afford higher rentals. Thus, an apparent correlation emerges between the increase in tourism due to the change in policy and the booming retail property market in the city.

As Figure 2 indicates, Chinese visitor arrivals exhibit two waves of expansion. The first wave of expansion started with the launch of IVS in 2003, while the second wave commenced in 2009 when the “multiple-entry permit” policy was implemented. The number of Chinese visitors more than doubled with the implementation of the 2003 IVS (+115%) and that of the 2009 “multiple-entry permit” policy (+125%), while the price of retail properties escalated even more dramatically. During the period between the launch of IVS and the implementation of the “multiple-entry permit” policy, retail property prices increased by 110%. Subsequently, from the start of the “multiple-entry permit” policy to its suspension in 2015, these prices rose by a further 220%. This trend partly revealed a strong impact of cross-border visitors on demand for retail properties (Li, Cheung & Han, 2018).6

Having provided the background to the multiple-entry permit policies in Hong Kong and its significant influence on visitor–resident irritants, we now turn to our empirical study, which documents the deteriorating attitudes (or irritation) among locals in Hong Kong towards Mainland Chinese visitors. In the ensuing section, we will discuss how we made use of the ARDL model with a structural break and our corresponding bound test. In particular, we will explain
why this model and test are better than the cointegration test with traditional “error correction” models (mainly due to the mixture of I(0) and I(1) data). A less trivial testable implication that can be drawn from the above *hysteresis* argument is that: *Ceteris paribus*, the implementation of a “multiple-entry permit” leads to a rapid increase in same-day in-town tourist arrivals and exhibits a negative cointegrating (long-run) hysteresis on public sentiment.

**Empirical tests and research design**

To investigate our testable hypothesis of the *hysteresis effect* of overtourism, we sought to quantify visitor–resident relations and tourist growth. Based on the system of equations (i.e., Equation A4 in Appendix), we needed to measure $\sigma$, that is visitor–resident relations (i.e., residents’ attitudes) and $\tau$, which is the tourist arrivals. In a word, we wanted to confirm the co-integrating relations of $\sigma$ and $\tau$ (i.e., significant bounds test results from the ARDL model) for the Mainland day-trippers.

While the figures of tourist growth $\sigma$ were fairly easy to obtain, finding aggregate data on visitor–resident relations was a big challenge. Although Doxey’s irridex has been considered by many tourism studies as one of the fundamental models characterizing local residents and tourists’ relation, it has not originated from any detailed empirical research. Ideally, we might have conducted a census of local residents’ satisfaction with tourists over time to derive the so-called *Irridex*, but this was not practical given the considerable manpower required. To study visitor–tourists’ relations, we therefore sought to employ public sentiment indices or their equivalent. Sentiment analysis is a newly emerging technique. The opinions and feelings expressed by users in their comments through social media significantly influence their tourism-related decisions (Jabreel, Moreno, & Huertas, 2017; Krsak & Kysela, 2016).

In Hong Kong, the Public Sentiment Index (PSI) is commonly used as an indicator for gauging residents’ sentiment on various social issues. The Public Opinion Programme at The University of Hong Kong compiles the PSI which aims at quantifying the Hong Kong public’s sentiment to

![Figure 2. Waves of expansionist policy on tourism.](image-url)
explain and predict the likelihood of certain collective behaviors. The PSI comprises two components: one being the Government Appraisal (GA) score and the other being the Society Appraisal (SA) score. The GA refers to the public’s appraisal of society’s governance while the SA refers to the public’s appraisal of the social environment. The PSI includes polls of locals’ perception of tourists, which is what we sought to investigate in this study.

Periodically, the poll center releases its survey results on the “perception of local government and people.” One particular survey in 2013 showed that Hong Kong people’s feelings towards Taiwanese people was +65% and the degree of resentment was 4%. In contrast, their feelings towards the Chinese Mainland people since the multiple-permit entry policy were about +30%, and the degree of resentment was 29%; being the historical low since the start of the opinion poll.

To validate the use of PSI as an effective measure of visitor–resident irritants, we used a “big data” approach. We tried to correlate the PSI with Google Trends data from keyword searches. The use of search engine data as an economic indicator is becoming popular. Examples include automobile sales, unemployment claims, travel destination planning and consumer confidence (Choi & Varian, 2012; Gawlik, Kabaria, & Kaur, 2011). We included keywords searches such as [Mainland tourists] and [locust]. Google Trends classifies those search queries as categories of “Hong Kong-Mainland China conflict (Hong Kong)/Tourism (Hong Kong). The query index compiled by Google Trends is based on query share: the maximum query share in the period specified is normalized to be 100, and the query share at the initial date being examined (or below a threshold) is normalized to be zero. To smooth the Google Trends query index, we took an average of those indices and computed the 12-month rolling average. For illustrative purpose, we named this index “Google irridex” and compared it with the Public Sentiment Index (PSI). A graph for these two indices is provided in Figure 3.

The negative correlation between these two indices revealed that the increase in Hong Kong-Mainland conflicts and tourism-related search queries is associated with a remarkable decline in public sentiment. While the validation here by no means guaranteed the PSI as a perfect indicator of visitor–tourist irritants, the co-variation of PSI with the conflicts between Hong Kong

![Figure 3. Comparison between PSI and "Google Iridex".](image-url)
residents and Mainland visitors could serve as prima facie evidence supporting our PSI usage. Indeed, robustness checks with different tourist groups are reported in the following section to ensure the validity of our hypothesis of the hysteresis effect.

For the time being, as we try to develop our hypothesis for our empirical test, let us take it for granted that PSI is a fair gauge of visitor–resident relations. When the Chinese visitor arrival numbers are plotted against the PSI, several features are highlighted.

- The Chinese visitor numbers continue to grow in an uninterrupted trend, establishing a convergence between the tourist boom and a public sentiment plunge.
- There was a structural break around the implementation of a “multiple permit entry.”
- Since 2009, the average sentiment of Hong Kong people has been trending downwards despite the entrenched economic recovery.

Figure 4 shows that an increase in Mainland Chinese visitors to Hong Kong correlates with a deterioration in public sentiment. But is there any further evidence showing that this is a long-run relationship (i.e., an adverse hysteresis effect)? More specifically, in the terminology of econometrics, the question is: “Are these two time-series cointegrated?”

The use of cointegration analysis to test hypotheses in macroeconomics and finance such as the persistent price swings around long-run equilibrium values is well established. However, such analysis is not common in tourism policy research. To perform a cointegration test, there is first a need to test each time series to determine whether both of them are non-stationary (i.e., having a unit root or namely I(1) process). However, in the unit root test we need to ensure the structural break in the trend for each series. As Perron (1989) points out, structural change and unit roots are closely related. Researchers should keep in mind that the conventional unit root tests are biased to falsify the unit root null when the data are trending stationary with a structural break. This observation has spurred the development of much literature outlining various unit root tests that remain valid for time series in the presence of a break (vide Hansen, 2001 for an overview).

Figure 4. Divergence trend between Mainland visitors and Public Sentiment Index. Note: LML represents the logarithm of Chinese visitor arrivals; i.e. ln(ML) and LPSI is the logarithm of the Public Sentiment Index, i.e. ln(PSI).
In consideration of structural breaks, the Augmented Dickey-Fuller (ADF) in Table 1 suggests that \( \ln(ML) \) and \( \ln(PSI) \) is the I(1) and I(0) process respectively. The traditional approach to cointegration may stop at this point as, by definition, some standard procedures such as Johansen, Mosconi, and Nielsen (2000)’s test on cointegration requires that both time series are I(1); otherwise the test will not be valid. Due to the problem that there was now a mixture of I(1) and I(0) processes, we brought the ARDL model into play as a remedy.

**Autoregressive-Distributed lag (ARDL) model in a mixture of I(1) and I(0) process**

The ARDL/bounds test methodology of Pesaran, Shin, and Smith (1999) and Pesaran, Shin, and Smith (2001) has a number of features that many researchers find make it more useful than conventional cointegration testing. For instance, (i) the ARDL model can be used with a mixture of I(0) and I(1) data; (ii) it involves just a single-equation set-up that makes it simple to implement and interpret; (iii) different variables can be assigned with different lag-lengths when they are entered into the model, and (iv) it can take into account the impact of structural breaks. This class of time series model has been in use for decades, but in more recent times it has been shown to provide a precious instrument for testing for the presence of long-run relationships between economic time series, in particular when there is a mixture of I(0) and I(1) data.

In its basic form, an ARDL regression model in our study is:

\[
PSIt = \beta_0 + \beta_1 PSI_{t-1} + \ldots + \beta_p PSI_{t-p} + \alpha_0 ML_t + \alpha_1 ML_{t-1} + \ldots + \alpha_q ML_{t-q} + \varepsilon_t \tag{1}
\]

where \( PSI \) is the Public Sentiment Index, and ML is Chinese visitor arrivals, while \( \varepsilon_t \) is a random disturbance term. This study is interested in modelling between the dependent variable, PSI, and the explanatory variable, ML, with their corresponding lags, that is, ARDL \((p, q)\). First, it is worth noting that before going into the detailed procedure of ARDL/Bounds tests, one must ensure none of the times series is I(2) as that would invalidate the methodology. That is something that we validated in the pre-testing procedure.

Second, there was a need to formulate an "unrestricted" error-correction model (ECM). Theoretically, the ECM model can be regarded as a particular type of ARDL model. A conventional ECM for cointegrated data would be of the form:

\[
\Delta PSI_t = \beta_0 + \Sigma \beta_i \Delta PSI_{t-i} + \Sigma \gamma_j \Delta ML_{t-j} + \phi z_{t-1} + \varepsilon_t \tag{2}
\]

where \( z \) is the "error-correction term" which is the OLS residuals series from the long-run "cointegrating regression,"

\[
PSI_t = \alpha_0 + \alpha_1 ML_t + \nu_t \ldots \tag{3}
\]

Perron’s work (1989), the Augmented Dickey-Fuller (ADF) tests with a structural break, required us to regress both time series by the ordinary least squares method. This equation included an intercept, a linear trend and a variable which is an artificial variable that took the value zero up to the breakpoints and then the values 1, 2, 3, up to the end of the sample (i.e., 2005M4 for PSI/2011M6 for ML inclusive in our case). We then tested the residuals from this first-stage regression or a unit root, using the ADF test with the "no drift-no trend" option for the Dickey-Fuller regression. This last point is important because the data have been filtered already for the drift and trend (with the break) in the first-stage regression. After performing the unit root test with a structural break, we obtained the results shown in Table 1.

<table>
<thead>
<tr>
<th>( t )-statistics</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(ML)</td>
<td>-2.8139 I(1)</td>
</tr>
<tr>
<td>ln(PSI)</td>
<td>-5.5149 I(0)</td>
</tr>
</tbody>
</table>

Notes: \( \ln(ML) \) represents the logarithm of Chinese visitor arrivals, and \( \ln(PSI) \) is the logarithm of the Public Sentiment Index.
The ranges of summation in (2) are from 1 to \( p \), and 0 to \( q \) respectively.

\[
\Delta \text{PSI}_t = \beta_0 + \sum \beta_i \Delta \text{PSI}_{t-i} + \sum \gamma_j \Delta \text{ML}_{t-j} + \theta_0 \text{PSI}_{t-1} + \theta_1 \text{ML}_{t-1} + \epsilon_t
\]  

(4)

This is very similar to a traditional ECM. The difference is that the error-correction term, \( z_{t-1} \), is substituted by the terms \( \text{PSI}_{t-1} / C_0 \) and \( \text{ML}_{t-1} / C_0 \) from Equation (3), where the lagged residuals series would be \( z_{t-1} = (\text{PSI}_{t-1} - a_0 - a_1 \text{ML}_{t-1}) \), where the coefficients \( a \)'s are the OLS estimates of the \( \alpha \)'s. So, what occurs in Equation (4) is the inclusion of the same lagged levels as is done in a regular ECM, while at the same time not restricting their coefficients. Often, Equation (4) is called an "unrestricted ECM," or as Pesaran et al. (2001) calls this, a "conditional ECM."

Third, we determined the appropriate maximum lags of \( p \) and \( q \). Usually, these maximum lags are determined by using one or more of the "information criteria" such as Akaike information criterion (AIC), Bayesian information criterion (BIC) or Schwarz (Bayes) criterion (SC). These criteria are based on a high log-likelihood value, with a "penalty" for including more lags to achieve this. The form of the penalty varies from one criterion to another. Each criterion starts with \(-2\log(L)\), and then penalizes, so the smaller the value of an information criterion the better the result. In this study, we used the Schwarz (Bayes) criterion (SC), as it is a consistent model-selector. Caution is needed to avoid "over-selecting" the maximum lags, and attention should be paid to the significance of the coefficients in the model as a reference.

One major assumption in the ARDL/Bounds test methodology of Pesaran et al. (2001) is that the errors of Equation (4) must be serially independent. Once an apparently suitable version of Equation (4) has been estimated, then the Breusch-Godfrey Serial Correlation LM Test is used to ensure serial independence. Also, due diligence must be done to make sure the model is dynamically stable by checking that all of the inverse roots of the characteristic equations associated with the model lie strictly inside the unit circle.

Finally, the conditions existed to perform the bounds test to see if there is a long-run relationship between the Chinese visitor arrivals and the Public Sentiment Index. We performed an F-test of the hypothesis, \( H_0: \theta_0 = \theta_1 = 0 \), against the alternative that \( H_1: \theta_0 \neq \theta_1 \neq 0 \). As in a conventional cointegration test, tests are for the absence of a long-run equilibrium relationship between the variables. This absence coincided with zero coefficients for \( \text{PSI}_{t-1}, \text{ML}_{t-1} \) in Equation (4). A rejection of \( H_0 \) implies that there is a long-run relationship. There was a practical difficulty that has to be addressed when the F-test is conducted. The distribution of the test statistic was non-standard (and also depended on a "nuisance parameter," the cointegrating rank of the system) even in the asymptotic case where there is infinitely large sample size.

Exact critical values for the F-test are not readily available for an arbitrary mix of I(0) and I(1) variables. Fortunately, Pesaran et al. (2001) supply bounds on the critical values for the asymptotic distribution of such F-statistics. For various situations (e.g., different numbers of variables, \( k + 1 \)), Pesaran et al. (2001) give lower and upper bounds on the critical values. In each case, the lower bound is based on the assumption that all of the variables are I(0), and the upper bound is based on the assumption that all of the variables are I(1). In fact, the truth may be somewhere in between these two extremes. If the computed F-statistic falls below the lower bound (i.e., \( l_0 \) bound) it can be concluded that the variables are I(0), so, by definition, no cointegration is evident. If the F-statistic exceeds the upper bound (i.e., \( l_1 \) bound), it can be concluded that there is cointegration. Finally, if the F-statistic falls within the bounds, the test is inconclusive.

The estimated results of Equation (1) are presented in Table 2. Column (1) presents the ARDL model for samples of overall Chinese visitor arrivals (ML) in relation to the public sentiment (PSI). Taking into account the mixture of I(1) and I(0) process of ML and PSI as well as the structural break in the time series, the negative coefficient for ML is consistent with our hypothesis (i.e., the short-run increase in Chinese visitors generates a negative public sentiment among residents in the short-run.)
As explained in our theoretical framework, the short-run situation will not be long-lasting unless there is a structural change altering the long-run irritants’ curve. Our main interest in the ARDL model is whether the cointegrating relationship persists between the series ML and PSI. The F-statistics of bound test 6.089 confirms that such a negative impact of ML on PSI exists in the long-run, implying that such structural change did indeed occur. We further attribute such structural change to the increase in same-day visitors. To confirm this hypothesis, we estimate Equation (1) by splitting the ML into two sub-samples, namely the same-day visitors (INTOWN) and overnight visitors (OVERNIGHT). Assuming our hypothesis holds, there should be a long-run cointegrating relationship between the INTOWN and PSI series, but no such relationship between the OVERNIGHT and PSI. The lower panel of Table 2 demonstrates our predicted results. The F-statistics for the bound test is only significant for the same-day visitors (INTOWN) series but not for their overnight counterparts (OVERNIGHT).

One alternative explanation for these bound test results could be some “unobserved” (or latent) systematic social factors that lead to the decline in sentiment. To rule out this argument, we further estimated the ARDL models and performed the corresponding bound tests concerning the short-haul (SHORT) and long-haul (LONG) visitors. In Column (4) and (5) of Table 2, we found that the short-haul and long-haul visitor arrivals both demonstrated an insignificant long-run relationship, even without a short-run dynamic being involved. Indeed, if social factors structurally influence the public sentiment, a significant cointegrated relationship should exist for

---

Table 2. Cointegrated relationship between public sentiment and visitor arrivals.

<table>
<thead>
<tr>
<th></th>
<th>ADRL(1,0) Mainlander</th>
<th>ADRL(1,0) In-town</th>
<th>ADRL(1,0) Overnight</th>
<th>ADRL(1,1) Short-haul</th>
<th>ADRL(1,2) Long-haul</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dep. Var.: ln(PSI)</td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>ln(PSI(−1))</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(ML)</td>
<td>0.0454***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(INTOWN)</td>
<td></td>
<td>−0.0290***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(OVERNIGHT)</td>
<td></td>
<td></td>
<td>−0.0544***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(SHORT)</td>
<td></td>
<td></td>
<td>−0.0244***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(SHORT(−1))</td>
<td></td>
<td></td>
<td>−0.0579</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ln(LONG)</td>
<td></td>
<td></td>
<td></td>
<td>0.0215</td>
<td></td>
</tr>
<tr>
<td>ln(LONG(−1))</td>
<td></td>
<td></td>
<td></td>
<td>−0.0138</td>
<td></td>
</tr>
<tr>
<td>ln(LONG(−2))</td>
<td></td>
<td></td>
<td></td>
<td>−0.0447</td>
<td></td>
</tr>
<tr>
<td>Break(2011M06)</td>
<td>−0.0969***</td>
<td>−0.0940***</td>
<td>−0.0974</td>
<td>−0.0843</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.1563***</td>
<td>0.8160***</td>
<td>1.1469</td>
<td>1.4381</td>
<td></td>
</tr>
<tr>
<td>Bound Test (Pesaran et al., 2001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistics</td>
<td>6.089***</td>
<td>5.675*</td>
<td>2.944</td>
<td>2.795</td>
<td></td>
</tr>
<tr>
<td>Significance 5%</td>
<td></td>
<td></td>
<td></td>
<td>1.398</td>
<td></td>
</tr>
<tr>
<td>R-squared:</td>
<td></td>
<td></td>
<td></td>
<td>0.9378</td>
<td></td>
</tr>
<tr>
<td>F-statistic:</td>
<td>698.7435</td>
<td>577.6371</td>
<td>581.2616</td>
<td>505.8615</td>
<td></td>
</tr>
</tbody>
</table>

Notes: The dependent variable is the logarithm of Public Sentiment Index (PSI). *, **, *** means the coefficients are at 10%, 5% and 1% significance level respectively. †indicates a marginal significance at the 10% level. Standard errors are presented in the parentheses. X(−1) represents the operator, such as X(−1) = X_t − X_{t-1}. The ARDL specification for each series is determined by the lowest value of the Schwarz (Bayes) criterion (SC) out of the possible 20 specifications with various values of p and q.
both SHORT and LONG series (i.e., those non-Chinese tourists). The insignificant cointegration results for those non-Chinese tourists further confirm that it was only the high rate of increase in same-day Chinese visitors led by the implementation of “multiple-entry permit” that induced a hysteresis effect in public sentiment, as manifested by the negative cointegrated (long-run) relationship of INTOWN and PSI.

Conclusion

This study provides a new perspective on residents’ attitudes toward visitors. It does so by highlighting that hasty expansionary travel visa policies implemented without proper planning may induce an overwhelming growth of same-day visitors and may permanently lower the quality of visitor–resident relations in the long run. A radical deterioration in visitor–resident irritants does not take place suddenly, and policymakers need therefore to plan carefully for changes in tourist destinations. One type of plan might be to create an effective “exit strategy” for tourism industry growth as a crucial step to allow the economy to move forward to a new phase of economic development (Baum, 1998; Butler, 2006a, 2006b).

Our findings also extend the literature on visitor–resident irritant effects, which to date has been exclusively focused on static (or short-run) residents’ responses to tourists. This study illustrates a significant and negative long-run cointegrating relationship between the same-day Chinese visitors and the residents’ Irridex. This negative correlation seems to be specific to this type of day-tripper as compared to all other visitor categories. Further, the notions of short-run deviation from the long-run equilibrium of visitor–resident relations imply that each destination has a limited tourism carrying capacity. That is in line with Butler’s advocacy in his Tourism Area Life Cycle theory (TALC; Bulter 2006a, p. 236) to use any available tool (i.e., our ARDL model) to detect early signals of decline and to take preventive measures with the purpose of leading the destination to a rejuvenation phase. The purpose of developing such an early warning system is, as implied in this study, to highlight the importance of the tourism area life cycle approach by setting up a diagnostic system of the evolution of the destination based on the Doxey’s Irridex approach. Similar studies in different destinations will allow tourism policymakers to gauge visitor–resident relations and enable them to undertake appropriate and timely actions.

Our theoretical framework is also useful to policymakers who wish to assess or evaluate their travel visa policies. Before our study, one could take for granted that an expansionary travel visa policy would boost the economy as tourist spending accumulated, and that any difficulties caused by the expansionary policy on visitor–resident relations could be overcome. The lesson from Hong Kong shows however such social benefits do not necessarily trickle through when a severe hysteresis effect on visitor–resident irritants is incurred.

We are not suggesting that an expansionary travel visa policy should not be adopted. Instead, our study reminds policymakers that the carrying capacity of cities matters and should be viewed in relation to the long-run residents’ perception of tourists. Policymakers should always be aware that any expansionary travel-visa policy that damages visitor–resident relations may result in hysteresis. Our results suggest that visitor–resident relations may be one of the important dimensions to be considered in tourism planning. A myopic view of the economic benefits of tourism development may not be in the host’s best interests. Seeking the possibility of disengaging economic growth from tourism specialization may need to be considered in liberal discourse (Marsiglio, 2018). This may require an attempt to put less emphasis on the importance of traditional pro-tourism policies. Also, our study is relevant to many fast-growing tourist destinations, such as Myanmar, Palestine, Egypt, Iceland, Vietnam, Uruguay, Mongolia, and Israel, where the tourism industry is exhibiting an unprecedented rise in tourist numbers in destinations that have relatively slow urban development.
We note the limitations of our study. Our model relies on a simple time-series approach to model the impact of tourist arrivals on visitor–resident irritants. Due to the aggregate analytical approach and the fact that the visitor–resident dynamics could be exposed to various economic shocks (either as benefits or costs for locals) in every period, our empirical treatment of persistence or hysteresis effects might not have been able to entirely capture the visitor–residents irritation dynamics, which may require further research. A deeper understanding based on studying the internal dynamics of the demonstrated hysteresis effect is needed. The existence of the hysteresis effect of overtourism on visitor–resident relationship deserves further analysis from a theoretical perspective, in particular, the more general conditions in which persistent hysteresis visitor–residents irritants might occur as a result of overtourism; and whether sustainable tourism requires exploring sustainable degrowth or developing resilience.

Notes

1. A detailed summary of these staged-based models can be referred to (Hunt & Stronza, 2014).
2. Hysteresis (Cross, 1993) means literally “that which comes later,” being derived from the Greek verb ὑστερεῖν. Thus, hysteresis effects, generally defined, are those that persist after the initial causes giving rise to the effects are removed.
3. Hong Kong, as a special administrative area within the People’s Republic of China, had always maintained a tight border control after 1997 when Hong Kong was returned to Chinese sovereignty. Individual citizens from China travelling to Hong Kong still had to apply for an entry permit after the unification in 1997. This institutional arrangement limiting the mobility of travellers was substantially refined in July 2003, when the SARS epidemic was finally eradicated from the city.
4. Although the parallel traders are the major trigger of the deteriorating visitor–residents’ relations, many non-parallel traders who are same-day in-town Mainland visitors are also contributing to the adverse effects of overtourism, for example, increasing congestion, overcrowding of public spaces; declining purchasing power parity of local residents versus visitors; and the dismantling of socio-cultural connectivity. Thus, we do not intend to differentiate the effects of parallel from non-parallel traders.
5. According to the survey conducted by the Hong Kong Tourism Board in 2013, both overnight and same-day IVS visitors favoured cosmetics and skin care products, ready-made wear, foodstuffs, and medicine and Chinese herbs. Overnight IVS visitors purchased high-end consumer products such as leather goods, jewellery and watches, and electrical/photographic goods. Same-day IVS visitors also included personal care products such as shampoo and diapers in their shopping lists. Retrieved from: https://www.legco.gov.hk/research-publications/english/1314rb06-individual-visit-scheme-20140507-e.pdf
6. For more discussion regarding the travel visa policy between Hong Kong and China, see Liu and McKercher, (2016).
7. The entire conference of Information and Communication Technologies (ICT) in Tourism (Schegg & Stangl, 2017) focused on the relationship between ICT and the tourism industry.
8. More details about the public sentiment index by The University of Hong Kong can be found at https://www.hkupop.hku.hk/english/features/PSI/index.html or the Listing according to topic and item at https://www.hkupop.hku.hk/english/popexpress/index.html
10. The query share in Google Trends is defined as the total query volume for the search term in question within a particular geographic region divided by the total number of queries in that region during the time period being examined.
11. Murray (1994) uses a humorous example of a drunk and her dog to illustrate the link between cointegrated variables and error correction models.
12. Recall that the characteristic polynomial of a square matrix $A$ is defined as $p(\lambda) = \det(A - \lambda I)$.

For a $2 \times 2$ matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, we have $p(\lambda) = \begin{bmatrix} a-\lambda & b \\ c & d-\lambda \end{bmatrix} = \lambda^2 - (a + d)\lambda + (ad - bc)$. If we define the trace and determinant for a $2 \times 2$ matrix $A$ as $\text{tr}A = a + d$ and $\det A = ad - bc$, respectively, we can express $p(\lambda) = \lambda^2 - \text{tr}A\lambda + \det A$. Use the abbreviations $T = \text{tr}A$ and $D = \det A$, we can express the characteristic polynomial as $p(\lambda) = \lambda^2 - T\lambda + D$. Recall characteristic roots are a set of scalars associated
with a matrix \( A \) (a.k.a. eigenvalues) in which a vector \( X \) leads to scalar \( \lambda \), such that \( AX = \lambda X \). If \( D < 0 \), the eigenvalues are real and of opposite sign, and the phase portrait is a saddle (which is always unstable). If \( 0 < D < T^2/4 \), the eigenvalues are real, distinct, and of the same sign, and the phase portrait is a node, stable if \( T < 0 \), unstable if \( T > 0 \). If \( 0 < T^2/4 < D \), the eigenvalues are neither real nor purely imaginary, and the phase portrait is a spiral, stable if \( T < 0 \), and unstable if \( T > 0 \). The operation herewith attempts to figure when the system of equations will be unstable.

13. This line is also known as “attractor” in the time-series literature (see Engle & Granger, 1991, p.1). That is along the notion suggested by many tourism researchers: a balance between economic benefits and environmental costs to attain a sustainable development (Yu, Chancellor, & Cole, 2011), where tourist numbers do not exceed the carrying capacity of the tourism destination (Marsiglio, 2015, 2017; Feliziani & Miarelli, 2012).

14. For \(-2 < d < 0\) a ‘groove’ shaped curve is implied in Case (I), representing a stable adjustment process towards the long-run equilibrium relation, even if the first equation shows a unit root.

15. For the case where \( \delta > 0 \), a dynamic amplification of the deviations from the long run equilibrium will follow. In this scenario, the relation \( \tau = \rho \sigma \) represents the maximum of the potential where an unstable equilibrium occurs.

Acknowledgments

We would also like to show our gratitude to Professor Harvey C. Perkins and Professor Kerr Inkson for sharing their pearls of wisdom with us during the course of this research. We are also immensely grateful to anonymous reviewers for their comments on an earlier version of the manuscript. Any errors are our own and should not tarnish the reputations of these esteemed persons.

Notes on contributors

Dr William K. S. Cheung is a Lecturer at the University of Auckland Business School. He obtained his PhD from The University of Hong Kong (HKU). His research and teaching interests cover a wide range of issues in the property economics, including but not limited to the institutional and policy analysis, property and tourism markets. Aiming to make the most of his expert knowledge and experience, William aspires to be a policy specialist to provide professional input to the policy formulation. Prior to his PhD study, William served as an economist at the HKSAR Government and worked as an assistant manager in the Asia Pacific Research Department at CBRE, a globally renowned real estate company. He is a chartered surveyor at the Royal Institution of Chartered Surveyors (MRICS). William was an Endeavour research fellow at the University of Melbourne and a Fulbright Scholar at the University of California, Los Angeles (UCLA). He also held various academic appointments at other institutions including the graduate visiting fellow at UCLA, alumni fellow in the Ronald Coase Institute, a research fellow of the Ronald Coase Centre for Property Rights Research at HKUrban Lab and research scholar at the Lee Hysan Foundation in Hong Kong.

Dr. L. H. Li, a land policy specialist, is currently an Associate Professor and the Programme Director of the China Network MSc programmes in the Department of Real Estate and Construction, the University of Hong Kong. A Fulbright Hong Kong Scholar, Dr. Li has a wide range of research interests in social, economic and sustainable aspects of policy, more specifically in the areas of urban land regeneration; the impact of the built environment and urban development. Dr. Li has written extensively on land use policies in Hong Kong and Mainland China with a total of 35 papers published in various international and professional journals, together with five academic books. Dr. Li’s research has been widely supported by various government and private sector grants including RGC Public Policy Grant, Jackson Memorial Fellowship grant, and contract research grants awarded by various entities, among them are the Guangzhou Land Development Bureau of the Guangzhou City Government; The Audit Commission of the HKSAR Government and the Urban Renewal Authority of Hong Kong. In terms of international collaboration, Dr. Li has had previous and current research projects with different institutions such as Tsinghua University and Peking University in Beijing; Griffith University in Australia and the Institute of Oriental Studies in France. Currently, Dr. Li is also part of the Child Friendly Cities Network, which composes of researchers around the world working on various aspects of childhood development and the built environment. The Network works closely with the UNESCO Asia Pacific division.
References


Appendix: Hysteresis model of overtourism

Hysteresis occurs when a past temporary change of the relevant forcing variables has led to a change in the economic behavior of the observed unit(s), but removal to the initial value of the forcing variables does not induce a complete shift back to the original behavior (Göcke, 2002). While in economics different types of hysteresis are applied to describe such persistence, the first order difference (or differential) equations with unit (zero) roots in the time series analysis are commonly adopted to characterize this “hysteresis” effect. Although there are no universally accepted methods to capture hysteresis effects, “at least, persistent effects may be captured by stochastic unit root difference equations (e.g. via cointegration models) (p.184)”. This procedure could be adequate if persistence is actually based on the degeneration of the adjustment dynamics. (Göcke, 2002, pp. 184–185).

Based on simulation results, Amable, Henry, Lordon, and R’s (1992, p. 12) suggested that unit root processes are suitable as an approximation of most “strong” macroeconomic hysteresis. Consider a simple first-order difference equation (Franz, 1990):

$$\sigma_t = a \cdot \sigma_{t-1} + \nu_t$$  \hspace{1cm} (A1)

where $$\sigma_t$$ is the state variable of visitor–resident’s irritants (i.e., residents’ perception/attitude towards tourists which is the sentiment index in our empirical test). The economic interpretation in the current context is that the visitor–resident’s irritants ($$\sigma$$) at current period $$t$$ is exposed to the visitor–resident’s irritants in the previous period and some exogenous market shocks that capture the structural and external changes, if any (e.g. epidemics, terrorist attacks etc.), which is denoted as $$\nu_t$$. For the sake of notational convenience, we apply a standard lag operator $$L$$ to reinstate Equation (A1) as Equation (A2):

$$\sigma_t = a \cdot \sigma_{t-1} + \nu_t \rightarrow (1-a \cdot L) \cdot \sigma_t = \nu_t$$  \hspace{1cm} (A2)

Furthermore, a basic economic error correction mechanism11 for the aggregate tourist level $$\tau$$ (i.e., the tourist arrivals in our empirical tests) is introduced to formulate our quantitative Doxey’s model. Similar to many other error correction models, we start from a simple, proportional, long-run equilibrium relationship between tourist arrivals $$\tau$$ and visitor–resident’s irritants $$\sigma$$. Of course, the equilibrium relationship need not be directly proportional, but let us keep it simple. In the long run, tourist arrivals $$\tau$$ is proportional to visitor–resident’s irritants $$\sigma$$ with a ratio $$\rho$$ i.e., the tendency of residents to be irritated, which can be mathematically expressed as $$\tau = \rho \sigma$$. Then, the short
run deviation ($\Delta \tau_t$) from that long-run equilibrium relation ($\tau = \rho \sigma$) is adjusted by a parameter $\delta$ in the following period and is exposed to other exogenous shocks $z_t$. Such “error correction” (i.e., how $\tau_t$ re-adjusts back to long-run equilibrium) can then be stated as:

$$\begin{align*}
\Delta \tau_t &= \delta \cdot (\tau_{t-1} - \rho \sigma_{t-1}) + z_t \\
&= \delta \cdot \rho \cdot L \cdot \sigma_t + [1 - (1 + \delta) \cdot L] \cdot \tau_t = z_t
\end{align*}$$

(A3)

To understand this adjustment process, we have to ask: under what conditions is the generic dynamic equation (3) consistent with the long run equilibrium relationship $\tau = \rho \sigma$? To answer this question, we “zero out” the factors that could cause the divergence from equilibrium.

Using the matrix representation $A(L) \cdot \sigma_t = \nu_t$, the system can be restated as follows:

$$\begin{bmatrix} 1 - a \cdot L & 0 \\
\delta \cdot \rho \cdot L & 1 - (1 + \delta) \cdot L \end{bmatrix} \begin{bmatrix} \sigma_t \\
\tau_t \end{bmatrix} = \begin{bmatrix} \nu_t \\
z_t \end{bmatrix}$$

(A4)

The roots $z_1$ and $z_2$ of the characteristic polynomial of the lag-operator matrix (i.e., “zero out” those diverging factors) can be calculated by:

$$\det(A(L)) = (1 - a \cdot L) \cdot [1 - (1 + \delta) \cdot L] = 0 \rightarrow z_1 = \frac{1}{a} \quad \text{and} \quad z_2 = \frac{1}{1 + \delta}$$

(A5)

From the Equation (A5), when $a = 1$ and $\delta = 0$, the unit roots (i.e., $z_t = 1$) will result. When the first equation shows a unit root ($a = 1$), and the root of the second equation is outside the unit root circle ($-2 < \delta < 0$), the equilibrium of the irridex model will be depicted as in Figure A1 Case (I) (See Amable et al., 1992, for the similar illustrations). The horizontal arrow line in Figure A1 graphically represents the long-run equilibrium relationship between tourists’ level and visitor–resident irritants ($\tau = \rho \sigma$). The dotted curves and lines sketch all the potential adjustment from the long-run equilibrium. For $-2 < \delta < 0$ in Case (I), the “groove-shaped” curves show a stable adjustment process of tourists’ irritants towards the equilibrium level $\tau = \rho \sigma$.

Given the temporary exogenous shocks such as the travel visa policy associated with a destination ($\nu_t \neq 0$ or $z_t \neq 0$), the temporary exogenous shocks push the system away from an initial equilibrium point A to D. At point D the relation of $\tau = \rho \sigma$ is violated, and therefore the “error correction mechanism” comes into play and drives the system back to an equilibrium point B. Certainly, although $\tau = \rho \sigma$ is met at point B, the levels of $\tau$ and $\sigma$ are different from those in the initial state of point A. Therefore, the first unit root where $a = 1$ leads to a different level of visitor–resident irritants $\sigma$ at point B.

This deviation is plausibly aggravated when the unit roots in the system occur simultaneously, i.e., $a = 1$ and $\delta = 0$. This case is depicted in Case (II) of Figure A1. For $\delta = 0$, even the adjustment process towards the long-run relation degenerates, the “groove” is flattened and a horizontal equilibrium plane results (i.e., as indicated by the dotted perpendicular lines in Case (III)). If an exogenous impulse causes a shift from point A to D, no further adjustments will follow and hysteresis effect of overtourism on visitor–resident irritants results.

In the Data and Research Design section, we have developed various empirical strategies to test the long-run co-integration relationship between tourist arrivals and visitor–resident irritants. To confirm our results, robustness checks on applying the estimation to impacts of the same-day (INTOWN) and overnight (OVERNIGHT) Mainland visitors versus other visitors on the residents’ sentiment measure (PSI) are conducted. The basic logic is to use the sentiment measure as $\sigma_t$, while $\tau_t$ is the tourist arrivals. If the travel visa policy causes a shift in the long-run equilibrium from point A to point D, and no further adjustments will follow (i.e., bound tests in our empirical study), the hysteresis effect of overtourism on visitor–resident irritants applies.