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Nexus Between Tourism and House Prices: Quantile-on-Quantile Approaches

Abstract

This work aims to examine the relationship between tourism activities and house prices (HP) in first-tier cities (i.e., Beijing, Shanghai, and Guangzhou) of China using a quantile-on-quantile approach. This approach provides an ideal framework with which to capture the overall dependence structure between tourism activities and HP. The empirical results show that there is a positive and negative relationship between tourism and HP for the first-tier cities considered, with substantial variations across cities and across quantiles within each city. Important city-specific policy implications may be drawn from these findings.

Keywords: tourism activities, house prices, quantile-on-quantile analysis, city, China

1. Introduction

In recent years, the influences of tourism activities on house prices (HP) have become especially relevant in the tourism literature. What is the relationship between HP and tourism activities? Tourism is perceived as increasing overall economic activities, and an increase in these activities is generally considered desirable; namely, the positive impact of tourism on economic activities is frequently described. Also, it is recognized as having a positive effect on short- or long-term economic growth using different channels. First, it belongs to a type of foreign exchange earner in terms of inbound tourism that attracts foreign tourists who consume the products of local markets and businesses, allowing the region to pay for imported capital goods or basic inputs used in the production process. Second, it motivates governments and firms to invest in new infrastructure, local housing, and the economic and business environment, fostering the ability of local firms to compete with the firms in other tourism regions. It will stimulate other economic industries through the direct, indirect and induced and spill-over effects. Finally, it contributes to employment generation and income increase and leads to the positive exploitation of economies of scale in national firms. In general, tourism development is considered to be a positive contributor to economic growth using different channels. However, whether tourism development actually causes housing economic growth or, alternatively, whether housing economic expansion substantially contributes to growth in tourism is unverified.

In fact, tourism products are unnecessary goods and are not a priority for consumption, which enables them to be very susceptible to income variations. From a macroeconomics formula: Y=C+I+G+(X-M), all civil consumption, business investment, government expenditure, and net exports may increase when the tourism industry is booming in a country. Subsequently, tourism development contributes to national income. As a result, economic growth increases, and HP develops. Therefore, there is already interest in the relationship between tourism activities and HP development, even though the theoretical ground of such relationships is

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not well defined. The housing economies of the world have become more interconnected than ever; however, this phenomenon is no doubt a direct result of the effect of housing development problems.

Tourism has grown very substantially during the last 30 years (Scott & Gössling, 2015). It contributes to national economies and employment (Manzo, 2019). However, tourism drives HP upwards (Day, 2015). Tourism can play a critical role in developing cities and substantially contributes to several aspects of economic performance indicators, such as national gross domestic product (GDP), employment, entrepreneurship, and investments. There has already been interest in the relationship between tourism activities and HP, although the theoretical ground of such a relationship has not been explicitly defined. It is recognized as having a positive effect on long-term HP using different channels. Over the past few decades, tourism destinations worldwide have experienced an inflow of international recreation capital, which is considered to be the result of the increase in demand for recreation services and holiday accommodation, both for use and investment purposes. It has long been recognized that tourism activities can have an impact on HP (e.g., Wu, Wu, Chu, & Deng, 2021). Various empirical methods dealing with this issue have been implemented, but they have mainly focused on linear or nonlinear models.

This work proposes a novel analysis technique, namely, quantile-on-quantile (QQ). The key features of the QQ approach (Sim & Zhou, 2015), as well as the model specification, are used in this study to examine the relationship between tourism activities and HP. The QQ method can be perceived as a generalization of the standard quantile regression (QR) model, which enables one to examine how the quantiles of a variable affect the conditional quantiles of another variable. The QQ approach is based on the combination of QR and nonparametric estimation. First, conventional QR is utilized to estimate the effect of an explanatory variable on the different quantiles of the dependent variable. The QR method developed by Koenker and Bassett (1978) can be regarded as an extension of the classic linear regression model. Unlike ordinary least squares (OLS) estimation, the QR analyzes the effects of explanatory variables not only at the center but also at the tail of the distribution of the dependent variable, thus allowing a more comprehensive characterization of the relationship between variables. Second, local linear regression is employed to estimate the local effect of a specific quantile of the explanatory variable on the dependent variable. The local linear regression introduced by Cleveland (1979) avoids the so-called "curse of dimensionality" problem associated with purely nonparametric models. The basic idea behind this dimension-reduction technique is to fit a linear regression locally around a neighborhood of each data point in the sample, assigning greater weight to closer neighbors. Therefore, combining these two approaches is able to model the relationship between quantiles of the explanatory variable and quantiles of the dependent variable, providing a greater amount of information than alternative estimation techniques such as OLS or standard QR.

This study contributes to the existing literature in several important ways. First, this is the first study to explore the relationship between tourism activities and HP by applying the QQ method. The QQ approach, which was recently developed by Sim and Zhou (2015), combines QR and nonparametric estimation techniques and basically involves regressing the quantile of a variable onto the quantile of another variable. Second, the experience of China's tourism industry is interesting. In recent years it has witnessed strong growth in tourism activities in the Asia-Pacific region, specifically in China. In 2019, China ranked third in inbound tourism arrivals and fourth in inbound tourism expenditure reported by World Tourism Organization (UNWTO, 2019). Given the importance of inbound tourism in China, it is important to estimate its potential contribution to China's economy. Third, this study applies the QQ approach to reveal the relationship between real international tourist receipts (RITRs) and HP. This approach is particularly interesting within this context because the relationship between RITRs and HP can be contingent on the HP cycle and the size and sign of tourism shocks. In this regard, although recognizing that tourism is quite a complex and multifaceted phenomenon and its relationship with HP growth depends on a large number of factors, the nature of the relationship between tourism activities and HP growth can vary depending on the state of the HP economy (i.e. expansion or recession). Similarly, the effect that large changes in tourism activities have on HP growth can be different from the effect associated with smaller changes in tourism activities. Likewise, HP growth can react asymmetrically to negative or positive tourism shocks. The rest of this paper is organized as follows. Section 2 briefly reviews the related literature. Section 3 provides an overview of data and wavelet theory. Section 4 presents empirical results, while the conclusions are given in Section 5.

2. Theoretical framework

In terms of the relationship between tourism and HP, several researchers have the following views. The first view is that tourism development has an effect on HP. Tourism is regarded as an important economic activity for developed or developing countries. It has been gaining importance due to its certain positive effects on the economy. Namely, it increases foreign exchange earnings, gives rise to economies of scale, increases international trade, creates new jobs, supports infrastructure development, protects cultural heritage, and boosts national income as a whole. Thus, it has a positive impact on tourism economic growth (Alhowaish, 2016; Harun, Akça, & Bayraktar, 2016). In addition to the direct impacts of tourism activities on the economy, the tourism industry has significant indirect and induced impacts (Manzo, 2018). The direct contribution of tourism includes the total spending within a country on tourism by residents and non-residents for business and leisure purposes. It also includes the spending by the government on tourism services directly linked to tourists, such as culture (e.g., museums) or recreation (e.g., national parks). The indirect contribution includes the GDP and jobs supported by the government or private businesses dealing directly with tourists, including, e.g., purchases of food and cleaning services by hotels, fuel and catering services by airlines, and services by travel agencies.

The second view is that under the capital circulation theory (Harvey, 1985), capital investment occurs along the primary circuit and secondary circuit (Mikulić et al., 2021). The latter circuit helps the economy absorb economic shocks and represents one of the pillars of capitalist development. Gotham (2009) points out that capital switching towards real estate investment has more to do with a proactive and conscious search by economic agents to increase profits than with corrective mechanisms to address economic crises. Accordingly, the rent gap between actual and potential land rents determines the use of real estate and its conversion from existing use into what economic agents view as the highest and best use (Smith, 1987). Kauko (2001) indicates that both theories may explain tourism-induced socio-spatial restructuring, as the rise of post-industrial societies diminishes the existing uses of many land rentals and calls for alternative opportunities with higher returns and better possible uses.

The third view is about tourism development and spatial planning. Albrechts and Balducci (2013) highlight the importance of strategic spatial planning that is capable of confronting tourism-driven challenges in an inclusive, action-oriented, and visionary manner to ensure the efficient exploitation of land resources and balanced economic development. The population's increased mobility and tourists' growth demands intensify land use and increase rent extraction possibilities, leading to the conversion of housing into rentals, lifestyle migration, or increased investments in tourism-related real estate or housing. The finding evidence suggests that in the absence of strategic spatial planning, the processes may conflict with existing social structures and locals' needs (McCarthy, 2003), leading to anarchic developments and making tourism the driver of local decay (Dimelli, 2017). This decay is particularly reflected in tourism gentrification (Gotham, 2005), which causes housing affordability crises (Lord, Cheang, & Dunning, 2021). Specifically, this type of socio-spatial restructuring increases HP, affecting particularly low and middle class residents, and has severe social and spatial implications on functionality, upward social mobility, and social harmony (Wetzstein, 2017). Affecting both urban and rural areas (Cocola-Gant, 2018), this rent gap-induced tourism gentrification appears in different parts of the US (Gotham, 2005) and Europe (Amore, de Bernardi, & Arvanitis, 2020).

The relationship between HP and tourism includes much research that attempts to identify the relationship. However, previous research (e.g., Ioannides et al., 2019; Vinogradov et al., 2020; Wu, 2019; Wu, Wu, Liu, Hsueh, & Wang, 2020; Wyman et al., 2020) has confirmed that tourism can certainly affect HP. Most previous studies have been conducted on the relationship between HP and tourism activities. Based on previous literature, tourism-related studies focus on case studies and are replete with disputable claims and mixed observations. In general, the impact of tourism has been studied by applying standard approaches, such as input-output and Keynesian multipliers, which calculate direct, indirect, and induced effects of the activities at local, regional or national levels. One part of the literature goes in the direction of applying or considering the possibility of applying other methods in order to include non-priced goods in the economic evaluation of tourism (Stabler, Papatheodorou, & Sinclair, 2010). The housing market dynamics, as widely presented in extant studies, reveal the relationship between HP and a handful of macroeconomics (Kishor & Marfatia, 2017), financial (Canarella et al., 2012), and socio-economic (Bengtsson, 2001) variables. Using different methods, Castles (2013) and Lutterbeck (2009) detail the trends and impact of migration across the Mediterranean.

Nevertheless, all of these approaches do not take into account the economic relationship between HP and tourism. The previous studies on the relationship between tourism and property prices have focused on the impact of tourism on the prices of tourism-related accommodations such as hotels, apartments, cottages or holiday homes. In the majority of the empirical studies, the hedonic method is applied to measure the influences of locational amenities on the price of tourism accommodation, including hotels (Espinet et al., 2003), holiday cottages (Nelson, 2010), and coastal single-family houses and small condominiums (Conroy & Milosh, 2011). Other studies apply the hedonic method to evaluate the influences of open spaces on the value of nearby properties (Anderson & West, 2006). Using the inverted demand approach existing in the housing literature Stevenson (2008) examines the effects of tourism activities on local HP dynamics.

Recently, the researchers used a multivariate panel Granger causality test to examine the causal relationship between tourism and HP in China's major regions for the period from 2000 to 2016, accounting for both dependency and heterogeneity across regions. The finding results support evidence for the tourism-leading hypothesis in regions such as Anhui, Jilin, Beijing, Liaoning, Zhejiang, Chongqing, and Yunnan, while the HP-leading hypothesis relationship is supported by the evidence for a city like Shanghai (Wu, 2019; Wu, Wu, Liu, Hsueh, & Chen, 2022). Mikulić et al. (2021) explore the relationship between tourism activities and housing affordability using a sample of Croatian municipalities. The findings show a particularly strong tourism seasonality impact, suggesting the presence of common negative externalities, such as employment fluctuations, difficulties in maintaining economic status and revenue instabilities, in localities prone to seasonal tourism fluctuations. Most previous studies have exclusively utilized the conventional time-domain and frequency-domain methods, namely, the aforementioned co-intergeneration techniques and causality tests as well as correlation analysis. However, the OLS approach does not consider time and frequency simultaneously. Accordingly, this work attempts to perform an investigation into the relationship between HP and tourism activities using the extensive framework of novel QQ methods.

3. Data collection

The data of RITRs and HP for China's first-tier cities, including Beijing, Shanghai, and Guangzhou, were collected from the National Bureau of Statistics (NBS, n.d.). Why did this study choose these first-tier cities? Rapid urbanization and economic development in China took off in the 1990s, coinciding with the period when tourism activities and HP development increasingly dominated the global trends of urban planning, including Beijing, Shanghai, and Guangzhou as dragon head cities. However, the national policy aims to develop the tourism industry into a major economic sector. Thus, it is important to investigate the relationships between tourism activities and HP forms in Chinese cities and their implications for tourism and HP performance. The reason for including these three leading cities in the study is not only to enable a wider understanding of the tourism and HP activities phenomenon among the most advanced cities in China but also to deepen the understanding of the relationships affecting the achievement of tourism activities and HP development across cities of varied national importance—Beijing as the political and banking leader, Shanghai as the commercial and financial hub, and Guangzhou as the forerunner of an economic experiment, respectively.

The dataset in this study comprising the indicator of the used data included HP growth rate to measure the HP performance and RITRs to measure the performance of tourism activities for each city. In addition, this work used control variables for other important variables that, if omitted, would cause the estimated coefficients to be biased. Therefore, the researchers adopted international tourist arrivals (ITA) as a control variable. Consistent with other studies, three key variables which had been employed in the tourism economics literature (Churchill et al., 2021; Wu & Wu, 2020; Wu, Ai, & Wu, 2022; Wu, Wu, Liu, Hsueh, & Wang, 2020; Wu, Wu, Wang, & Wu, 2021, Wu, Wu, Wang, Wu, & Hsueh, 2022; Wu, Wu, Wu, Chen, & Wu, 2022; Wu, Wu, Wu, Liu, & Wu, 2022), and annual data were used in this study. The sample period spanned from 1995 to 2019. The researchers provide a statistical summary of the data in Table 1. Before the QQ test result was produced, three conventional unit root tests (e.g., Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) tests) were applied in this paper; therefore, the researchers could see how much the proposed method had contributed. These results showed that both the ADF and the PP tests failed to reject the null of the non-stationary HP, RITRs, and ITA in all cities (Table 2). The KPSS test produced similar results. Figure 1 plots the RITRs index versus the HP index across these cities.

Table 1
Descriptive summary statistics across Beijing, Shanghai and Guangzhou

Cities	Mean	Max.	Min.	Std. dev.	Skew.	Kurt.	J. B.
Panel A: RITRs							
Beijing	8.206	8.597	7.551	0.341	-0.521	1.755	2.747
Shanghai	8.115	8.961	6.845	0.680	-0.511	1.753	2.707
Guangzhou	8.977	9.963	7.780	0.743	-0.164	1.579	2.215
Panel B: HP							
Beijing	4.687	4.870	4.600	0.077	0.751	2.686	2.453
Shanghai	4.714	4.947	4.561	0.111	0.464	2.180	1.598
Guangzhou	4.699	4.983	4.583	0.121	1.040	2.834	4.539
Panel C: ITA							
Beijing	1.221	1.649	0.513	0.318	-0.721	2.455	2.478
Shanghai	1.356	2.043	0.077	0.632	-0.601	1.846	2.895
Guangzhou	2.906	3.589	0.199	0.792	-1.689	6.343	2.532

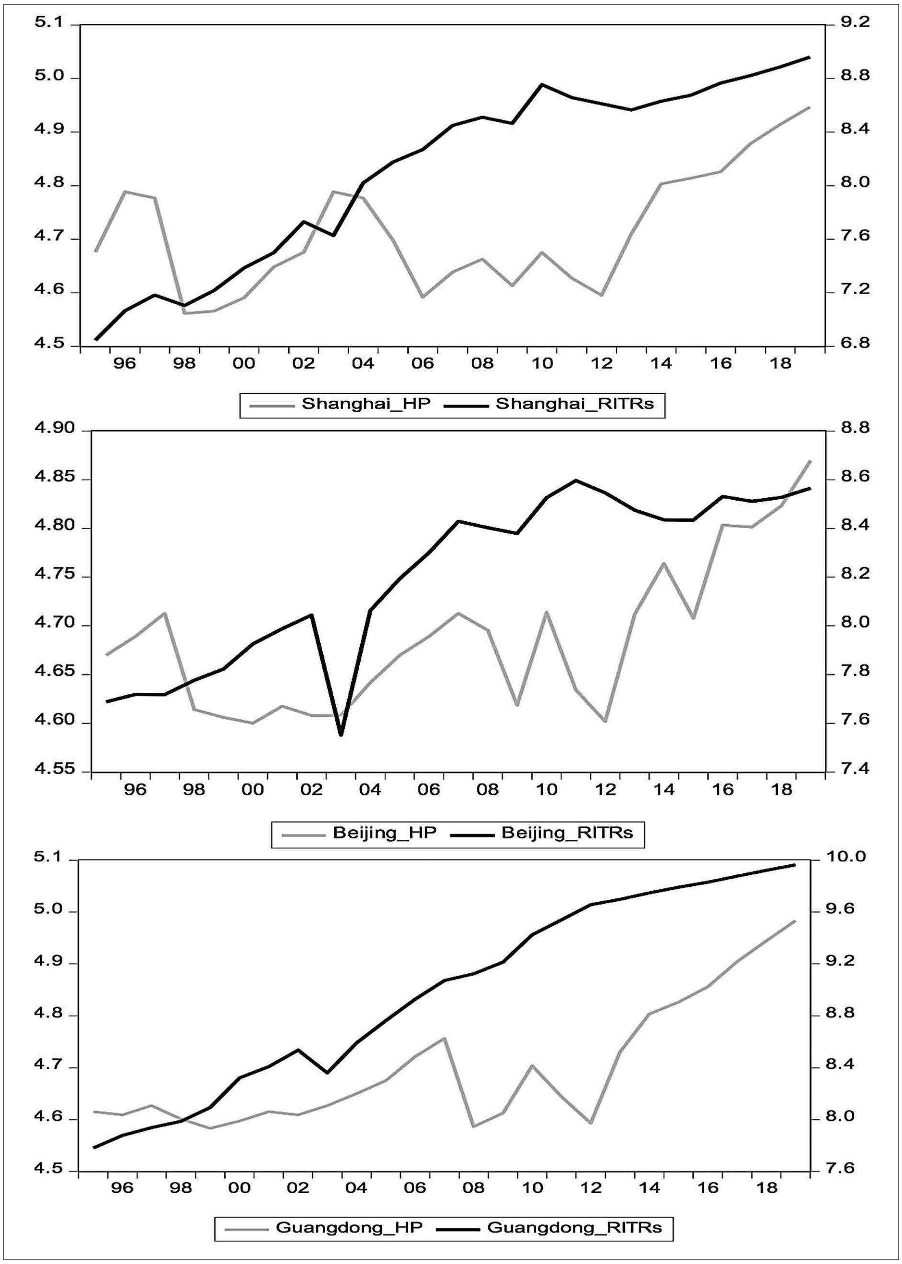
Note: The sample period is from 1995 to 2019.

Table 2
Univariate unit root tests (ADF, PP and KPSS) across Beijing, Shanghai and Guangzhou

Cities	Levels			First difference		
	ADF(k)	PP(k)	KPSS(k)	ADF(k)	PP(k)	KPSS(k)
Panel A: RITRs						
Beijing	-1.776(1)	-1.223(1)	1.366[11]***	-11.116(0)***	-11.141(4)***	0.062[1]
Shanghai	-1.603(1)	-1.485(3)	0.723[11]**	-11.701(0)***	-11.730(4)***	0.078[3]
Guangzhou	-1.965(3)	-1.802(6)	1.378[11]***	-7.187(2)***	-10.415(1)***	0.050[6]
Panel B: HP						
Beijing	-2.759(2)	-3.949(1)	1.782[11]***	-10.993(1)***	-13.496(3)***	0.195[3]
Shanghai	-1.385(1)	-1.179(5)	1.529[12]***	-10.414(0)***	-11.251(4)***	0.052[5]
Guangzhou	-1.817(2)	1.815(2)	1.146[12]***	-10.075(1)***	-11.800(2)***	0.506[4]
Panel C: ITA						
Beijing	-2.358(2)	-2.233(4)	0.830[12] **	-13.620(0)***	-13.411(5)***	0.090[6]
Shanghai	-1.874(1)	-1.801(4)	1.913[11]***	-12.657(0)***	-12.727(3)***	0.054[3]
Guangzhou	-2.226(1)	-2.104(3)	0.909[12]**	-11.275(0)***	-13.029(6)***	0.049[3]

Notes: The number in parenthesis indicates the lag order selected based on the recursive t-statistic, as suggested by Perron (1989). The number in the brackets indicates the truncation for the Bartlett Kernel, as suggested by the Newey and West (1994).
*** indicates significance at the 0.01 level.

Figure 1
RITRs versus HP index across Beijing, Shanghai and Guangzhou



4. Methodology

The researchers used a novel technique, the QQ approach introduced by Sim and Zhou (2015), showing the effects of quantiles of tourism on quantiles of HP at both higher and lower quantiles of distribution. This approach is a mixture of conventional QR and nonparametric estimation. The QQ approach can perform well in an asymmetric environment, account for structural breaks, and examine a comprehensive relationship between lower and upper quantiles of data series. This work had more realistic features than conventional QR, which measured the impacts of the independent variable on different quantiles of the dependent variable. The

QQ approach analyzes the impacts of different quantiles of the independent variable on various quantiles of the dependent variable and shows a comprehensive relationship between lower and upper quantiles (Sim & Zhou, 2015). Thus, the researchers employed the QQ technique to investigate the complex and heterogenous linkages between HP growth and tourism growth. In the framework of this paper, the QQ approach was applied to investigate the effects of the quantiles of tourism growth on the quantiles of HP growth in three cities. The researchers then engaged in the QQ technique, following the approach of Sim and Zhou (2015).

As such, the equation is first, let HPG_t be the HP growth of a given city in a period at time t. The researchers assume superscript θ denoting its quantile so that a basic nonparametric QR for θ-quantile of the HP growth can be developed as:

$$HPG_t = \beta^{\theta}(RITRs_t) + \alpha_t^{\theta} r_{t-1} + \partial_1^{\theta} ITA_t + u_t^{\theta} \quad (1)$$

where $RITRs_t$ denotes the growth rate of tourism activities in that city in period t, while u_t^{θ} implies an error term that has a zero θ-quantile. The ITA is considered in the interaction between HP growth and tourism growth (Wu, Wu, Liu, Hsueh, & Chen, 2022). Thus, the ITA is included in this equation as a control variable. Then assuming that $\beta^{\theta}(*)$ is unknown, for the reason that the prior information for the integration between HP growth and tourism growth cannot be obtained, the researchers further linearize this unknown function by taking a first-order Taylor expansion around $RITRs^{\tau}$ ($RITRs^{\tau}$ represents the τ-quantile of the RITRs).

The equation β^{θ} ( ) yields that can be written as:

$$\beta^{\theta}(RITRs_t) = \beta^{\theta}(RITRs^{\tau}) + \beta^{\theta'}(RITRs^{\tau})(RITRs_t - RITRs^{\tau}) \quad (2)$$

According to Sim and Zhou (2015), equation (2) shows that the parameters $\beta^{\theta}(RITRs^{\tau})$ and $\beta^{\theta'}(RITRs^{\tau})$ are both the functions of θ and τ, implying that they can be rewritten as the β_0 (θ, τ) and β_1 (θ, τ) respectively. Then the researchers can redefine equation (2) as:

$$\beta^{\theta}(RITRs_t) \approx \beta_0(\theta,\tau) + \beta_1(\theta,\tau)(RITRs_t - RITRs^{\tau}) \quad (3)$$

Second, equation (3) is substituted into the basic nonparametric QR, as shown in equation (1). The following function can be eventually obtained:

$$HPG_t = \underbrace{\beta_0(\theta,\tau) + \beta_1(\theta,\tau)(RITRs_t - RITRs^{\tau}) + \alpha(\theta) r_{t-1} + \partial_1(\theta) ITA_t + u_{\theta}^{t}}_{(*)} \quad (4)$$

where $\alpha(\theta)$ refers to α^{θ} while part of (*) in the equation refers to the θth conditional quantile of the HP growth. The QQ approach captures the relationship between the r_t and $RITRs_t$ in each respective quantile since the coefficients depend on θ and τ. Also, β_0 (θ, τ) and β_1 (θ, τ) provide more detailed information on complex linkages; thus, the key problem turns to solve these two coefficients.

To conduct the estimation, this work replaces the independent variables with their estimated counterpart, $\widehat{RITRs}_t$ and $\widehat{RITRs}^{\tau}$. Thus, the parameters b_0 and b_1 are then obtained as the minimization problem in the following formula:

$$\min_{\beta_0\beta_1} \sum_{i=1}^{n} \rho_{\theta} \left[r_t - b_0 - b_1\left(\widehat{RITRs}_t - \widehat{RITRs}^{\tau}\right) - \alpha(\theta) r_{t-1} + \partial_1(\theta) ITA_t\right] K\left(\frac{F_n(\widehat{RITRs}_t) - \tau}{h}\right) \quad (5)$$

where ρ_{θ} (*) is the absolute value function of the slope, which can be solved by the θ-conditional quantile of r_t. K(*) denotes a Gaussian kernel, and h is its bandwidth parameter. With this parameter, the researchers can weigh the observations in the neighborhood of $\widehat{RITRs}^{\tau}$. The choice of bandwidth is critical while using nonparametric estimation techniques. The bandwidth determines the size of the neighborhood surrounding the target point; therefore, the bandwidth controls the smoothness of the resulting estimate. A larger bandwidth indicates a greater potential for bias in estimates, whereas a smaller bandwidth can lead to estimates with greater variance. Thus, a bandwidth that strikes a balance between bias and variance must be selected. Following Sim and Zhou (2015), a bandwidth parameter h=0.1 was employed in this work. Interested readers can refer to several studies (Sim & Zhou, 2015; Wu, Ai, & Wu, 2022; Wu, Wu, Wang, Wu, & Hsues, 2022) for detail. Note that the weights are inversely correlated with the distribution between $\widehat{RITRs}_t$ and $\widehat{RITRs}^{\tau}$, so the empirical function is as follows:

$$F_n(RITRs_{t-1}) = \frac{1}{n}\sum_{i=1}^{n} I(RITRs_k < RITRs_{t-1}) \quad (6)$$

For an empirical purpose, the same exercise is constructed to investigate the cases of different countries, and the constructed model allows us to deeply explore the established research questions at the national level.

There are many advantages of the QR approach, such as its suitability for the models with heteroscedasticity. Its estimators are not susceptible to outliers, therefore, they are more robust, and it efficiently uses time and cross-sectional data to increase the variability of data and reduces multi-collinearity. Despite having many merits, the QR technique has a serious limitation as it is ineffective in depicting the complete dependence of variables. Therefore in such a case, econometricians suggest using the OLS technique proposed by Cleveland (1979) and Stone (1977), which considers the local effects of the quantiles of an explanatory variable on the explained variable. As an alternative, the use of local linear regression prevents the only problem of nonparametric estimation, which is "the curse of dimensionality".

5. Main results and implications

The data collection section presents the primary empirical result of the QQ analysis of HP and RITRs for the first-tier cities. Figure 2 displays the estimates of the slope coefficient β_1 (θ, τ), which captures the effect of the τth quantile of tourism growth on the θth quantile of growth in HP growth at different values of θ and τ for the first-tier cities under consideration.

Figure 2
QQ estimates of the slope coefficient

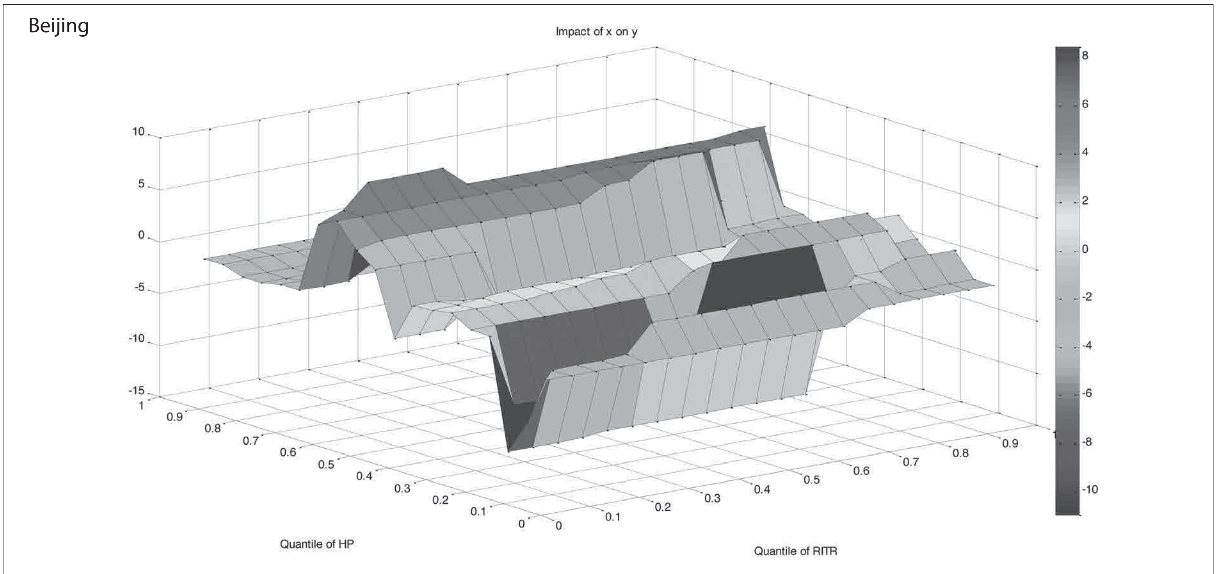
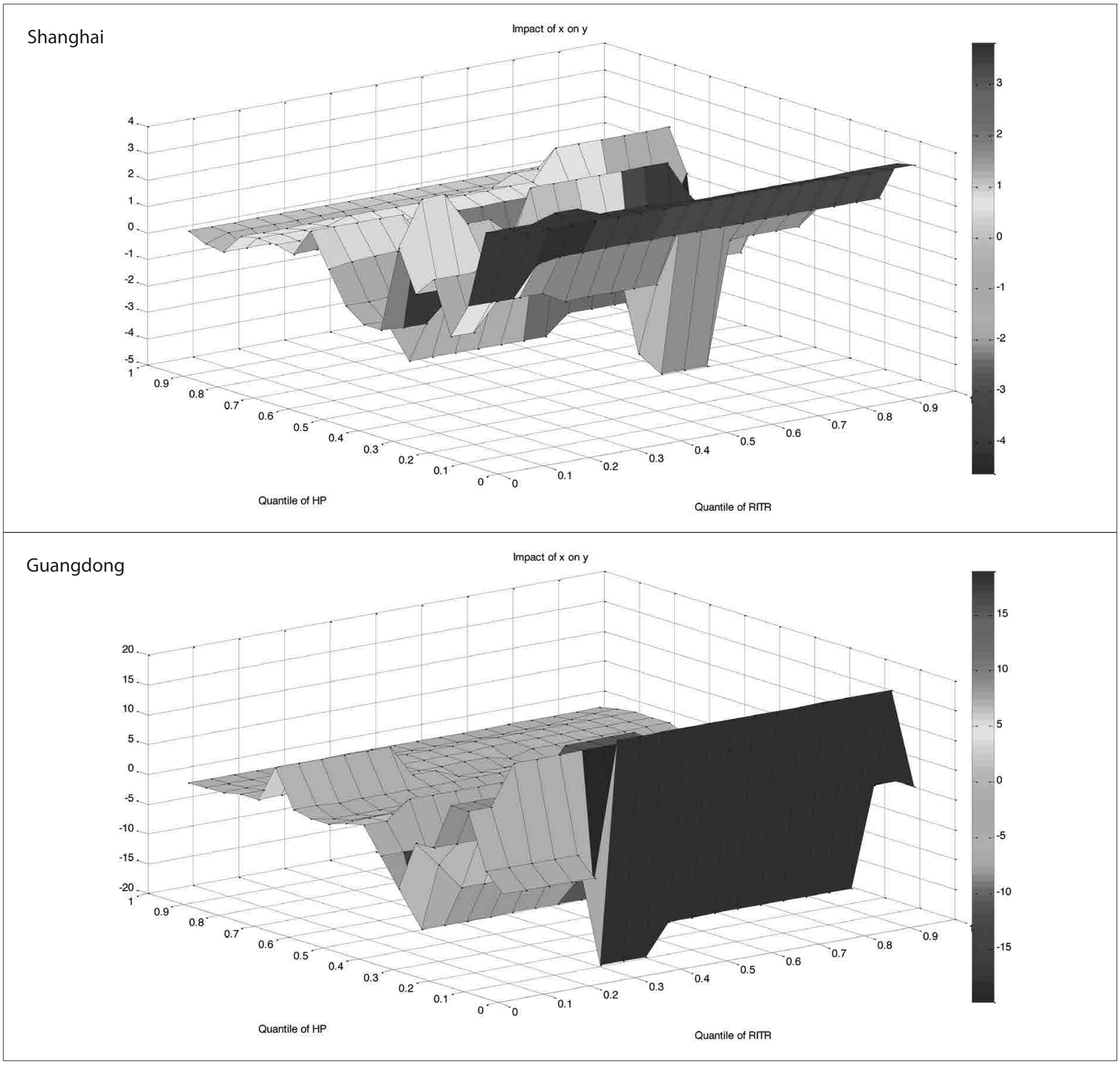


Figure 2 ***(continued)***



The results emerge from the graphs in Figure 2. First of all, the relationship between tourism growth and HP growth is positive for most combinations of quantiles of both variables in all cities. This finding is consistent with the positive association between tourism development and HP growth that has been extensively documented in prior literature for a wide range of countries or cities and can be justified by the multiple beneficial effects of tourism on the HP economy of cities (e.g., Wu, 2019; Wu & Wu, 2021; Wu, Wu, Liu, Hsueh, & Chen, 2022). Secondly, despite the prevailing positive connection, there is considerable heterogeneity across cities regarding the tourism-HP economic growth nexus. This result may be attributed to the significant difference across cities in terms of the relative importance of tourism in their overall HP economies, the size and openness of each economy and its production capacity constraints, and the role and effectiveness of local businesses in supporting tourism sector development and the possible negative externalities caused by tourism in some cities. It is also worth mentioning that ignoring such heterogeneity across cities can lead to inaccurate inferences. Thirdly, within each city, sizeable variations of the slope coefficient are observed across different quantiles of tourism growth and HP growth. This finding suggests that the relationship between tourism development and HP economic growth is not uniform across quantiles. However, this relationship depends on both the sign and size of tourism shocks in a city and the specific phase of the HP economic cycle that a city is experiencing. In addition, the most pronounced (in absolute value) relationship between tourism and the overall HP economy is observed for Shanghai and Guangzhou in extreme circumstances of tourism and HP growth, that is, when considering the lowest and highest quantiles of both variables.

In terms of the case of Beijing, it was also prevalently positive for most combinations of quantiles of tourism and HP growth. The highest positive connection between tourism growth and general HP growth of Beijing was detected in the region that combined the quantiles of tourism growth (0.1-0.9) with the highest quantiles of HP growth (0.7-0.9). However, a relatively strong positive relation was also observed in the region, combining the quantiles of tourism growth (0.1-0.9) with the highest quantiles of HP growth (0.7-0.8). This result indicates that inbound tourism appears to have a particularly beneficial effect on HP growth during times of sharp HP economic boom and vigorous growth of the tourism sector. In contrast, the weakest relationship was found in the region combining the quantiles of tourism growth (0.2-0.7) with high quantiles of HP growth (0.2-0.4), indicating that in times of HP economic downturn and low tourism growth, the tourism-economic growth link was quite limited. Accordingly, it appears clear that tourism activities only have a significant influence on the HP economic activities of Beijing during a strong HP economic growth. This evidence is consistent with the result of Wu (2019) in the sense that, in general, the tourism industry in Beijing is a key driving factor of the overall HP development of Beijing, which seems reasonable considering that Beijing is not a particularly tourism-HP economy.

Notably, Shanghai shares some commonalities regarding the relationship between tourism development and HP growth. In this city, a positive relationship between tourism and economic growth was also consistently observed for most combinations of quantiles of tourism and HP growth. The tourism-HP economic growth connection is positive for the great majority of combinations of quantiles. However, the intensity of the relationship is, in general, extremely high, suggesting that the HP development of Shanghai depends on the tourism industry. In particular, the most accentuated positive connection for this city is in the regions combining most quantiles of tourism growth (0.1-0.9) with lower quantiles of HP growth (0.2-0.4). A possible explanation for this result is that significant drops in inbound tourism in Shanghai appear to have led to further deterioration of the irrespective HP growth during a strong HP growth recession. This empirical evidence is consistent with the findings of Wu (2019) and Wu, Wu, Liu, Hsueh, and Chen (2022).

Finally, in terms of the examination of the results based on the first-tier cities, the weakest connection between tourism growth and HP growth was observed for Guangzhou. The tourism-HP economic growth link takes quite small or even negative values for the vast majority of combinations of quantiles of tourism and HP growth, implying that there is apparently no significant relationship between tourism activities and the HP development of Guangzhou. This result may be explained by the extremely limited weight of tourism on the HP development of Guangzhou and is consistent with the empirical evidence previously reported for China's cities (Wu, 2019; Wu, Wu, Liu, Hsueh, & Chen, 2022). In this regard, according to the data of the NBS Report, the direct contribution of tourism to the tourism economy of Guangzhou was 0.22% of the total Chinese GDP in 2019. In fact, a relatively pronounced relationship, with a positive sign, was only observed in the city that combined the quantile of the growth in tourism activities (0.3-0.9) with intermediate to lowest quantiles of HP growth (0.1-0.2). This finding suggests that the sharp rise in international tourism activities, which are represented by the lowest to highest quantiles of tourism growth, appear to have a relevant upward effect on the HP economy of Guangzhou, primarily in times of buoyant HP recession, which is represented by the lowest quantiles of HP economic downturn.

6. Checking the validity of the QQ method

In this context, a simple manner of checking the validity of the QQ approach is to compare the estimated QR parameters with the τ-averaged QQ parameters. Figure 3 shows the QR and averaged QQ estimates of the slope coefficient that measure the effect of growth in tourism activities on HP growth for these cities under this study. The graphs in Figure 3 reveal that the averaged QQ estimates of the slope coefficient are quite similar to the QR estimates for these cities, regardless of the quantile considered. This graphical evidence provides a simple validation of the QQ method by showing that the primary feature of the QR model can be recovered by summarizing the more detailed information contained in the QQ estimates.

Figure 3
Comparison of QR and QQ estimates

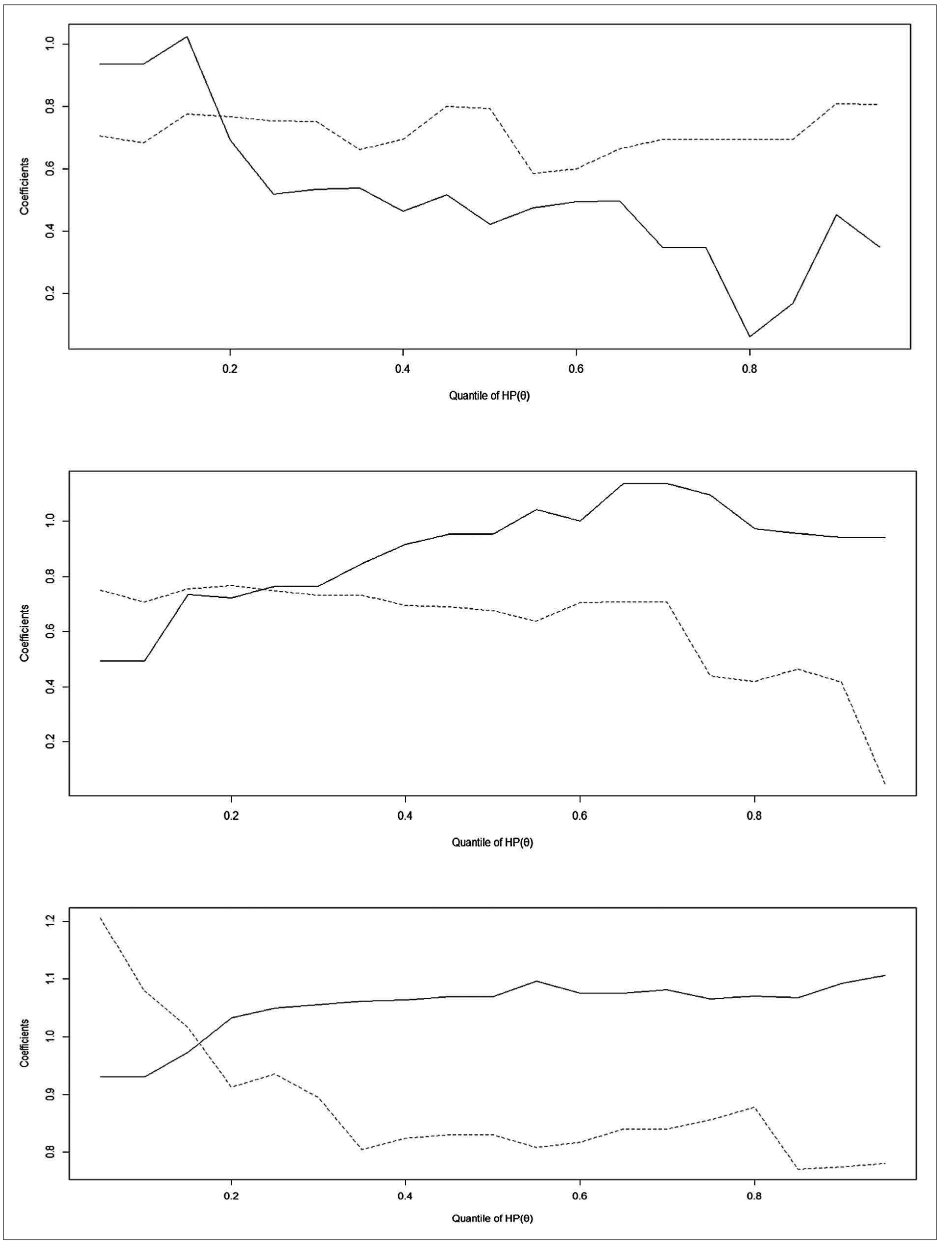


Figure 3 largely confirms the result of the aforementioned QQ analysis. First, the effect of tourism growth on HP growth was the most positive across quantiles for Beijing and Shanghai. In fact, a negative relationship between tourism development and the part of HP performance was found for some quantiles of HP growth of these cities. Second, a notable heterogeneity across quantiles within each city in terms of the relationship between tourism growth and HP growth was also observed. Specifically, the largest effect of overall tourism growth on the HP economy of Shanghai and Guangzhou was identified at the lowest quantiles of their respective distributions of HP growth. This finding corroborates the argument that the influence of tourism on HP growth tends to be stronger in an environment of HP downturn, suggesting that the tourism sector becomes an important engine of HP growth primarily during the period of HP activity depression.

7. Conclusion

This work investigates the empirical validity of the relationship between tourism activities and HP for China's first-tier cities over the period 1995 to 2019 using the QQ approach proposed by Sim and Zhou (2015). The QQ method allows one to estimate how the quantiles of tourism growth affect the quantiles of economic growth, thus providing a more precise description of the overall dependence structure between tourism activities and HP growth compared with conventional techniques such as OLS or QR. The results show that the relationship between tourism development and HP growth is primarily positive for these cities, although there are wide differences across these cities and different quantiles of tourism and HP growth within each city. The heterogeneity between cities in terms of the tourism-HP economic growth nexus may be attributed to the difference in the relative weight of the tourism industry in the overall economy of each city, the size, and openness of each economy and its production capacity constraints, the relevance of local businesses in the tourism industry of each city and the possible positive or negative externalities caused by tourism growth in several cities. In particular, the weakest relationship between tourism and HP economic growth was noted for Beijing, most likely because of the scant direct contribution of tourism to the respective HP development of Beijing. Furthermore, the marked divergence across quantiles of tourism and HP growth indicated that the tourism-HP economic growth link was inconsistent; however, tourism development depended on both the phase of the HP economic cycle and the sign and size of tourism shocks. In this respect, for a wide range of cities such as Shanghai and Guangzhou, the most pronounced relationship between tourism activities and HP growth was observed only during the periods of deep HP economic downturn. The empirical evidence presented in this study may have important implications for policymakers, who should consider the specific phase of the HP cycle when designing their tourism policies. Specifically, tourism-enhancing policies may be particularly beneficial to the general HP development of cities during the periods of HP development downturn. Accordingly, the tourism sector may play a strategic role in stimulating HP's economic recovery. In any case, this work can be regarded as the first attempt to analyze the relationship between tourism and HP growth based on the overall HP development conditions and the particular conditions prevailing in the tourism sector.

Based on the above conclusions, this study proposed the following implications and outlined the potential for the generalization of findings. First of all, Guangdong should fully understand the impact of tourism development on HP, improve the construction of related facilities for tourism development, and provide commercial housing for the commercialization of tourism and real estate development. Second, the policy should be fully used to guide real estate market funds of Beijing and Shanghai, classify management of different types of commercial housing markets, appropriately reduce the construction of residential commercial housing, and allow Beijing and Shanghai real estate funds. More business in the field of commercial housing and other commercial housing, which is conducive to promoting the balance of supply and demand for different types of commercial housing, maintaining the healthy and stable development of the real estate market and tourism activities in Beijing and Shanghai, and at the same time promoting the industrial diversification in Beijing and Shanghai is necessary. Third, in tourism and while developing the real estate industry, attention should be paid to protecting the natural resources and environment of these cities and achieving green development.

Future studies can focus on Corona Virus Disease 2019 (COVID-19)-related uncertainty effects on tourism activities and HP development in several ways, which can be empirically examined in future studies. The first, the pandemic has increased restrictions on people's movement and goods between cities, which affect the demand for tourism and, ultimately, the HP development. Second, the spread of COVID-19 is also related to geography. At this stage, cities and regions have some advantages in the spread of COVID-19; however, these cities and regions are more vulnerable to COVID-19-related shocks. Therefore, the impact of COVID-19 on tourism activities could be moderated by the urban size and geography to influence HP development. Third, tourism is of strategic importance for the national economy, so governments may increase their role in the tourism sector. As such, COVID-19 can change the dynamics in the tourism industry due to the government's role. Finally, COVID-19 can accelerate humanitarian crises (e.g., food insecurity) because of the potential decline in foreign aid. Similarly, the long-standing trade conflicts can be exacerbated as a result of COVID-19, which will harm the tourism sector and housing investment. As a result, there can be a double jeopardy effect on global tourism investment owing to some knee-jerk reactions of governments and companies to this global crisis without due consideration and coordination. Disease risk and uncertainty risk, in terms of their effects on tourism and HP development, are similar. In the tourism sector, both can be interpreted as worries or concerns for safety, leading to social distancing, which eventually affects tourism investment and HP development. In other words, both the risks of disease and uncertainty work with a similar underlying mechanism in the tourism and HP sectors. Thus, this study helps to reveal the mechanism that can improve an understanding of the COVID-19 effect in the tourism and HP sectors. Therefore, future research on the tourism-HP development nexus under different scenarios of HP development and tourism growth appears necessary to shed more light on this issue.

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