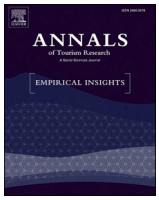
Annals of Tourism Research Empirical Insights 6 (2025) 100200

Contents lists available at ScienceDirect

Annals of Tourism Research Empirical Insights

journal homepage: www.sciencedirect.com/journal/annals-of-tourism-research-empirical-insights



What drives local-level tourism in Brazil? Insights from panel regression models

Maurício Ragagnin Pimentel [a,*], Melise de Lima Pereira [b,*]

[a] Center of Socio-Organizational Sciences (CCSO), Pelotas Federal University (UFPel), 1 Gomes Carneiro, Pelotas, RS 96010-610, Brazil
[b] Tourism Department, Paraná Federal University (UFPR), 2645 Sete de Setembro Avenue, Curitiba, PR, 80230-010, Brazil

ARTICLE INFO

Editor name: Lorenzo Masiero

Keywords:
Local tourism
Tourism specialization
Emerging economies
Panel regression
Spatial analysis

ABSTRACT

Due to the increasing global tourism, developing countries are recognizing the value of tourism for local economic growth. This study investigates Brazil's local tourism performance using six panel regression models on a dataset covering 1711 municipalities spanning the period from 2007 to 2019. The study formulates twelve hypotheses to test how economic growth, agglomeration, accommodation specialization, government investment, and the entrepreneurial environment influence local-level tourism in Brazil. Specialization emerges as the only significantly supported driver of Brazil's uneven local tourism development. Furthermore, the study highlights that municipal public spending has a negligible impact on tourism, raising concerns about its effectiveness. This research contributes by providing a subnational perspective on tourism growth in a predominantly domestically driven market.

1. Introduction

In emerging countries, domestic tourism can be more advantageous than international tourism. It generates lower economic leakages and environmental costs. It also promotes regional development, local pride and helps mitigate social and territorial inequalities, while being less vulnerable to external shocks (Agyeiwaah & McKercher, 2025). Researchers such as Centinaio, Comerio, and Pacicco (2023), Brida, Cortes-Jimenez, and Pulina (2016), and Yang and Fik (2014) advocate for analyzing inbound and domestic tourism separately, recognizing their distinct demand structures and impacts. Despite WTTC (2021) figures indicating it accounts for 73 % of global tourism expenditure, Dragičević (2024) points out that domestic tourism remains understudied.

Furthermore, at the discussion framed by evolutionary economic geography (EEG) conceptualization it is crucial to assess the impact of territorial resources and tourism dynamics on regional economic growth through spatial econometric models (Romão & Nijkamp, 2018). As global tourism continues to grow, developing countries are increasingly recognizing tourism's value for local economic development. The public, regional governments and economic growth planners have enhanced their support for tourism (Yang & Fik, 2014). Countries with higher institutional quality tend to extract greater benefits from tourism development, highlighting the need for strong governance mechanisms (Sun, Liu, Pan, Wang, & Zhang, 2025).

The Tourism-Led Growth Hypothesis (TLGH) suggests that the expansion of tourism contributes to economic development (Nunkoo, Seetanah, Jaffur, Moraghen, & Sannassee, 2020). In contrast, the Economic-Led Tourism Growth (ELTG) hypothesis posits that improvements in the general economy drive tourism growth. Both were theoretically derived from the export-led growth hypothesis (ELGH) and have analyzed the relationship between tourism and economic growth (Brida, Lanzilotta, Pereyra, & Pizzolón, 2013; Eluwole, Bekun, & Lasisi, 2022).

Despite the growing body of literature on the theme, there remains a research gap in how these dynamics unfold at subnational scales, where tourism drivers and institutional capacities may vary considerably (Brida et al., 2013; Brida et al., 2016; Eluwole et al., 2022). Additionally, results vary depending on different contexts in what is known as the country effect. They are also sensitive to shocks or structural breaks. This underscores the need for empirical research across various settings to better understand the specific factors influencing the relationship between tourism and economic growth (Eluwole et al., 2022).

Brida et al. (2013) finds that studies on TLGH and ELTG for South American countries are scarce. Brazil, with the world's 10th-largest GDP and the seventh-largest population, presents an interesting case study in tourism dynamics. Despite its significant natural attractions and

* Corresponding author at: Center of Socio-Organizational Sciences (CCSO), Pelotas Federal University (UFPel), 1 Gomes Carneiro, Pelotas, RS 96010-610, Brazil.
E-mail addresses: mauricio.ragagnin@ufpel.edu.br (M. Ragagnin Pimentel), melisepereira@ufpr.br (M. de Lima Pereira).

https://doi.org/10.1016/j.annale.2025.100200
Received 12 March 2025; Received in revised form 21 October 2025; Accepted 25 October 2025
Available online 8 November 2025

economic potential, Brazil's international tourism arrivals remain low in contrast with its size and economic standing. According to UN Tourism (2025), the country's 6.35 million arrivals in the latest pre-pandemic figure accounted for 0.04 % of global international tourism. The primary source of tourism demand in Brazil is its domestic market, estimated to be 35 times larger than inbound tourism (Santos & de, 2023). In Europe, for instance, domestic tourism is valued at 1.6 times the level of inbound tourism (Eurostat, 2023).

According to empirical evidence presented by Ribeiro, Santos, De Moura, Montenegro, and Freitas (2024), who employed a dynamic panel data model, variables such as specialization, urbanization, and diversification externalities, have favorable long-term effects on the employment trajectory of tourism in Brazil at the regional scale.

Given Brazil's uneven tourism landscape, a key contribution of this study lies in its focus on investigating the determinants of municipal-level tourism performance. Municipalities are the country's smallest administrative units. Twelve hypotheses are formulated based on theoretical frameworks such as ELTG, EEG, and spatial agglomeration theories to achieve the research objective. These hypotheses are grounded in the following question: to what extent do economic development, agglomeration effects, specialization, entrepreneurial activity, and public investment explain variations in accommodation employment across Brazilian municipalities? To explore the factors influencing tourism performance at the municipal level in Brazil, proxied as formal accommodation employment, we model five panel data regressions of 13 variables across 1711 Brazilian municipalities between 2007 and 2019. Additionally, thematic maps are used to illustrate Brazilian tourism dynamics.

The study contributes to advancing both theoretical and empirical understanding of tourism economics in four ways. First, it critically approaches tourism development models that remain largely untested at the local scale. Second, its granular approach offers a subnational perspective on the tourism dynamics of a large emerging economy characterized by a predominantly domestic market. Third, its empirical assessment contrasts panel regressions with different specifications. Fourth, it provides insights on policy-relevant variables, highlighting the limitations of traditional assumptions regarding the role of public investment and economic development in tourism growth in Brazil.

The remainder of the paper is organized as follows: Section 2 contains the literature review and research hypotheses, which focuses, separately, on theoretical foundations of tourism economic performance and tourism drivers: agglomeration, accommodation specialization, entrepreneurial setting, and local public budget; Section 3 outlines the methodology and data handling; Section 4 presents the results; Section 5 discusses the results; Section 6 concludes.

2. Literature review and hypothesis

2.1. Theoretical foundations of tourism economical performance

Understanding the drivers of tourism development at the subnational level requires a multidisciplinary approach that integrates theories from tourism economics, regional development, agglomeration theory, and institutional analysis. This study draws on three primary theoretical strands. First, the Tourism-Led Growth Hypothesis (TLGH) and Economic-Led Tourism Growth (ELTG) hypothesis offer macroeconomic explanations for the tourism growth rooted in the export-led growth tradition (Brida et al., 2013; Eluwole et al., 2022). Second, agglomeration economies and spatial development theories emphasize the role of localized economic complexity and clustering effects (Capone & Boix, 2008; Romão & Nijkamp, 2018). Third, entrepreneurial performance in tourism and state intervention are two leading agents that intervene to impact the tourism sector (Gan, Lim, Trupp, & Poon, 2024; Su, Li, Wen, & Liang, 2025). Combining these perspectives, the study formulates twelve hypotheses that examine how economic development, agglomeration, specialization, entrepreneurship, and public investment influence formal accommodation employment in Brazilian municipalities.

Romão and Nijkamp (2018) also use the tourism labor force as a proxy. Tourism is difficult to measure since it is defined by demand, or what visitors choose to consume. Unlike other tourism characteristic activities (TCA), such as restaurants or transport, accommodation has a low demand from residents. It is the most tourist-specific product. Also, where people choose to sleep suggests the location is a wholesome destination, not just a single day visit attraction. Moreover, this proxy aligns with the concept of tourism competitiveness, which is commonly defined as a destination's ability to sustainably maximize its inhabitant's welfare while providing fulfilling experiences for visitors. Despite its limitations and potential biases, since it does not include informal economy or multiplier effects, accommodation employment seems an adequate proxy compared to others, such as the number of visitors.

2.2. Economic-led Tourism growth

Does tourism stimulate economic activity, or is the expansion of tourism simply a reflection of overall economic growth? Over the past two decades, numerous studies have explored the relationship between tourism and economic growth (Brida et al., 2013; Brida et al., 2016; Çağlayan, Şak, & Karymshakov, 2012; Eugenio-Martin, Martín Morales, & Scarpa, 2004; Raifu & Afolabi, 2024). Researchers have investigated whether tourism drives economic growth or if the relationship is reciprocal. This area of inquiry has led to the development of the Tourism-Led Growth Hypothesis (TLGH), which has become a significant topic in tourism economics research (Eluwole et al., 2022).

Despite the theoretical consensus (Perles-Ribes & Moreno-Izquierdo, 2024), empirical findings are not unanimous, varying according to the tested models (Çağlayan et al., 2012; Nunkoo et al., 2020; Raifu & Afolabi, 2024). Po and Huang (2008) questions whether tourism's benefits outweigh its negative externalities. These authors and Brida et al. (2016) demonstrate that the relationship between tourism and economic growth can be non-linear. Raifu and Afolabi (2024) indicate it is also unstable due to structural breaks such as natural disasters and economic, political, or sanitary crises.

Antonakakis, Dragouni, Eeckels, and Filis (2017) identify bidirectional relationships in democratic countries with higher levels of government effectiveness, while an economic-driven tourism relationship prevails in developing, nondemocratic, bureaucratic countries with lower tourism specialization. An similar result was found by Çağlayan et al. (2012), who observed bidirectional causality between tourism and GDP in the case of Europe, unidirectional causality from tourism revenue to GDP for East Asia, South Asia, and Oceania, while in the Americas causality is found from GDP to tourism, and no causal relationship on the Middle East & North Africa, Central Asia and Sub-Saharan Africa. The country-level argument, which accounts for each nation's specificities such as export composition, natural endowments, geographical position, macroeconomic policies, and indicators, plays a significant role in explaining this variability.

According to Sun et al. (2025), institutional quality plays a significant role in moderating the relationship between tourism development and economic growth, enhancing the economic outcomes in countries with stronger institutional frameworks. While assessing Latin America between 1985 and 1998, Eugenio-Martin et al. (2004) found that the TLDH was valid only for low and medium-income countries but not for those above a GDP per capita threshold. However, the ELTG was true for the whole set, implying that tourism benefits from increased GDP, international trade, life expectancy at birth, and education. Another important finding is the non-significance of prices variable for tourism arrivals.

Previous literature has positively evaluated Latin America's Economic-Led Tourism Growth (ELTG) hypothesis (Eugenio-Martin et al., 2004). This study examines whether this hypothesis applies at the municipal level in Brazil, the largest country in the region in terms of

size, economy, and population, and one of its primary tourism destinations. Economic expansion can mean more revenue for tourism and investments with an overall improvement in infrastructure, service quality, and availability, not to mention positive expectations that lead people toward spending.

Sun, Lin, Sun, and Chen (2024) note that tourism is highly susceptible to external factors and environmental changes due to its extensive industry linkage effect, wide coverage, and complex structures. However, Yang and Fik (2014) argue that local economic growth is more important in stimulating inbound tourism than domestic tourism. When assessing China at a regional scale, the authors found that the nexus between tourism and growth can vary within the same nation over the same period. Also investigating China, Wei et al. (2013, p. 1133) states, "There is no causal relationship between the tourism economy and tourism employment". Therefore, the hypothesis:

H1. : General economic activity measured through municipal gross product influences employment in accommodation.

2.3. Agglomeration

The Economic-Led Tourism Growth (ELTG) framework aims to evaluate whether overall economic growth benefits all sectors equally and whether economic downturns similarly affect them (Eluwole et al., 2022). However, existing literature suggests that the outcomes for destinations may vary significantly based on certain conditions. For example, destinations that host a diverse range of tourism-related activities or that are specialized in tourism tend to experience different effects (Romão & Nijkamp, 2018).

Geographic research on the spatial distribution of tourism illustrates that this is a site-specific activity. While examining regional tourism in Italy, Centinaio et al. (2023) point to the heterogeneity in the relationship between tourism and growth according to the degree of attractiveness, local specialization, and supply characteristics. Despite the spatial concentration of tourism resources, according to Capone & Boix (2008, p.209), the growth rates 'are not based on natural endowments but on localization economies', meaning the presence of a local production system that upholds a chain of economic activities directly related to tourism production.

In this context, when a region benefits from agglomeration and scale economies in a local production environment that enables tourism providers to pool resources, knowledge, labor force, suppliers, marketing, infrastructure, and accessibility, ultimately reducing costs, then a resource advantage becomes a competitive advantage (Capone & Boix, 2008). Tourists also benefit from the convenience of the place's diverse offerings with high-quality service, due to competition. Even places with a poor resource base can overcome and succeed if an agglomeration supporting the tourism industry is set up (Yang & Fik, 2014). Conversely, others with astonishing natural endowments fail to develop. One method for evaluating overall agglomeration is by analyzing the percentage of municipal gross product allocated to services. A higher percentage indicates a more complex structure (Yang & Fik, 2014). Thus, the hypothesis:

H2. : The percentage of services' municipal gross product influences accommodation employment.

Conversely, lagging locations tend to rely more on government incentives; therefore, it is appropriate to test the hypothesis:

H3. : The percentage of federal and State transfers on municipal receipts influences accommodation employment.

Additionally, as a direct method of evaluating agglomeration, we set up an index inspired by Herfindahl-Hirschman in which the municipal employment share in each TCA is squared and then summed. This captures how a tourism services network, with different kinds of providers, is established in each destination. Based on this, we propose a hypothesis:

H4. : The agglomeration of tourism characteristic activities influences employment in accommodation.

A common outcome of agglomeration is that it pools resources such as qualified human resources and infrastructure, enabling their access at a lower, or shared, cost. In that sense, goes the following hypotheses:

H5. : The basic education index influences employment in accommodation.

H6. : Broadband internet access density influences employment in accommodation.

2.4. Accommodation specialization

Despite its importance for tourism, agglomeration can occur in any suitable-sized urban environment, benefiting from its density, diversity, and infrastructure. However, in those cases, marginal economic growth generated by tourism tends to decrease when reaching a specialization threshold (Centinaio et al., 2023). For Capone and Boix (2008), urbanization as a factor for tourism growth is unclear, since the place size has a positive impact while diversity slows growth. In those cases, tourism does not receive the same attention, and its network of agents does not have as much power as in tourism-specialized places. According to the EEG's concept of path dependence, as a place concentrates more on a particular industry, it is expected to see efforts to sustain or reinforce this position with knowledge, innovation, firm creation, and growth being channeled to it (Brouder & Eriksson, 2013; Romão & Nijkamp, 2018). At the country level, Po and Huang (2008) use tourism specialization to group nations, justifying that the relationship between tourism and economic growth will be significant where there is a higher degree of tourism specialization. Considering these arguments, we propose the following hypothesis:

H7. : Municipal specialization in accommodation employment influences accommodation employment.

Despite the arguments favoring higher specialization as a tourism growth factor, Yang & Fik (2014, p.150) note that the opposite can be true, as "cities with less developed tourism industries are more likely to experience more intense tourism growth to catch up with the leading cities".

2.5. Entrepreneurial setting and local public budget

Entrepreneurial performance in tourism requires an examination of the structural and institutional contexts that shape firm behavior. Within hospitality and tourism, small firms often operate at the intersection of local economic ecosystems and public governance frameworks (Su et al., 2025).

Su et al. (2025) argue that the embeddedness of small hospitality and tourism firms (SHTFs) in industry networks, involving local government and intermediary institutions, is a critical determinant of entrepreneurial performance. These networks represent instrumental ties that enable firms to access external resources, including those derived from local public budgets.

The role of local public budgets emerges through the structure and strength of industry networks. Entrepreneurial firms that occupy central positions or are connected to public agencies and regional administrative bodies benefit from information flows and opportunities for collaboration (Su et al., 2025). These relationships often provide access to public funding schemes and investments in tourism infrastructure.

Gan et al. (2024) provide a detailed analysis of how local public budgets and state interventions influenced tourism business resilience in Malaysia. Their findings emphasize that while financial stimulus is vital, its design, delivery, and strategic alignment with business needs determine its actual effectiveness. The research calls for a shift from top-

down, blanket interventions toward more tailored, sector-specific, and responsive public budgeting frameworks. Based on these considerations, both entrepreneurs and the State are key agents creating a path-changing event that shifts the location's inertial situation. Thus, we propose the following hypotheses:

H8. : A municipality's entrepreneurial activity, measured by the number of opening businesses, influences accommodation employment.

H9. : The number of loans granted to businesses from the Brazilian Public Development Bank influences accommodation employment.

H10. : Destination market access, measured by the number of passengers at airports in its mesoregion, influences accommodation employment.

H11. : General municipal government spending influences employment in accommodation.

H12. : Municipal government spending on tourism influences employment in accommodation.

3. Data and methodological approach

3.1. Data

This study primary interest lies in modeling Brazil's local tourism performance, using various panel data approaches. As Hsiao (2014) points out, panel data provides control for heterogeneity, that is, for the individual and time-invariant variables, thereby reducing the risk of biased results. In the case of tourism destinations, characterized by their uniqueness in endowments and agents' networks, the panel data approach seems more accurate than trying to proxy tourism attractiveness by variables. Baltagi (2008) also underlines that panel data offers less collinearity and gives more efficient estimates since it relies on more variable and informative data. Another advantage is its suitability in evaluating adjustment dynamics, which is how and who varies over time.

This inquiry was driven by empirical evidence. The research began by examining Brazilian government open data websites for variables that could serve as indicators of municipal tourism drivers over various periods. During this initial exploration, many datasets were discarded due to inconsistencies across different measurements, short time series, and inadequate nationwide representation. Ultimately, we retained 13 variables, that measure economic development, agglomeration effects, specialization in accommodation, entrepreneurial activity, and public investment to explain variations in formal accommodation employment across 1711 Brazilian municipalities between 2007 and 2019. Table 1 provides a brief description of the variables used in our empirical analysis.

Among Brazil's 5571 municipalities, we selected those with complete yearly records for accommodation employment, municipal gross product measurements, and municipal budget information. The result was a balanced panel for 1711 municipalities for the 2007 to 2019 period, resulting in 20,532 observations. As tourism is a highly concentrated activity, it is unsurprising that most municipalities were excluded for presenting limited accommodation employment. We also chose not to include pandemic abnormal years of 2020 and 2021, since that shock is not our research focus and it would bias regression estimates. Given the large number of individuals and short-time observations, long-run cointegration tests were not feasible.

Table 1
- Variables used in the empirical analysis and their descriptions.

Dimension and reference	Variable	Definition	Datasets (sources)
Tourism proxy (Romão & Nijkamp, 2018)	htl	Municipality number of employment in accommodation	Annual Social Information Report (Rais) from the Economy Ministry available through the R 'basedosdados' package at 'basedosdados.br_me_rais. microdados_estabelecimentos';
Accommodation specialization (Centinaio et al., 2023)	htl_esp	Jobs in accommodation per total employment in municipalities	
Agglomeration (Brida et al., 2013; Eluwole et al., 2022)	tca_hhi	The sum of each squared TCA share on municipal employment.	
Government investment (Gan et al. (2024; Su et al., 2025)	tourbgt	Amount of yearly municipal public budget spent on tourism	Finbra (Brazilian Finances data) made available by the Brazilian National Treasure at https://siconfi.tesouro.gov.br/siconfi/pages/public/consulta_finbra/finbra_list.jsf
Government investment (Gan et al. (2024; Su et al., 2025)	bgt	Total yearly spent municipal budget	
Agglomeration (Brida et al., 2013; Eluwole et al.,2022, Capone & Boix, 2008; Yang & Fik, 2014)	tnf_pct	Percentage of federal and State transfers on municipal receipts	
TLGH and ELTG (Brida et al., 2013; Eluwole et al., 2022).	gmp	Municipal gross product	Brazilian Municipal GDP from the National Accounts System calculated by the Brazilian Institute of Geography and Statistics (IBGE) and available at https://www.ibge.gov.br/estatisticas/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?=&t=downloads
Agglomeration (Brida et al., 2013; Capone & Boix, 2008; Eluwole et al., 2022; Yang & Fik, 2014)	gmp_srv_pct	Percentage of services in municipal gross product	
Entrepreneurial activity (Su et al., 2025)	loans	Brazilian Public Development Bank (BNDES) credit operations per municipality	BNDES Automatic Indirect Operations available at https://dadosabertos.bndes.gov.br/dataset/10e21ad1-568e-45e5-a8af-43f2c05ef1a2/resource/612faa0b-b6be-4b2c-9317-da5dc2c0b901/download/operacoes-financiamento-operacoes-indiretas-automaticas.csv
Entrepreneurial activity (Su et al., 2025)	n_bsns	Number of new businesses per municipality	Brazilian Federal Revenue Services (BFRS) data on legal entities available through the R 'basedosdados' package at 'basedosdados.br_me_cnpj. estabelecimentos';
Agglomeration Market Access (Yang & Fik, 2014)	flypax	Passengers flow per mesoregion	Brazilian Civil Aviation Agency data on flights available at 'https://www.anac.gov.br/acesso-a-informacao/dados-abertos/areas-de-atuacao/voos-e-operacoes-aereas/dados-estatisticos-do-transporte-aereo/48-dados-estatisticos-do-transporte-aereo-formato-csv'
Agglomeration Human Resources (Eugenio-Martin et al., 2004; Brida et al., 2013; Eluwole et al.,2022)	educ	Municipal rate on basic education development	Brazilian Education Quality Index (IDEB) is available through the R 'basedosdados' package at 'basedosdados.br_inep_ideb.municipio'
Agglomeration Infrastructure (Brida et al., 2013; Eluwole et al., 2022; Eugenio-Martin et al., 2004)	w_inet	Wired broadband internet access density	Brazilian Telecommunication Agency (ANATEL) data available through the R 'basedosdados' package at 'basedosdados.br_anatel_banda_larga_fixa. densidade_municipio'.
Period of analyses	shock	Dummy for the 2015–2019 period	

In addition to the panel data modeling, we also developed thematic maps to illustrate the spatial distribution of accommodation employment, its variation, and its specialization. The maps were created with QGIS Geographic Information System Desktop 3.16.10 (QGIS.org, 2024), and class intervals were determined using Jenk's breaks.

Following this, we outline the process of data testing and variable transformation. The initial summary of descriptive statistics is presented in Table 2. The variables are highly skewed with outliers present. In that scenario all were log-transformed after adding a small constant with minimal impact on the distribution (0.01) to handle zeros, ensuring the natural logarithm was defined.

Panel-specific unit root tests were unreliable due to the dataset's small time dimension relative to the large cross-sectional size. Therefore, we performed unit root tests on the means of yearly aggregated data to determine the variables' stationarity. We implemented the Augmented Dickey-Fuller (ADF) test with a trend component and lag length selected via the Akaike Information Criterion (AIC) as provided by the 'urca' R package (Pfaff, 2008; R Core Team, 2024). All variables exhibited non-stationarity based on the ADF test, with tests failing to reject the null hypothesis of a unit root at the 5 % level. Consequently, the first differences were used to achieve stationarity. The results of ladder test results are also summarized in Table 2.

To examine potential cross-sectional dependence, whether factors affecting one unit simultaneously influence other units, we applied Pesaran's Cross-Sectional Dependence test with the R 'plm' package (Croissant & Millo, 2008). The 460.39, *p*-value <2.2e-16 indicates there is cross-sectional dependence. This supports the use of within-fixed effects to account for individual effects and focus on global shared characteristics. Also, it made us consider Driscoll-Kraay standard error correction from the R 'sandwich' package in R (Zeileis, 2004).

Before model estimation, we assessed multicollinearity among potential explanatory variables. We computed the Pearson correlation matrix, ensuring that no pairwise correlation exceeded 0.5, thereby mitigating the risk of multicollinearity issues. To further confirm the absence of multicollinearity, we calculated the Variance Inflation Factor (VIF) through a preliminary Ordinary Least Squares (OLS) regression model using the R 'car' package (Fox & Weisberg, 2019). Since none of the pairwise correlations exceeded 0.5 and VIF values remained below 1.5, multicollinearity was not a concern. The VIF results are also summarized in Table 2.

Another aspect to consider was the presence of data heteroskedasticity, which was confirmed after being testing with the Breusch-Pagan Test of 'LM Test' R library (Zeileis & Hothorn, 2002) over a Panel Linear Model with the data already logged and first differenced. The results were 113.45 with a *p*-value of <2.2e-16. Since even logged variables were heteroskedastic, we also estimated a Feasible Generalized Least Squares (FGLS) model using the 'plm' R package 'pggls' function Croissant and Millo's (2008). It addresses heteroscedasticity by estimating and incorporating an error covariance matrix, thereby producing more efficient parameter estimates than OLS (Bai, Choi, & Liao, 2021).

Due to the heteroskedastic nature of the data, we also estimated an alternative model where the data were transformed using the Empirical Cumulative Distribution Function (ECDF), which replaces original values by their position on the distribution to deal with highly skewed distributions. To account for the within-fixed-effects model's aspect, this function was applied over demeaned data.

Fixed-effects model is theoretically supported by our research problem, as we aim to control municipalities' unique and non-variable features, and because data is cross-sectional dependent. Even so, we ran a Hausman test, which result is X^2 76.96, df = 12, p-value 1.1e-11 indicates the presence of unobserved municipality-specific heterogeneity and within-fixed-effects to be preferable over random effects.

In summary, the original values were logged and first differenced. We also performed a model where this data was demeaned, to consider fixed-effects within transformation, and converted by ECDF function.

3.2. Regression models

Considering our twelve hypotheses, the data transformation, and the results of previously mentioned tests, our general model is expressed in Fig. 1.

Considering this common structure, we present five different regression modeling strategies, that account for the symbol * at the error term, namely: (A) Linear Models for Panel Data with Driscoll Kraay adjustment – PLM, (B) Feasible Generalized Least Squares - FGLS, (C) Panel with data converted using the empirical cumulative distribution function - ECDF, (D) Quantile regression at the median and the distribution tails, and (E) Quantile regression at the median and the distribution tails of data converted using the ECDF.

After modeling A, B, and C we performed the Jarque-Bera test for residuals normality. In the three models, the test supports the alternative hypothesis of non-normal residual distribution. Examining the residual plots (Fig. 8) it is possible to see data is heavy-tailed, meaning a nonlinear distribution at both extremes. Hence, we also made a quantile regression approach.

Assaf and Tsionas (2018) advocate for the use of Quantile Regression (QR) in research related to hospitality and tourism. They emphasize that the use of QR leads to more robust and comprehensive hypothesis testing, even when the results do not significantly vary across quantiles. Unlike traditional methods that provide estimates based on the average, QRs analyze different points within the distribution or quantiles. This

Table 2
Summary statistics over original non-transformed variables and test statistics for UR and VIF.

Dimension	Variable	Min	1st Qu	Median	Mean	3rd Qu	Max	ADF UR	Tau 5 %	(S/ NS)	VIF
Tourism proxy	htl	1,100,015.00	3,106,705	3,508,405	3.492.238	4,202,073	5,222,005	−1.73	−3.60	NS	
Specialization	htl_esp	0.01	0.31	0.55	1.27	0.98	46.75	−1.70	−3.60	NS	1.04
Agglomeration	tca_hhi	0.22	0.39	0.47	0.50	0.57	1	−2.25	−3.60	NS	1.03
Government support	tourbgt	0	0	0	488,985	172,566	187,592,764	−1.56	−3.60	NS	1.37
Government support	bgt	730,000	28,440,000	53,470,000	192.600.000	117.800.000	55,860,000,000	−3.34	−3.60	NS	1.34
Agglomeration	tnf_pct	0.00	73.56	83.88	82.21	92.48	127.05	−2.06	−3.60	NS	1.09
ELTG	gmp	11,857	216,936	484,361	2,478,542	1,285,961	763,597,808	−1.64	−3.60	NS	1.00
Agglomeration	gmp_srv_pct	2.57	31.02	38.29	38.43	45.83	169.40	−1.58	−3.60	NS	1.00
Entrepreneurial activity	loans	0.00	4.00	15.00	59.61	46.00	9286	−2.64	−3,60	NS	1,01
Entrepreneurial activity	n_bsns	4,00	130.00	255.00	923.50	575.00	313,523	−1.69	−3.60	NS	1.09
Market access	flypax	0.00	0.00	0.00	133,125	0.00	64,436,988	−2.12	−3.60	NS	1.00
Agglomeration	w_inet	0.37	215.30	507.56	685.35	987.42	7.364	−2.62	−3.60	NS	1.04
Agglomeration	educ	1.95	4.22	4.80	4.71	5.27	7.05	−2.33	−3.60	NS	1.03

Legend: S for stationary and NS for non-stationarity.

$$\begin{aligned}\Delta_{\hat{\tau}}\text{log\_htl} = \alpha + \hat{\beta}_1\,\Delta\text{log\_htl\_esp} + \hat{\beta}_2\,\Delta\text{log\_tca\_hhi} + \hat{\beta}_3\,\Delta\text{log\_gmp} + \hat{\beta}_4\,\Delta\text{log\_gmp\_srv\_pct} \\ + \hat{\beta}_5\,\Delta\text{log\_bgt} + \hat{\beta}_6\,\Delta\text{log\_tourbgt} + \hat{\beta}_7\,\Delta\text{log\_tnf\_pct} + \hat{\beta}_8\,\Delta\text{log\_loans} \\ + \hat{\beta}_9\,\Delta\text{log\_n\_bsns} + \hat{\beta}_{10}\,\Delta\text{log\_flypax} + \hat{\beta}_{11}\,\Delta\text{log\_w\_inet} + \hat{\beta}_{12} \\ \Delta\text{log\_educ} + \delta\text{shock} + \varepsilon_t^*\end{aligned}$$

Fig. 1. Model equation.

approach offers robustness against non-normal distributions, including heavy-tailed data. It was implemented with the 'quantreg' package (Koenker, 2025).

Another issue to consider in the modeling process is endogeneity and potential reverse causality. Although our purpose is to find municipal tourism drivers, we must consider that some of these factors also might be influenced by tourism growth and that variable relations can be presented the other way around or have mutual influence. For example, rather than public spending, entrepreneurship, or service agglomeration leading to better tourism performance, municipalities with better tourism performance might attract more tourism companies and higher public spending. To address this, we used panel vector autoregression models (PVAR) with potential endogenous variables lags, applied through Sigmund and Ferstl (2021) 'panelvar' R package.

4. Results

4.1. Thematic map analysis of the spatial distribution of accommodation employment

It is important to explore the chosen tourism proxy before regressing it with other variables. When examining the spatial distribution of accommodation employment by municipality, there is a strikingly uneven distribution in the country (Fig. 2).

The two major Brazilian gateways and metropolises, São Paulo and Rio de Janeiro, concentrate the tourism supply, along with their hinterland getaway destinations. Another prominent area is the northeastern coast. Ragagnin Pimentel and Pereira (2021) provide a more in-depth assessment of the spatial distribution in Brazilian tourism. Pegas, Weaver, and Castley (2015) explains the dynamics of two different tourism Brazilian systems, one organically developed in the southeast and the more recent induced northeastern pleasure periphery.

If instead of absolute figures, we consider municipalities' specialization in tourism these systems become more evident. Considering the weight of tourism to a particular municipality's economy provides a distinct picture (Fig. 3), highlighting resorts or tourism-based towns while softening metropolises' large employment concentration.

The northeastern coastal resorts appear more prominently; however, the main feature is a small municipality in Central Brazil with hot springs. This type of asset, or other natural features, also explains other inland destinations. Besides, the map also highlights municipalities that are driven by regional tourism demand from mid-sized cities.

Despite the $p = 0.85$ correlation between accommodation and overall employment time series in aggregated national figures, there is

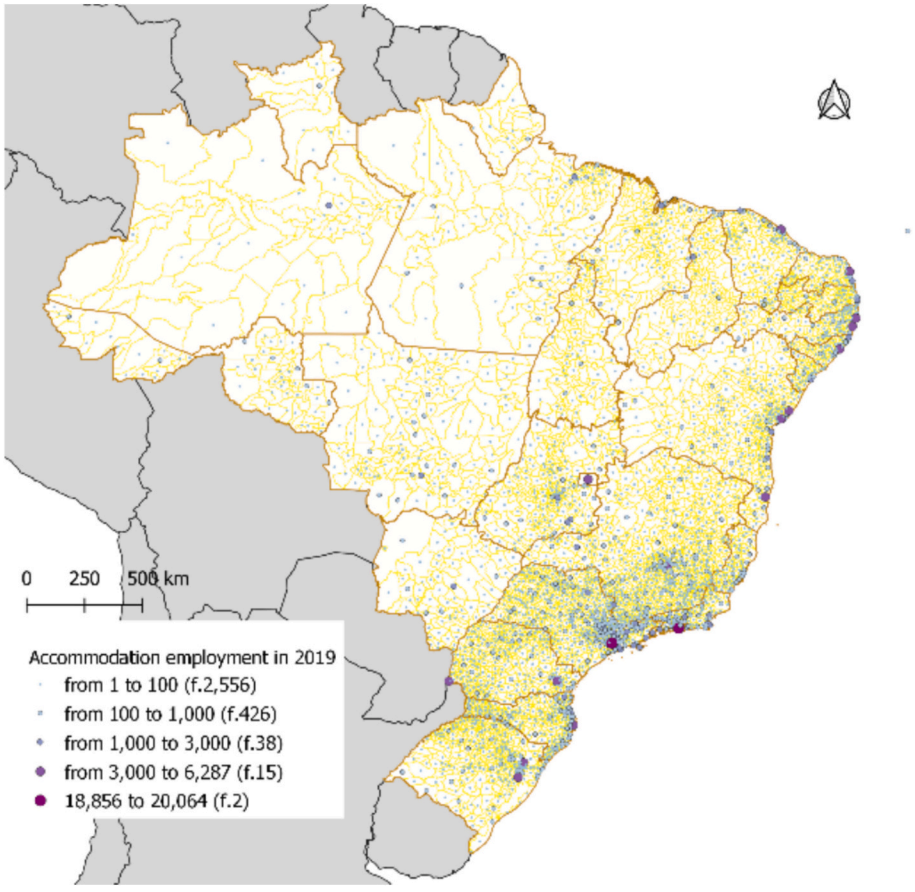


Fig. 2. Map with accommodation employment distribution in 2019.
Source: authors' composition from RAIS data.

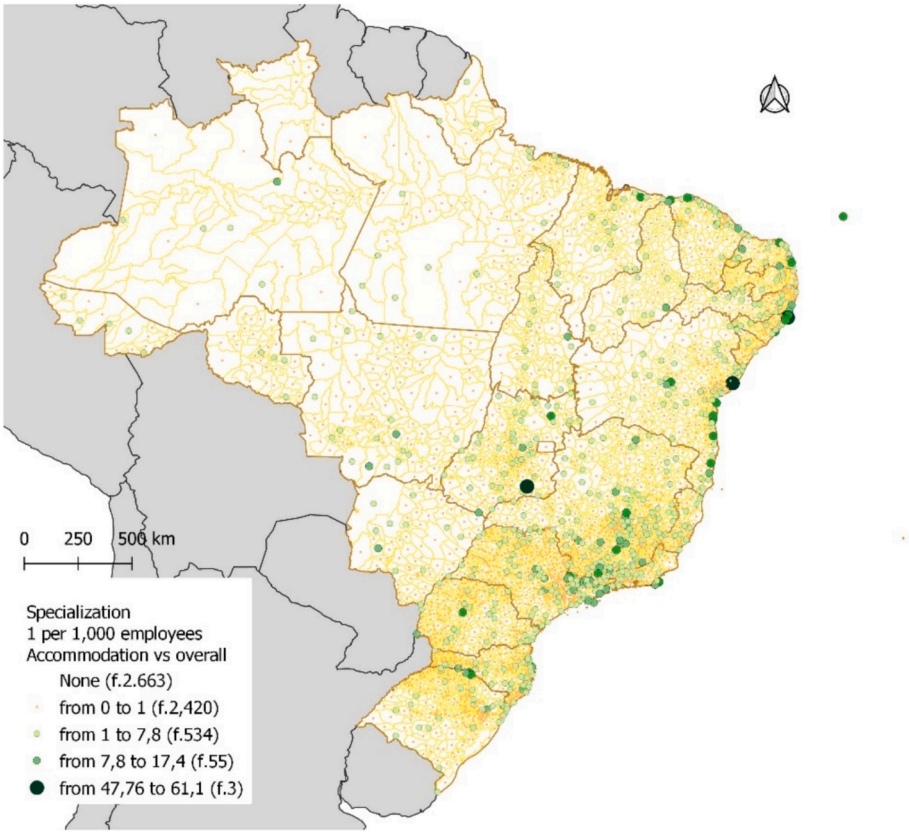


Fig. 3. Map with employment specialization in accommodation in 2019.
Source: authors' composition from RAIS data.

an uneven spatial distribution. This is reflected in the differing trends in accommodation employment over time (Fig. 4). Highlighting the need to address the differences between tourism dynamics at local and national levels.

While some municipalities experience growth in accommodation employment, others see a decline, not to mention the 46 % that do not have this type of employment. On average, among those that do, 45 % show a growth trend throughout the time series, 36 % a decline, and 18 % remain in a steady state. This implies diverse trajectories in tourism development at the municipal level. The following map (Fig. 5) shows the same conclusion, displaying the difference in accommodation employment between the initial and final years.

For most municipalities, accommodation employment either grows or decreases slightly. The map also clearly shows how some destinations concentrate growth on accommodation employment. Notable examples include Rio de Janeiro, the 2016 Olympics host, and tourism-specialized resorts. Amazonian capitals present a decrease, as do some other coastal municipalities. It is interesting to note that in some cases, similar vicinal destinations show different trends.

The regional analysis catch-up theory, as discussed by Yang and Fik (2014) and Romão and Nijkamp (2019), postulates an equalization tendency, whereby lagging regions would experience faster growth and eventually converge with more dynamic areas. However, our data contradicts this assumption, suggesting instead a trend to concentrate

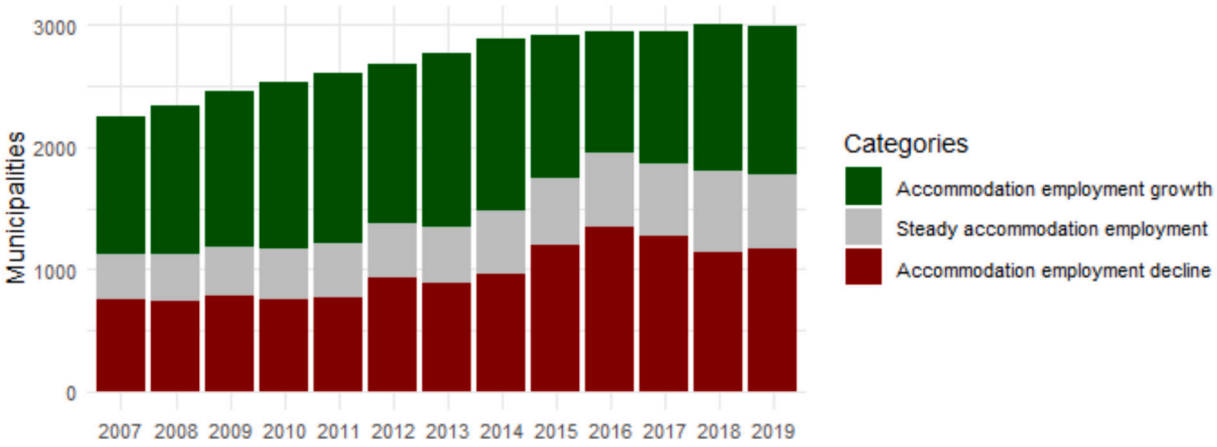


Fig. 4. Accommodation employment trend: yearly sum of municipalities.
Source: authors' composition from RAIS data.

Fig. 5. Map with accommodation employment difference between 2007 and 2019.
Source: authors' composition from RAIS data.

more on specialized destinations. This pattern is further illustrated in Fig. 6.

Specialization tends to reinforce existing advantages, meaning that regions already strong in tourism are likely to continue outperforming others. Our findings reveal a trend of increased specialization, where established tourism hubs like Rio de Janeiro and resort areas continue to grow, while other municipalities stagnate or decline in their tourism share. This supports the idea of divergent regional tourism development rather than convergence.

Northeast coastal municipalities are moving to becoming more tourism-specialized with the rise of new destinations. The Southeast and South regions, however, experience a decline. Yet, contrary to a general loss of vitality, this can be the result of an economic diversification through the incorporation of urban functions in mature destinations, as indicated by their GMP growth.

4.2. Panel regression models

The thematic map analysis provided an overview of Brazilian tourism dynamics; however, our goal is to examine Brazil's local tourism performance, using panel regression models to explore and understand its drivers. Therefore, we assessed the influence of 13 variables, along with a time dummy, on the distribution of accommodation employment using within fixed effects panel models. Fig. 7 illustrates the mean time-trends of the logged variables.

It is evident that all variables are non-stationary, which led us to first differentiate them. However, there is no clear overall common pattern. Table 3 presents the results of models A (within OLS panel Driscoll-Kraay adjusted), B (FGLS within panel), C (manually demeaned ECDF transformed data panel), D (within quantile regression at 0.1, 0.5, and 0.9 Tau), and E (quantile regression over manually demeaned ECDF transformed data at 0.1, 0.5 and 0.9 Tau). All models have the same balanced structure with 20,532 observations, with 1711 municipalities in 12 years. Fig. 8 shows residual plots for models A, B, and C. Fig. 9 displays quantile regression plots for each variable. We chose not to present the quantile ECDF residuals. This transformation replaces each data point with its percentile rank and causes the transformed data to cluster near the boundaries of 0 and 1, making it uninformative.

The use of log-transformed and first-differenced variables implies that the regression estimates reflect the elasticities of changes. Instead of measuring levels, the models capture how percentage changes in independent variables are associated with percentage changes in employment. This is particularly useful for analyzing growth dynamics and reducing non-stationarity and heteroskedasticity in the data. For instance, a 1 % increase in hotel specialization accounts for roughly 99 (model A) to 97 (model B) out of every 10,000 jobs. The same logic applies to models D and E, but instead of the mean value, the estimates are made for the median (0.5 tau) and the tails, at the 10th and 90th quantiles. In Models C and E the estimates relate to where observations are in the distribution, for instance, 0.9 indicates that about 90 % of observations are below the reference value without any predictors changing.

We recognize endogeneity as a concern in our study. Therefore, we estimated a panel vector autoregression (PVAR) model using the

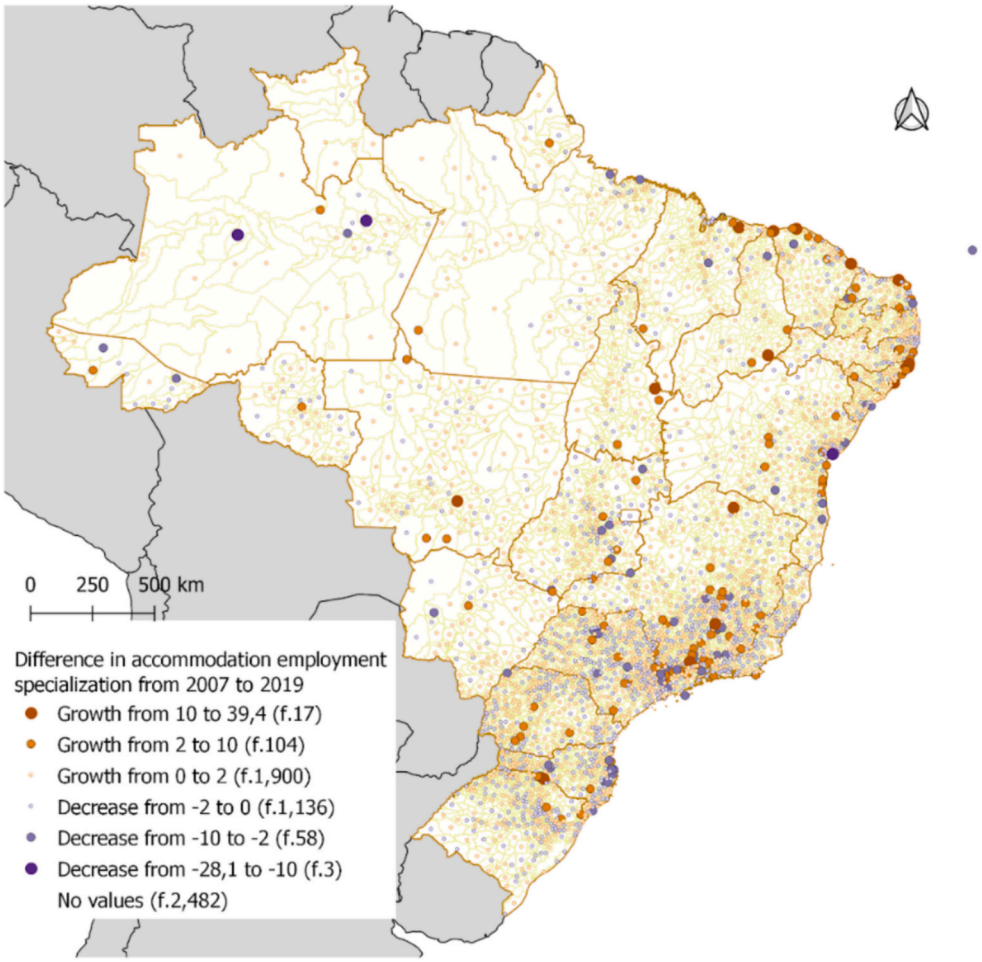


Fig. 6. Map with the difference in accommodation employment specialization from 2007 to 2019.
Source: authors' composition from RAIS data.

'pvarfeols' function of the R 'Panelvar' package (Table 4).

This model employs lagged values as instruments to treat all variables as endogenous, and the shock variable is considered as exogenous. It is worth mentioning no other valid instrumental variable was found. Since two lags were used, data ranges from 2009 to 2019. While we acknowledge this does not eliminate the problem, it contributes to a more careful interpretation of the results.

5. Discussion

5.1. EDTH

Regarding EDTH, hypothesis (H1, gmp → htl) proposed that overall economic growth is significantly and positively related to formal accommodation employment. This hypothesis was supported in all models, including model A. Quantile estimations show that this association is marginally stronger at the top of the distribution. However, the low intercept values make the practical significance of this association arguable.

The idea that tourism in Brazilian municipalities would follow general economic development does not hold since the municipal gross product shows only a marginal relation with accommodation employment. This could suggest, as Yang & Fik (2014, p.154), that "local economic growth plays a more important role in stimulating inbound tourism than domestic tourism". However, Brazil's outcome differs from that study, where local economic growth was the most important factor in China's regional tourism development. Our results align with those of Centinaio et al. (2023) findings for Italy, where a positive shock of GDP does not result in an increase in overnight stays.

The appropriateness of the dummy variable aligns with Antonakakis et al. (2017) who argue that the tourism-economic growth relationship is not stable over time in magnitude and direction but is somewhat responsive to major economic events. Thus, there is an influence of structural breaks, as discussed by Raifu and Afolabi (2024), in a non-linear relationship, as examined by Brida et al. (2016).

Conversely, in the PVAR model, it is also possible to observe relations between general economic variables, such as the increase in loans linked to past new business growth. The association between firm creation with previous municipal budget spending suggests that government investment is linked to a more vibrant local economic ecosystem. As suggested by TLGH there is also a positive relationship between tourism, proxied by hotel employment, and local budget spending and firm creation.

5.2. Agglomeration

Agglomeration was a driver we sought to evaluate through four hypotheses. The first was whether the percentage of municipal gross product on services influences accommodation employment (H2, gmp_srv_pct → htl). It was supported in all models, but C; leading to believe that tourism growth is slightly associated with a more service-oriented and diversified local economic landscape.

The next hypothesis was whether the percentage of federal and State transfers on municipal receipts influences accommodation employment (H3, tnf_pct → htl), expecting that a more self-sufficient local economy

Fig. 7. Logged variable's means time trends.

with a lower need for transfers would provide a more fertile environment for tourism growth. A larger share of state and federal transfers in municipal budgets indicates economic stagnation and poorer arrangement. However, it was only supported in model E, particularly at the distribution's tail. Overall, the results indicate that municipal dependence on state and federal transfers has no significance in tourism performance.

The following hypothesis was that agglomeration of TCA influences employment in accommodation (H4, tca_hhi → htl). It was supported in all models, but A. The results imply that a balanced distribution of employment across tourism-characteristic activities relates to higher accommodation employment. A negative estimate is expected, as less concentrated TCA employment indicates a more even spread among the distinct services required in a tourism production system with the proper chain links in a more complex and complementary structure. The result matches Capone and Boix's (2008) findings for Italy.

Agglomeration can be seen as an opportunity to pool shared resources. Therefore, we sought to estimate whether the basic education index, as a proxy for labor resource quality, influences employment in accommodation (H5, educ → htl). It was partially supported. Basic education had no association with accommodation employment at models A and C, but a positive link was found in all quantiles at D and E.

Another shared resource is infrastructure. As an information-intensive industry, we modeled whether broadband internet access density influences employment in accommodation (H6, w_inet→ htl). This hypothesis was not supported in models A, B, and C. Despite its support in the quantile regressions, estimates were small, with a higher value on the top of the distribution.

5.3. *Tourism specialization*

Derived from path dependence theory, a hypothesis proposes specialization in accommodation employment as an explanatory variable for destination performance (H7, htl_esp → htl). All models support this proposition. Specialization is the variable with the greatest estimates and the only one that has support at the robust Driscoll Kraay adjusted model A.

Although specialization is an important driver with lock-in trajectories, it does not mean change is out of the landscape. The Spearman correlation for that variable in the series' initial and final year is 0.509, indicating a substantial change in the tourism-specialized destinations' rank in that 12-year gap. Also, in the residuals, it is possible to see a pattern where less-specialized municipalities had a larger than expected accommodation growth and, on the other, tourism-specialized places with a less than expected growth. Specialization was not influenced by previous values of the dependent variable, and vice-versa. PVar model results suggest feedback loops and reverse causality to be weak. Moreover, accommodation employment lags show a negative effect on the

Table 3
Models' summary.

Dimension	Variable	Model A	Model B	Model C	Model D [τ 0.1]	Model D [τ 0.5]	Model D [τ 0.9]	Model E [τ 0.1]	Model E [τ 0.5]	Model E [τ 0.9]	Outcome
	(intercept)				−0.088 (0.001) ***	−0.001 (0.000)	0.089 (0.001) ***	−0.089 (0.004) ***	−0.048 (0.003) ***	0.120 (0.005) ***	
ELTG	**gmp** - Municipal gross product	−0.000 (0.003)	0.118 (0.006) ***	0.052 (0.005) ***	0.135 (0.010) ***	0.150 (0.003) ***	0.166 (0.012) ***	0.062 (0.002) ***	0.045 (0.002) ***	0.069 (0.002) ***	Supported in B, C, D, E Not supported in A
Agglomeration	**gmp_srv_pct** -Percentage of services in municipal gross product	0.016 (0.007) *	0.029 (0.009) **	−0.002 (0.007)	0.052 (0.015) ***	0.067 (0.006) ***	0.061 (0.017) ***	0.011 (0.002) ***	0.009 (0.002) ***	0.008 (0.002) ***	Supported in D, E Not supported in A, B, C
Agglomeration	**tnf_pct** - Percentage of federal and State transfers on municipal receipts	−0.000 (0.000)	−0.000 (0.001)	−0.006 (0.004)	0.000 (0.003)	−0.000 (0.001)	−0.006 (0.003)	−0.012 (0.002) ***	−0.003 (0.002) *	−0.008 (0.002) ***	Supported in E Not supported in A, B, C, D
Agglomeration	**tca_hhi -** Sum of each squared TCA share on municipal employment.	−0.000 (0.001)	−0.043 (0.004) ***	−0.030 (0.002) ***	−0.037 (0.008) ***	−0.023 (0.003) ***	−0.044 (0.009) ***	−0.024 (0.002) ***	−0.010 (0.002) ***	−0.020 (0.002) ***	Supported in B, C, D, E Not supported in A
Agglomeration	**Educ -** Municipal basic education development index	0.034 (0.055)	0.075 (0.016) ***	0.012 (0.012)	0.114 (0.029) ***	0.179 (0.011) ***	0.164 (0.032) ***	0.022 (0.002) ***	0.018 (0.002) ***	0.017 (0.002) ***	Supported in B, D, E Not supported in A, C
Agglomeration	**w_inet** - Wired broadband internet access density	−0.012 (0.006) *	0.003 (0.002)	0.014 (0.006) *	0.008 (0.004) **	0.017 (0.002) ***	0.023 (0.004) ***	0.026 (0.002) ***	0.018 (0.002) ***	0.029 (0.002) ***	Supported in D, E Not supported in A, B, C
Specialization	**htl_esp -** Jobs in accommodation per total employment in municipalities.	0.995 (0.001) ***	0.977 (0.002) ***	0.903 (0.005) ***	0.991 (0.003) ***	1.006 (0.001) ***	0.996 (0.004) ***	0.845 (0.006) ***	0.986 (0.002) ***	0.821 (0.005) ***	Supported in all models
Entrepreneurial setting	**n_bsns -**Number of new businesses per municipality	−0.001 (0.006)	−0.019 (0.002) ***	−0.043 (0.020) *	−0.034 (0.003) ***	−0.021 (0.001) ***	−0.022 (0.003) ***	−0.056 (0.002) ***	−0.025 (0.002) ***	−0.024 (0.002) ***	Supported in B, D, E Not supported in A, C
Entrepreneurial setting	**loans -** Public development bank credit operations per municipality	−0.001 (0.000) **	0.001 (0.000) ***	0.029 (0.008) ***	0.002 (0.001) ***	0.004 (0.000) ***	0.004 (0.001) ***	0.037 (0.002) ***	0.025 (0.002) ***	0.045 (0.002) ***	Supported in B, C, D, E Not supported in A
Market access	**flypax** – mesoregions' passengers flow	−0.000 (0.000)	0.000 (0.000)	0.030 (0.006) ***	−0.002 (0.001) **	−0.001 (0.000)	0.001 (0.001)	−0.004 (0.003)	0.008 (0.002) ***	0.024 (0.002) ***	Supported in C, E Not supported in A, B, D
Public investment	**bgt -** Yearly spent municipal budget	0.001 (0.006)	0.033 (0.005) ***	0.008 (0.008)	0.028 (0.001) ***	0.025 (0.002) ***	0.031 (0.009) ***	0.033 (0.002) ***	0.012 (0.002) ***	0.009 (0.002) ***	Supported in B, D, E Not supported in A, C
Public investment	**tourbgt** -Amount of yearly municipal public budget spent on tourism	−0.000 (0.000).	0.000 (0.000) *	0.011 (0.003) **	0.000 (0.000)	0.000 (0.000) *	−0.000 (0.000)	0.009 (0.002) ***	0.004 (0.002) *	0.006 (0.002) **	Supported in E Not supported in A, B, C, D
	Shock – dummy for 2016–2019 crisis	−0.000 (0.010)	−0.033 (0.001) ***	−0.043 (0.011) ***							

current value, which suggests tendency to converge after an expansion.

5.4. Entrepreneurial setting

The shift toward destination specialization does not happen without new firms, private investments, and market access. Municipal entrepreneurial activity was assessed by the number of new businesses openings (H8, n_bsbs → htl). This relationship was not supported in A and C. At the quantile regressions, unlike what we expected, the significant estimates were in the opposite direction. This could hint that tourism growth is more prominent in less economically vibrant scenarios, such as emerging destinations. Tourism is primarily formed of small enterprises that can benefit from government credit mechanisms. Their use is also a sign of private sector confidence in making investments and, ultimately, serves as a proxy for a flourishing local economic environment. Therefore, we asked if the number of loans granted to businesses by the Brazilian Public Development Bank influences accommodation employment (H9, loans → htl). Despite being significant in most models, as with some other variables, the low estimates question the practical influence of this driver. Market access to destinations was measured by the number of passengers at airports located in a municipality mesoregion, as a factor that also influences accommodation employment (H10, flypax → htl). It does not appear to be influential. Estimates were only significant in the ECDF models. However, they were low and conflicted with opposing signs displayed in other computations.

5.5. Public investment

Throughout the 20th century, Brazil's import substitution policies

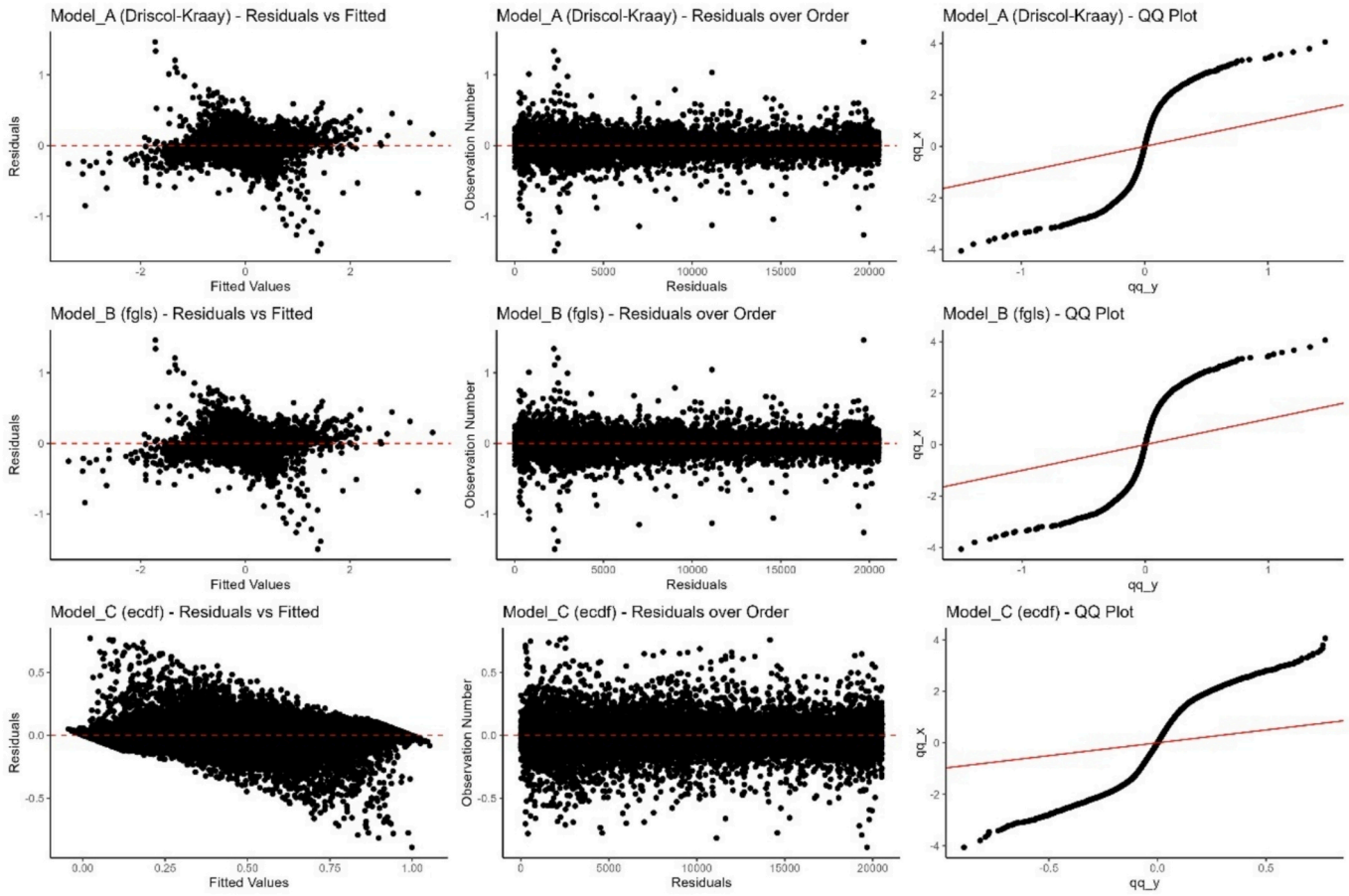


Fig. 8. Residuals plot for models A, B, and C.

shaped the belief that public investment is essential for boosting tourism. Many believe that insufficient government action is a key reason for the sector's unfulfilled potential. Furthermore, Bernini and Pellegrini (2013) examine the role of subsidies in Italian tourism, noting that they help to sustain jobs while also leading to inefficiencies. Hence, the hypotheses are that general municipal government spending influences employment in accommodation (H11, bgt_1d → htl_1d), and Municipal government spending on tourism influences accommodation employment (H12, tourbgt → htl).

Overall, the municipal budget had no significant effect on accommodation employment in models A and C, with a positive significant relationship in models B and on quantile regression. Nevertheless, the estimates are low, hinting it has a marginal effect. Additionally, direct tourism local investment had the lowest estimate among all variables, raising questions about the efficiency of local tourism policies, and the use of taxpayer money to support tourism. A summary of the 12 hypotheses' outcome is available on Table 3.

6. Conclusion

There is a need for tourism studies that evaluate tourism at a subnational scale in a comprehensive way, going beyond local case studies. Country-effect variations also call for the examination of different settings, which is particularly important when considering the role of institutional quality in tourism performance, as advocated by Sun et al. (2025). Moreover, domestic tourism remains understudied, despite the higher visitor flow and distinct demand structures and impacts.

Brazil is an example of an emerging tourism destination with domestic-driven demand. This article contributes by evaluating the performance drivers of Brazilian destinations, examining 1711 municipalities over 12 years. The theoretical assessed dimensions were (a) economic-led tourism growth, (b) agglomeration, (c) tourism specialization, (d) entrepreneurial setting, and (e) public investment. They were tested through twelve hypotheses. Multiple panel data estimations provided a robust framework for understanding the relative importance of these various accommodation employment drivers. Most hypotheses were just partially supported. Specialization being the only variable statistically significant across all the models.

A key finding of this study is that at the municipal scale, a different dynamic is at play compared to country-level studies. For example, the literature highlights general economic growth as a tourism driver in Latin America and the Brazilian case (Eugenio-Martin et al., 2004; Brida et al., 2013). Although accommodation employment mirrors the overall job market, with a 0.85 correlation, examining it at a more granular scale reveals significant diversity in municipal outcomes and trends. This underscores the uneven spatial distribution of Brazilian tourism and the need for studies to more carefully at a subnational scale.

Our analysis did not confirm the EDTH. Municipal gross product has only a marginal effect on tourism growth, which differs from the Chinese context presented by Yang and Fik (2014). The significance of an event dummy variable also suggests that the relation between tourism and overall economic growth can be non-linear and sensitive to structural breaks and economic shocks. These findings question the effectiveness of the country's recent strategy of hosting major events, such as the World Cup and the Olympics, for sustainably enhancing national tourism. Instead, a managerial insight from this study would be to focus on local tourism diagnosis to promote tailored strategies. Which is reinforced when we consider the absence of significant relationships for local public investment and tourism growth. This yells for the need to reevaluate how public resources are being targeted toward tourism

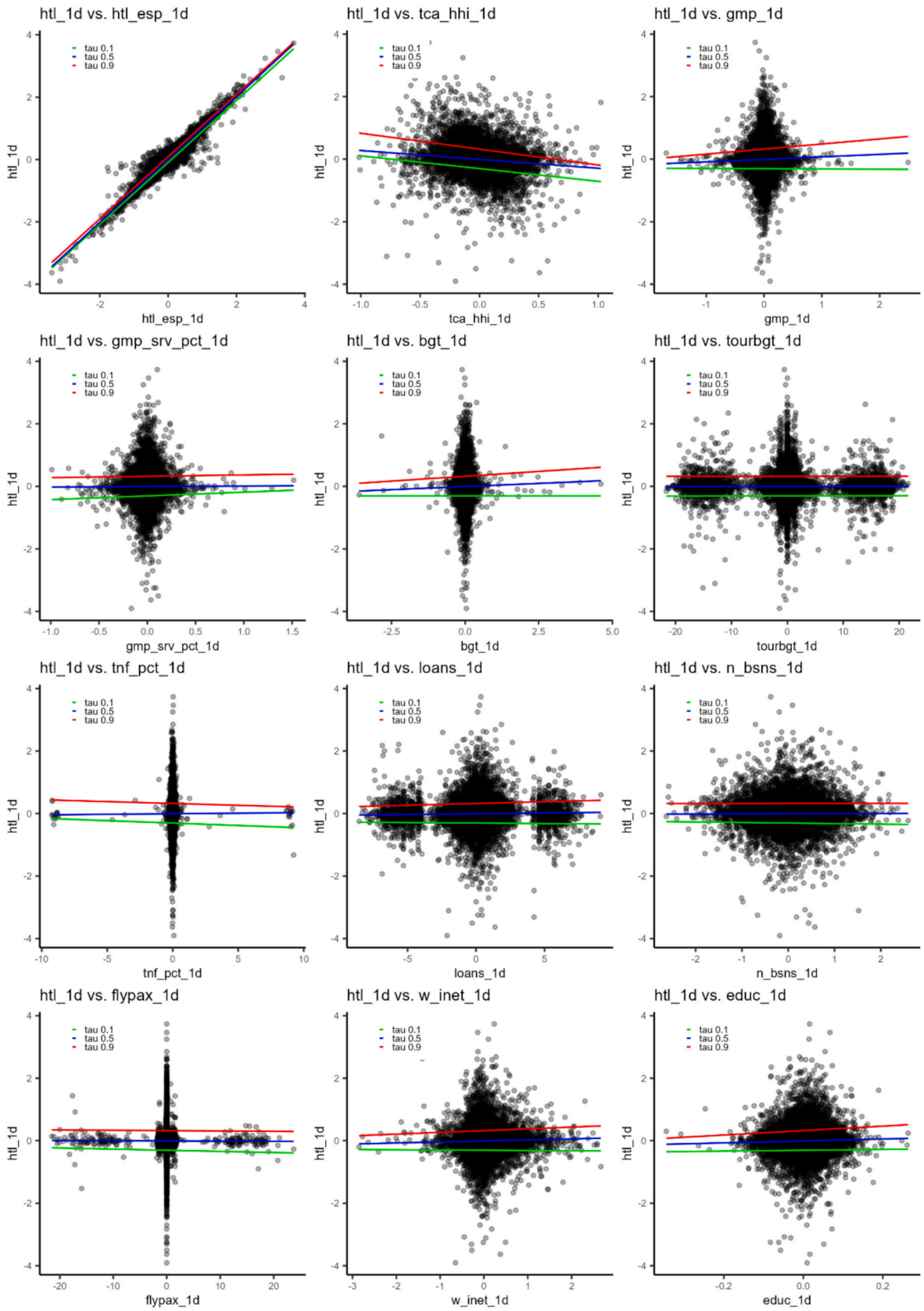


Fig. 9. Quantile regression estimates and residuals by variable.

Table 4
Panel vector autoregressive model.

	htl	htl_esp	tca_hhi	gmp	bgt	tourbgt	loans	n_bsns	educ
lag1_htl	−0.409 (0.033)	−0.061 (0.032)	0.009 (0.014)	0.032 (0.013)	0.128 (0.012)	0.092 (0.481)	0.445 (0.151)	0.349 (0.035)	0.007 (0.003)
lag1_htl_esp	0.025 (0.033)	−0.320 (0.033)	−0.003 (0.014)	−0.030 (0.013)	−0.127 (0.012)	−0.011 (0.486)	−0.478 (0.153)	−0.350 (0.035)	−0.006 (0.003)
lag1_tca_hhi	0.053 (0.023)	0.039 (0.023)	−0.355 (0.010)	−0.009 (0.009)	−0.013 (0.008)	0.064 (0.339)	−0.105 (0.107)	−0.012 (0.025)	0.004 (0.002)
lag1_gmp	0.029 (0.024)	−0.014 (0.024)	−0.011 (0.011)	−0.141 (0.010)	0.054 (0.009)	0.151 (0.361)	0.059 (0.113)	0.020 (0.026)	0.003 (0.002)
lag1_bgt	0.072 (0.028)	0.058 (0.028)	0.006 (0.012)	0.003 (0.011)	−0.544 (0.010)	−0.679 (0.418)	0.093 (0.131)	0.218 (0.030)	−0.003 (0.003)
lag1_tourbgt	0.000 (0.001)	0.000 (0.001)	−0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)	−0.451 (0.009)	0.001 (0.003)	0.000 (0.001)	0.000 (0.000)
lag1_loans	0.003 (0.002)	0.000 (0.002)	0.000 (0.001)	0.001 (0.001)	0.003 (0.001)	0.066 (0.032)	−0.628 (0.010)	0.003 (0.002)	0.001 (0.000)
lag1_n_bsns	0.001 (0.010)	−0.021 (0.010)	−0.003 (0.004)	0.012 (0.004)	−0.022 (0.004)	0.106 (0.149)	0.521 (0.047)	−0.380 (0.011)	−0.010 (0.001)
lag1_educ	0.284 (0.088)	0.352 (0.087)	−0.066 (0.037)	0.053 (0.035)	0.162 (0.032)	−1.587 (1.296)	−1.875 (0.407)	1.456 (0.094)	0.418 (0.008)
lag2_htl	−0.242 (0.032)	−0.069 (0.032)	0.013 (0.013)	0.015 (0.013)	0.064 (0.012)	−0.970 (0.471)	−0.210 (0.148)	0.155 (0.034)	0.006 (0.003)
lag2_htl_esp	0.013 (0.032)	−0.158 (0.032)	−0.011 (0.014)	−0.018 (0.013)	−0.062 (0.012)	0.971 (0.479)	0.127 (0.151)	−0.156 (0.035)	−0.005 (0.003)
lag2_tca_hhi	−0.017 (0.023)	−0.021 (0.023)	−0.194 (0.010)	0.001 (0.009)	0.007 (0.008)	−0.024 (0.335)	0.004 (0.105)	0.035 (0.024)	−0.001 (0.002)
lag2_gmp	0.004 (0.025)	0.001 (0.025)	0.001 (0.011)	−0.155 (0.010)	0.058 (0.009)	0.734 (0.372)	−0.272 (0.117)	0.025 (0.027)	0.005 (0.002)
lag2_bgt	0.003 (0.030)	0.046 (0.030)	0.003 (0.013)	−0.017 (0.012)	−0.222 (0.011)	−0.564 (0.442)	−0.678 (0.139)	0.429 (0.032)	−0.033 (0.003)
lag2_tourbgt	−0.001 (0.001)	−0.000 (0.001)	−0.000 (0.000)	−0.000 (0.000)	0.000 (0.000)	−0.214 (0.009)	0.000 (0.003)	0.001 (0.001)	0.000 (0.000)
lag2_loans	0.005 (0.002)	0.005 (0.002)	0.001 (0.001)	0.002 (0.001)	0.006 (0.001)	−0.004 (0.036)	−0.377 (0.011)	0.031 (0.003)	0.000 (0.000)
lag2_n_bsns	−0.033 (0.011)	−0.018 (0.011)	0.005 (0.005)	−0.002 (0.005)	0.032 (0.004)	0.176 (0.169)	0.594 (0.053)	0.066 (0.012)	−0.014 (0.001)
lag2_educ	−0.204 (0.088)	−0.021 (0.088)	−0.015 (0.037)	−0.116 (0.035)	−0.129 (0.032)	−1.381 (1.308)	−0.415 (0.411)	−0.415 (0.095)	−0.611 (0.008)
shock	−0.111 (0.009)	−0.045 (0.009)	0.008 (0.004)	−0.060 (0.004)	−0.021 (0.003)	−0.189 (0.134)	−0.935 (0.042)	0.118 (0.010)	−0.030 (0.001)

development in Brazil.

On the other hand, PVAR panel results suggest that past tourism growth is associated with an increase in the local government budget and the opening of new businesses. This supports tourism-led growth at a municipal scale in a context where tourism demand is primarily domestic. This is theoretically relevant, given the support in a subnational setting for a theory where exports are a key element. It also underlines the practical significance of supporting tourism as an economic growth strategy in a primarily domestic-driven market.

In our findings, specialization was the most significant tourism driver at the local level. Po and Huang (2008) already argued for its role in tourism growth through country-level data. This situation challenges the appropriateness of catch-up theories in the studied context since it points in the opposite direction of a municipalities' equalization trend. Moreover, it aligns with the concept of path dependence, where efforts are made to reinforce an industry's local role the more concentrated it becomes. Tourism stakeholders can interpret specialization as a conservative choice by economic agents to invest in an industry that has been proven to give positive returns locally and to which there is an already established knowledge base, demand, and resource pool. However, in our case shifts in specialized tourism destinations over time undermine a rigid path dependency. Suggesting that industry pioneers may benefit from the opportunity to vertically control the services' agglomeration needed in uprising destinations.

A key takeaway from a government perspective is that, when faced with the dilemma of how to treat equally legitimate municipalities with different tourism prospects, a dual strategy is recommended. Support should be prioritized for established destinations to ensure overall tourism success. Meanwhile, emerging destinations can evolve into specialized tourism spots, and fostering this development involves supporting their agglomeration needs to strengthen supply chain links. For that, a bottom-to-top policy that assesses the local agents' role and the environment's institutional quality would be recommended.

Statistical support for within-fixed-effects modeling also highlights the role of local context. Despite controlling municipalities' unique and non-variable features, future studies would benefit from qualitatively examining municipal individual trajectories.

Notwithstanding its contributions, this study also presents limitations. Given the data shape, with a high number of individuals and few measurements over time, it does not aim to establish causal relationships or argue for long-run cointegration. Also, although we extensively searched for proxies of tourism drivers, not all influencing factors have available data, such as safety, local tourism governance, and tourism service prices, to name a few. This limitation may expose the study to omitted variable bias.

CRediT authorship contribution statement

Maurício Ragagnin Pimentel: Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Melise de Lima Pereira:** Writing – review & editing, Visualization, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

The authors express their gratitude to Pelotas Federal University for a post-doctoral fellowship supported with internal resources. We also acknowledge the financial support from the Paraná Federal University and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code Graduate Support Program (PROAP). Moreover, we praise https://basedosdados.org/ for making much of the data used in this research more easily accessible.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.annale.2025.100200.

References

Agyeiwaah, E., & McKercher, B. (2025). Developing a thriving domestic tourism sector in emerging economies: A horizon 2050 paper. *Tourism Review, 80*(1), 28–38. https://doi.org/10.1108/TR-11-2023-0816

Antonakakis, N., Dragouni, M., Eeckels, B., & Filis, G. (2017). The Tourism and economic growth enigma: Examining an ambiguous relationship through multiple prisms. *Journal of Travel Research, 58*(1), 3–24. https://doi.org/10.1177/0047287517744671 (Original work published 2019)

Assaf, A. G., & Tsionas, M. (2018). Changing the basics: Toward more use of quantile regressions in hospitality and tourism research. *International Journal of Hospitality Management, 72*, 140–144. https://doi.org/10.1016/j.ijhm.2018.01.001

Bai, J., Choi, S. H., & Liao, Y. (2021). Feasible generalized least squares for panel data with cross-sectional and serial correlations. *Empirical Economics, 60*, 309–326. https://doi.org/10.1007/s00181-020-01977-0

Baltagi, B. H. (2008). *Econometric analysis of panel data*. Chichester: John Wiley & Sons Ltd.

Bernini, C., & Pellegrini, G. (2013). Is subsidizing tourism firms an effective use of public funds? *Tourism Management, 35*, 156–167. https://doi.org/10.1016/j.tourman.2012.06.012

Brida, J. G., Cortes-Jimenez, I., & Pulina, M. (2016). Has the tourism-led growth hypothesis been validated? A literature review. *Current Issues in Tourism, 19*(5), 394–430. https://doi.org/10.1080/13683500.2015.1073234

Brida, J. G., Lanzilotta, B., Pereyra, J. S., & Pizzolón, F. (2013). A nonlinear approach to the tourism-led growth hypothesis: The case of the MERCOSUR. *Current Issues in Tourism, 18*(7), 647–666. https://doi.org/10.1080/13683500.2013.802765

Brouder, P., & Eriksson, R. H. (2013). Tourism evolution: On the synergies of tourism studies and evolutionary economic geography. *Annals of Tourism Research, 43*, 370–389. https://doi.org/10.1016/j.annals.2013.07.001

Çağlayan, E., Şak, N., & Karymshakov, K. (2012). Relationship between tourism and economic growth: A panel granger causality approach. *Asian Economic and Financial Review, 2*(5), 591–602.

Capone, F., & Boix, R. (2008). Sources of growth and competitiveness of local tourist production systems: An application to Italy (1991–2001). *The Annals of Regional Science, 42*(1), 209–224. https://doi.org/10.1007/s00168-007-0133-7

Centinaio, A., Comerio, N., & Pacicco, F. (2023). Arrivederci! An analysis of tourism impact in the Italian provinces. *International Journal of Hospitality & Tourism Administration, 24*(4), 563–589. https://doi.org/10.1080/15256480.2021.2025187

Croissant, Y., & Millo, G. (2008). Panel data econometrics in R: The plm package. *Journal of Statistical Software, 27*(2), 1–43. https://doi.org/10.18637/jss.v027.i02

Dragičević, D. (2024). A bibliometric examination of domestic tourism literature: Unveiling research patterns and trends. *International Journal of Tourism Research, 27*, 139–149. https://doi.org/10.20867/thi.27.23

Eluwole, K. K., Bekun, F. V., & Lasisi, T. T. (2022). Fresh insights into tourism-led economic growth nexus: A systematic literature network analysis approach. *Asia Pacific Journal of Tourism Research, 27*(4), 374–410. https://doi.org/10.1080/10941665.2022.2075775

Eugenio-Martin, J. L., Martín Morales, N., & Scarpa, R. (2004). Tourism and economic growth in Latin American countries: A panel data approach. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.504482

Eurostat. (2023). *Tourism satellite accounts in Europe*. https://doi.org/10.2785/7794

Fox, J., & Weisberg, S. (2019). *An R companion to applied regression* (3rd ed.). Thousand Oaks, CA: Sage https://www.john-fox.ca/Companion/.

Gan, J. E., Lim, J. P., Trupp, A., & Poon, W. C. (2024). State intervention and tourism business resilience: Exploring firm-level crisis responses. *Annals of Tourism Research Empirical Insights, 5*(2), Article 100142. https://doi.org/10.1016/j.annale.2024.100142

Hsiao, C. (2014). *Analysis of panel data*. Cambridge University Press. https://doi.org/10.1017/CBO9781139839327

Koenker, R. (2025). *Quantreg: Quantile Regression*. https://doi.org/10.32614/CRAN.package.quantreg. R package version 6.1.

Nunkoo, R., Seetanah, B., Jaffur, Z. R. K., Moraghen, P. G. W., & Sannassee, R. V. (2020). Tourism and economic growth: A meta-regression analysis. *Journal of Travel Research, 59*(3), 404–423. https://doi.org/10.1177/0047287519844833

Pegas, F. D. V., Weaver, D., & Castley, G. (2015). Domestic tourism and sustainability in an emerging economy: Brazil's littoral pleasure periphery. *Journal of Sustainable Tourism, 23*(5), 748–769. https://doi.org/10.1080/09669582.2014.964372

Perles-Ribes, J. F., & Moreno-Izquierdo, L. (2024). Testing the tourism-led growth hypothesis: A nonsensical exercise? *European Journal of Tourism Research, 38*, 3817. https://doi.org/10.54055/ejtr.v38i.3637

Pfaff, B. (2008). *Analysis of integrated and cointegrated time series with R* (2nd ed.). New York: Springer. ISBN 0–387–27960-1.

Po, W. C., & Huang, B. N. (2008). Tourism development and economic growth: A nonlinear approach. *Physica A: Statistical Mechanics and its Applications, 387*(22), 5535–5542. https://doi.org/10.1016/j.physa.2008.05.037

QGIS.org. (2024). *QGIS geographic information system desktop 3.16.10*. QGIS Association. http://www.qgis.org.

R Core Team. (2024). R: A language and environment for statistical computing. In *R v4.3.2*. Vienna, Austria: R Foundation for Statistical Computing. https://www.R-project.org/.

Ragagnin Pimentel, M., & Pereira, M. D. L. (2021). Tourism spatial distribution in Brazil: A recent assessment using thematic cartography. *Journal of Hospitality and Tourism Insights, 4*(3), 318–334. https://doi.org/10.1108/JHTI-03-2019-0051

Raifu, I. A., & Afolabi, J. A. (2024). Revisiting the tourism-led growth hypothesis: Fresh evidence from the world's top ten tourist destinations. *Asian Economics Letters, 5*(1). https://doi.org/10.46557/001c.91077

Ribeiro, L. C. D. S., Santos, F. R. D., De Moura, F. R., Montenegro, R. L. G., & Freitas, E. E. (2024). Determinants of tourist employment in Brazilian microregions: A dynamic panel data approach. *Journal of Regional Science, 64*(5), 1622–1646. https://doi.org/10.1111/jors.12723

Romão, J., & Nijkamp, P. (2018). Spatial impacts assessment of tourism and territorial capital: A modeling study on regional development in Europe. *International Journal of Tourism Research, 20*(6), 819–829. https://doi.org/10.1002/jtr.2234

Romão, J., & Nijkamp, P. (2019). Impacts of innovation, productivity and specialization on tourism competitiveness: A spatial econometric analysis on European regions. *Current Issues in Tourism, 22*(10), 1150–1169. https://doi.org/10.1080/13683500.2017.1366434

Sigmund, M., & Ferstl, R. (2021). Panel vector autoregression in R with the package panelvar. *The Quarterly Review of Economics and Finance Management, 72*, 140–144. https://doi.org/10.1016/j.qref.2019.01.001

Santos, G. E., & de, O. (2023). Turistas brasileiros: Quem são? Onde vivem? Quanto consomem? *Revista Acadêmica Observatório de Inovação do Turismo, 17*(2), 66–91. https://doi.org/10.61564/raoit.v17n2.7491

Su, H., Li, S., Wen, T., & Liang, Y. (2025). The impact of industry network strength, centrality and heterogeneity on entrepreneurial performance in the hospitality and tourism: Perspectives on innovation and leadership. *International Journal of Hospitality Management, 127*, Article 104088. https://doi.org/10.1016/j.ijhm.2025.104088

Sun, Y., Lin, W., Sun, M., & Chen, P. (2024). Spatiotemporal evolution and driving forces of tourism economic resilience in Chinese provinces. *Sustainability, 16*(18), 8091. https://doi.org/10.3390/su16188091

Sun, Z., Liu, L., Pan, R., Wang, Y., & Zhang, B. (2025). Tourism and economic growth: The role of institutional quality. *International Review of Economics and Finance, 98*, Article 103913. https://doi.org/10.1016/j.iref.2025.103913

UN Tourism. (2025). Key tourism statistics. https://www.e-unwto.org/toc/unwtotfb/current (accessed 28 February 2025).

Wei, X., Qu, H., & Ma, E. (2013). Modelling tourism employment in China. *Tourism Economics, 19*(5), 1123–1138. https://doi.org/10.5367/te.2013.0249

WTTC. (2021). *Domestic tourism: Importance and economic impact*. World Travel and Tourism Council. https://wttc.org/Portals/0/Documents/Reports/2018/Domestic%20Tourism-Importance%20Economic%20Impact-Dec%2018.pdf?ver¼2021-02-25-182514-683.

Yang, Y., & Fik, T. (2014). Spatial effects in regional tourism growth. *Annals of Tourism Research, 46*, 144–162. https://doi.org/10.1016/j.annals.2014.03.007

Zeileis, A. (2004). Econometric computing with HC and HAC covariance matrix estimators. *Journal of Statistical Software, 11*(10), 1–17. https://doi.org/10.18637/jss.v011.i10

Zeileis, A., & Hothorn, T. (2002). Diagnostic checking in regression relationships. *R News, 2*(3), 7–10. https://CRAN.R-project.org/doc/Rnews.