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Assessing the Tourism-Led Inflation Hypothesis: An Empirical Framework

Abstract

The tourism-led economic growth hypothesis is one of the most investigated concepts in tourism economics literature. It has been verified by many empirical studies so far. Since the concept of growth-driven inflation belongs to the fundamentals of macroeconomic theory, one could reasonably assumeinflation can also be led by tourism development. The question, however, is through what mechanisms could it be adequately identified and assessed. If anywhere, tourism-led inflation could first and foremost be perceived in a country with a significant economic impact of tourism. We take one of such countries as a case study and use the structural vector autoregression methodology to examine tourism-led inflation. The presented empirical framework may also serve as a role model applicable to other countries and regions.

Keywords: inflation, tourism, TLGH, SVAR

1. Introduction

The tourism-led economic growth hypothesis claims that tourism development can induce GDP growth, which has been verified in several empirical studies (for example, Castro-Nuno et al., 2013). Following the Phillips curve, one of the workhorse models in macroeconomics, economic growth can induce a rise in prices both in the short and long run (see, for instance, Romer, 2012). Hence, the simple corollary would state that increased tourism activity should also induce inflationary pressure. It is logical to expect that, but since there have been few empirical efforts, this result seems far from rigorous scientific verification.

While the most frequently used methodological apparatus for the verification of the tourism-led economic growth hypothesis is testing for Granger causality (see, for instance, Brida et al., 2014; Pablo-Romero & Molina, 2013), it seems that this simple methodological approach does not correctly work in the case of the tourism-led inflation. The reason could be the persistent intention to find a simple relation between tourist arrivals and the growth of the overall price level. Although a clear, direct causality from tourism to the general price level could not be evident at first glance, it does not mean there is no hidden underlying mechanism revealing the tourism-inflation nexus. The issue is more complex if the specificities of a particular country are considered. Generally, it is hard to believe that tourism activity can directly induce growth in overall consumer prices. However, it is also not easy to abandon the idea that tourism activity can influence specific subcategories of consumer price index. What subcategories should be considered depends on the specificities of a particular country.

In searching for answers, one should depart from a simple assertion that tourism characteristic activities (as defined by the tourism satellite account methodology) could significantly transmit inflationary pressure from

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tourism demand to the general price level. The question is whether tourism activity can influence the prices in tourism characteristic industries and, if so, to what extent the price growth in each tourism characteristic industry impacts the dynamics of the total consumer price index. Following this conceptualization, this paper aims to test the hypothesis of tourism-led inflation while identifying underlying mechanisms through which the tourism-inflation nexus could be adequately assessed.

We approach this objective by applying the structural vector autoregression methodology. Our case study is Croatia, a small Mediterranean country whose national economy is heavily impacted by tourism development. Tourism activity generates as much as 15% of Croatian GDP, making Croatia a perfect example for investigating tourism inflationary potential.

We have selected the Harmonized Index of Consumer Prices as the main indicator of the general price level in Croatia. Since Croatia is a member of the European Union and Eurozone, the Harmonized Index of Consumer Prices, a consumer price index compiled according to a methodology that has been harmonized across EU member states, is the most representative and the most transparent indicator of the general price level in Croatia. We have also supplemented the main indicator with a set of its sub-categories and, following recent empirical findings, with a set of control variables including oil price, foreign and domestic GDP, and the Harmonized Index of Consumer Prices in the Eurozone as Croatia's primary trade partner. Our main explanatory variable is the indicator of nights spent at tourist accommodation establishments in Croatia. It is supposed to represent tourism demand. Although it could be argued to which extent this indicator can be a good approximator of the overall tourism demand, no one can deny its suitability for the representation of tourism demand dynamics, and tourism demand dynamics is precisely in the focus of our analysis.

For the sake of research transparency, we have used the data available free of charge at the European Statistical Office (EUROSTAT) website. Therefore, our analysis is completely reproducible, and its results are transparent and checkable.

As for the methodology, we have decided to use structural vector autoregression modelling since we believe this technique is modern and reasonably suitable for the analysis of the complex network of interrelationships among different sectors of a small open economy (see, for example, Sato et al., 2011; Fernández et al., 2017; Bukovšak et al., 2018) and thereby different segments of the consumer price index.

The rest of the paper is organized as follows. The following section presents the theoretical framework accompanied by a brief review of the literature, which was shown to be very scarce. In the theoretical framework, we have tried to depict a complex mechanism of tourism demand's impact on the general price level. As already noted, not many papers deal with this issue theoretically or empirically. We managed to find some and present them briefly here. This is followed by describing our data, methodology, and empirical results. The paper ends with a conclusion section discussing the main findings.

2. Theoretical framework and a brief literature review

Inflation is a continuous increase in the general price level for goods and services in a national economy over a given period (Lim & Sek, 2015). It corresponds to a reduction in the value of money, as each currency unit can buy fewer goods and services, implying an increased cost of living. The consumer price index, often abbreviately noted as CPI, is the most widely used indicator of inflation, and it measures the changes in the price of a basket of goods and services purchased by households.

Various causes of inflation have been detected in the literature, with the growth in the money supply or a decrease in the quantity of goods being supplied commonly cited as the most important (Lim & Sek, 2015). Changes in interest rates and government expenditures may cause increased money supply, thereby inducing aggregate demand to grow faster than aggregate supply. On the other hand, higher costs, such as an actual increase in transport prices, could lead to a shortage of goods, causing supply-side inflationary pressure.

Regarding tourism-led inflation, from a purely theoretical point of view, its mechanism should start with increased demand for domestic goods and services induced by tourism growth. Since tourists bring additional financial resources to a visiting area, increased demand leads to higher prices of some goods and services. Increased demand also accentuates the need for higher supply, thereby positively affecting the employment rate and wages of the residents. This enhances the purchasing power of residents, contributing to a more significant consumption of goods and services and thereby causing additional inflationary effects (Shaari et al., 2018). The extent to which the residents' purchasing power increases and whether this increase is comparable to the rise in prices primarily depends on the elasticity of supply (Mihalic, 2014). Besides the rise in the prices of goods and services, tourism development can also affect real estate demand. It may lead to a substantial increase in land and house prices, as demonstrated by Paramati and Roca (2019) on a panel of 20 OECD countries. Rising house prices may prompt a substantial inflationary effect (Stevenson, 2000; Korkmaz, 2020). Since housing becomes less affordable for residents, it may force them to move from tourist areas, where more and more properties will be used for tourism purposes (Kariyapol & Agarwal, 2020; Malhotra & Van Alstyne, 2014; Henkens et al., 2007). This final step could lead to another cycle of price growth. Although Vanhove (2005), for example, suggested that this is a purely localized effect, limited to the area with an increased tourism demand, and thus does not substantially contribute to the general price growth at the national level, the rare empirical studies suggest that inflationary effects of tourism are, at least, heterogeneous.

The empirical studies investigating the effect of tourism demand on inflation in a destination or country are mostly survey-based and focused on residents' perceptions (e.i., Sanchez-Fernandez et al., 2019; Peters et al., 2018) or simulated in Computable General Equilibrium (CGE) setting (see, for example, Dwyer et al., 2000). Studies using objective measures to assess the impact of tourism on inflation are incredibly scarce. For instance, Shaari et al. (2018) investigated tourism-led inflation in Malaysia. The authors used the Autoregressive Distributed Lag (ARDL) approach to assess the impact of tourism on inflation in both the short and long run. Their results showed that tourism significantly determines short-term and long-term inflation. Tang (2011) applied the vector error-correction model (VECM) to determine the causal relationship between crime rate, tourist arrivals, inflation and unemployment in Malaysia and concluded that tourist arrivals are an essential factor in explaining the variation in inflation. Tkalec and Vizek (2016) investigated 13 member states of the EU and two candidate countries. Using panel data analysis, they concluded that tourism activity can induce growth of prices in tourism characteristic industries, i.e., recreation and culture, and hotels and restaurants. They also argued that the effect of tourism activity on prices is not a regional phenomenon but a national one that affects the whole economy, at least in the countries that heavily rely on tourism.

On the other hand, Naidu et al. (2017) used the ARDL model to examine the relationship between urbanization, inflation and tourism output in the Fiji Islands. The results indicated that tourism output does not significantly impact inflation in the Fiji Islands in the long run. Espinet et al. (2011) used a microeconomic perspective. They surveyed the retail prices of 149 products in 45 tourism and non-tourism jurisdictions in Catalonia, Spain. They concluded that the prices in tourism jurisdictions are not significantly higher than those in non-tourism ones. They explain this result by the geographical proximity of tourism and non-tourism jurisdictions and the overall popularity of destinations amongst tourists.

3. Data and methodology

Our analysis pivots around the Harmonized Index of Consumer Prices (*HICP* hereinafter) as an indicator of the general price level in Croatia and around a set of its sub-categories: food including alcohol and tobacco

(*FOOD* hereinafter), furnishing, household equipment and routine household maintenance (*FURN* hereinafter), package holidays (*HOLIDAYS* hereinafter), recreational and cultural services (*RECR* hereinafter), restaurants and hotels (*REST* hereinafter), and transport services (*TRANS* hereinafter). All these variables are expressed in index form (2015=100). The choice of sub-categories is determined by the tourism satellite account methodology, referring the sub-categories to tourism-characteristic activities that typically produce tourism-characteristic products. Most of the included sub-categories are typically recommended by tourism satellite account methodology (United Nations et al., 2010). The FURN sub-category (i.e. furnishing, household equipment and routine household maintenance) is a specificity related to Croatia. Since the supply of accommodation in Croatia is dominated by rooms and apartments owned by households who rent them via popular booking websites during the summer months, the end of each tourist season is the beginning of a small investment cycle involving the renovation of renting facilities. This increases the demand for furnishing, household equipment and routine household maintenance in the quarters outside the primary tourist season. Doing a preliminary analysis of the Croatian tourism sector, we have recognized this sub-category as a potentially critical factor of transmitting inflationary impulses from tourism demand to the overall price level.

Our main goal is to examine the influence of tourism demand, measured as nights spent at tourist accommodation establishments in Croatia (*TOUR* hereinafter), on each of the selected tourism-related price sub-categories. As control variables, we also assess oil prices in the world market (Europe Brent post price; *OIL* hereinafter), the corresponding price indices for the euro area (*PRICE_EA* hereinafter), as well as Croatian and the euro area GDP (chain-linked volume in index form (2015=100), *GDP_CRO* and *GDP_EA*, respectively). All assessed variables are seasonally adjusted and in quarterly frequencies from 2003Q1 to 2019Q4. The choice of period is also determined by the specificity related to Croatia and the COVID-19 pandemic. Since it suffered the consequences of the War of Independence in the 1990s, tourism in Croatia began to reemerge in the 2000s.

On the other hand, we were reluctant to include the period after 2019 due to the COVID-19 pandemic, which could distort the results and blur relevant conclusions. It should again be noted that all-time series are available free of charge on the European Statistical Office's website. Brief descriptions and labels of all variables in the dataset are given in Appendix.

For estimation purposes, we utilize a structural vector autoregression (SVAR) model of the following form:

$$\boldsymbol{A}_0\boldsymbol{Y}_t = \boldsymbol{A}_1\boldsymbol{Y}_{t-1} + \boldsymbol{A}_2\boldsymbol{Y}_{t-2} + \cdots + \boldsymbol{A}_p\boldsymbol{Y}_{t-p} + \boldsymbol{\varepsilon}_t , \quad (1)$$

where $\boldsymbol{Y}_t = [OIL_t \; GDP\_EA_t \; PRICE\_EA_t \; GDP\_CRO_t \; PRICE\_CRO_t \; TOUR_t]'$ is a vector of examined variables, $\boldsymbol{A}_0$ to $\boldsymbol{A}_p$ are matrices of structural parameters (representing the interrelationships among the examined variables through time: from a contemporary effect up to a lagged effect with a lag of p quarters), and $\boldsymbol{\varepsilon}_t$ is a vector of i.i.d. structural shocks. For simplicity, the constant term is not included in equation (1), but it is included in the estimated models.

We estimate a total of seven SVAR models. Each of these seven models considers one Croatian and the Eurozone price indicator ($PRICE\_CRO_t$ and $PRICE\_EA_t$). Three foreign variables (OIL_t GDP_EA_t and $PRICE\_EA_t$) enter the model as a reflection of the fact that Croatia is a small open economy, so its inflation generating process is strongly influenced by cost-push and demand-pull factors on the global market. For example, Globan et al. (2016) find that more than half of Croatian inflation is imported from abroad. Similarly, Vizek and Broz (2009) confirm that inflation in main Croatian trading partners significantly governs price changes on the domestic market.

Having in mind the Croatian dependence on foreign inflation determinants, we divide the vector of system variables into two distinctive blocks:

$$\boldsymbol{Y}_t = [\boldsymbol{Y}_{1,t}, \boldsymbol{Y}_{2,t}]', \quad (2)$$

where $\boldsymbol{Y}_{1,t}$ is the foreign, and $\boldsymbol{Y}_{2,t}$ is the domestic block of variables. To be specific, the stated blocks are given as $\boldsymbol{Y}_{1,t} = (OIL_t \;\; GDP\_EA_t$ and $PRICE\_EA_t)$ and $\boldsymbol{Y}_{2,t} = (GDP\_CRO_t \;\; PRICE\_CRO_t$ and $TOUR_t)$.

The SVAR model in (1) can be presented as:

$$\boldsymbol{A}_i \, \boldsymbol{Y}_t = \boldsymbol{\varepsilon}_t \,, \tag{3}$$

where the matrices of structural parameters $\mathbf{A}_i$ are as follows:

$$\boldsymbol{A}_i = \begin{bmatrix} A_{11}^i & A_{12}^i \\ A_{21}^i & A_{22}^i \end{bmatrix}, \mathrm{i} = 0, \ldots, p. \tag{4}$$

We impose the block exogeneity restriction via $\boldsymbol{A}_{12}^i = 0$, stating that euro area shocks can influence the Croatian economy, but a vice-versa relationship is not plausible. This type of restriction has a strong tradition in SVAR literature (Zha, 1999), so its relevance rapidly grew until it recently became the workhorse macro-econometric model for small open economies. The only way to impose the block exogeneity restriction (obviously valid for small open economies) is through an SVAR setup. This is precisely why, for instance, ARDL modelling is unsuitable for this study.

Our analysis starts with estimating a reduced VAR model, obtained by multiplying (1) by $\boldsymbol{A}_0^{-1}$:

$$\boldsymbol{Y}_t = \boldsymbol{B}_1 \boldsymbol{Y}_{t\text{-}1} + \boldsymbol{B}_2 \boldsymbol{Y}_{t\text{-}2} + \cdots + \boldsymbol{B}_p \boldsymbol{Y}_{t\text{-}p} + \boldsymbol{u}_t, \tag{5}$$

where $\boldsymbol{B}_1$, $\boldsymbol{B}_2$, ... $\boldsymbol{B}_p$ are parameter matrices of the reduced-form VAR model, and $\boldsymbol{u}_t$ is a vector of i.i.d. error terms. Lütkepohl (2005) shows that matrices $\boldsymbol{B}_i$ keep the block exogeneity restriction:

$$\boldsymbol{B}_i = \begin{bmatrix} B_{11}^i & 0 \\ B_{21}^i & B_{22}^i \end{bmatrix}, i = 1, \ldots, p\,. \tag{6}$$

However, the reduced-form VAR (equation 5) has two essential deficiencies. First, it does not allow for contemporary relationships between the variables at hand (as opposed to the SVAR model in equations 1-4). Second, reduced-form error terms will, in general, be mutually correlated. Since we want to extract "pure" tourism shocks and simulate their effects on the price changes of various goods and services, it is vitally important to identify mutually orthogonal shocks. We therefore identify the underlying structural shocks $\boldsymbol{\varepsilon}_t$ (mutually orthogonal) from the reduced-form disturbances $\boldsymbol{u}_t$ using a standard SVAR identification strategy (Lütkepohl & Kratzig, 2004, p. 162):

$$\boldsymbol{A}_0 \boldsymbol{u}_t = \boldsymbol{B} \boldsymbol{\varepsilon}_t \,, \tag{7}$$

Or, written in more detail:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_{OIL_t} \\ u_{GDP\_EA_t} \\ u_{PRICE\_EA_t} \\ u_{GDP\_CRO_t} \\ u_{PRICE\_CRO_t} \\ u_{TOUR_t} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{bmatrix} \begin{bmatrix} \varepsilon_{OIL_t} \\ \varepsilon_{GDP\_EA_t} \\ \varepsilon_{PRICE\_EA_t} \\ \varepsilon_{GDP\_CRO_t} \\ \varepsilon_{PRICE\_CRO_t} \\ \varepsilon_{TOUR_t} \end{bmatrix} \tag{8}$$

To obtain a precisely identified SVAR system, $K^2 + \frac{K \cdot (K-1)}{2}$ are needed, where K is the number of system variables (Lütkepohl & Kratzig, 2004, p. 162). In model (8), we impose $6^2 + \frac{6 \cdot 5}{2}$ =51 restrictions and the system are precisely identified.

A short explanation should also be provided on ordering variables in the model (8). Oil prices are determined through supply and demand interactions on the global market and are entirely independent of other euro area variables and domestic (Croatian) ones. However, they affect all other system variables (foreign and domestic) contemporaneously and with a time lag. Therefore, *OIL* is the first variable in our preferred ordering. The second variable in the foreign block is *GDP_EA*, affecting *PRICE_EA* and all domestic variables contemporaneously and through the lag structure. The same restriction is also applied in the domestic block, i.e., *GDP_CRO* is ordered before *PRICE_CRO* (see, for example, Globan et al., 2016; Sato et al., 2011). The most endogenous variable in the model is *TOUR* (ordered last) since tourism demand is highly dependent on all variables that were given priority in the established ordering.

Results of the Augmented Dickey-Fuller (ADF) unit root test are presented in Appendix A. Since all variables in the examined dataset are nonstationary in levels, all SVAR specifications are estimated in log differences (mimicking growth rates) to ensure stationarity and circumvent the spurious regression problem. It has to be mentioned that all examined SVAR specifications were tested for cointegration using the Johansen technique. Still, we could not robustly identify a unique cointegration vector at the 5% significance level for any of the examined models. In that sense, it was logical to investigate only the short-run relationship among the assessed variables, using SVAR models with variables in (stationary) log differences.

4. Results

For each SVAR specification, we assess three methodological approaches: Granger causality testing, impulse response functions and forecasting error variance decomposition. The first tool allows us to examine whether past information about the dynamics of tourism demand can help us explain current inflation rates. In other words, we assess tourism demand as a potential leading indicator by testing the joint significance of its lagged values in explaining price changes in tourism-related goods and services.

On the other hand, impulse response functions and variance decompositions offer us a dynamic intertemporal insight into the responses of price changes (in quarter t) to structural shocks in tourism demand (in period t-k). We are interested in examining whether price changes react to tourism demand shocks, when the effect occurs, and how persistent it is.

Each SVAR specification is estimated for a lag order chosen based on the Schwarz information criterion, and subsequent lags were added if the Lagrange multiplier (LM) test detected significant autocorrelation of the 4th order at the 5% significance level. The final leg lengths, along with the results of Granger causality tests for the seven estimated SVAR models (each one comprising one of the six examined price subcategories, plus the seventh model comprising the overall HICP as the target variable), are given in Table 1.

We report only the results for the null hypothesis of non-causality running from TOUR to a particular price category. All other results are omitted for the sake of brevity.

Table 1
Granger causality test results

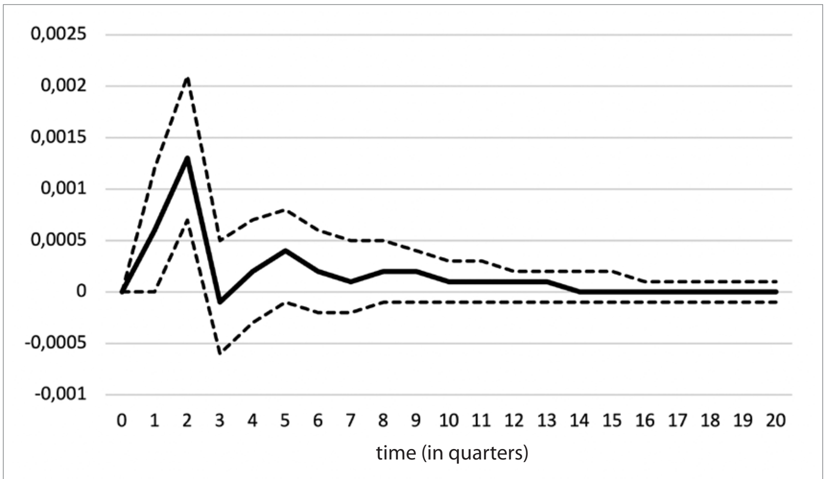
Causal relationship	Lag order	p-value
TOUR → FOOD_CRO	1	0.8766
TOUR → FURN_CRO	2	0.0013
TOUR → HOLIDAYS_CRO	2	0.4319
TOUR → RECR_CRO	1	0.6201
TOUR → REST_CRO	1	0.1210
TOUR → TRANS_CRO	1	0.4603
TOUR → HICP_CRO	2	0.6849

Among the seven considered price (sub)categories, *TOUR* Granger causes only *FURN_CRO* at the conventional 5% significance level. Tourism demand can, therefore, be utilized as a leading indicator of *FURN_CRO*.

No significant evidence of Granger-causality running from *TOUR* towards the aggregate inflation rate in Croatia (*HICP_CRO*) was found.

In the following step, we present the impulse response function for the significant Granger-causal relationship in Table 1.

Figure 1
The impulse response function of FURN_CRO (shock in TOUR)



Note. Dashed lines correspond to the 95% confidence interval.

A one standard deviation shock in *TOUR* effectuates a short-lived but significant[1] increase of *FURN_CRO*. The assessed impact is the strongest in the second quarter after the shock (a rise of 0.13% in *FURN_CRO*), after which the effect fades away to zero very quickly.

Finally, we also assess the forecasting error variance decomposition of *FURN_CRO* in the same model. The results are presented in Table 2.

Table 2
Variance decomposition of FURN_CRO

Forecast horizon	OIL	GDP_EA	FURN_EA	GDP_CRO	FURN_CRO	TOUR
1	0.00	0.02	0.02	0.01	0.96	0.00
4	0.04	0.10	0.08	0.05	0.62	0.11
8	0.04	0.17	0.17	0.04	0.49	0.09
12	0.04	0.19	0.18	0.04	0.47	0.09
16	0.04	0.19	0.18	0.04	0.46	0.09
20	0.04	0.19	0.18	0.04	0.46	0.09

Table 2 reveals that *TOUR* accounts for 9% of the forecast error variance of *FURN_CRO* in the long run (20 quarters after the initial shock).

Further on, we assess an extension of the starting SVAR model, where the foreign and domestic blocks of variables are given as $\boldsymbol{Y}_{1,t} = (OIL_t\ GDP\_EA_t$ and $HICP\_EA_t)'$ and $\boldsymbol{Y}_{2,t} = (GDP\_CRO_t\ FURN\_CRO_t\ HICP\_CRO_t$ and $TOUR_t)'$ (in that particular order), and the block exogeneity restrictions are determined just as in model (3). This specification serves as a robustness check to corroborate that *TOUR* indeed feeds into *FURN_CRO*,

[1] A 95% confidence interval not comprising zero translates to a statistically significant effect at the 5% significance level.

and we are interested in assessing a potentially relevant indirect effect of *TOUR* on the aggregate inflation rate in Croatia (*HICP_CRO*). Statistically significant Granger-causal relationships are presented in Table 3.

Table 3
Granger causality test results (robustness check)

Causal relationship	Lag order	p-value
TOUR → *FURN_CRO*	3	0.0078
FURN_CRO → *HIC_CRO*	3	0.0386
TOUR → *HICP_CRO*	3	0.0727

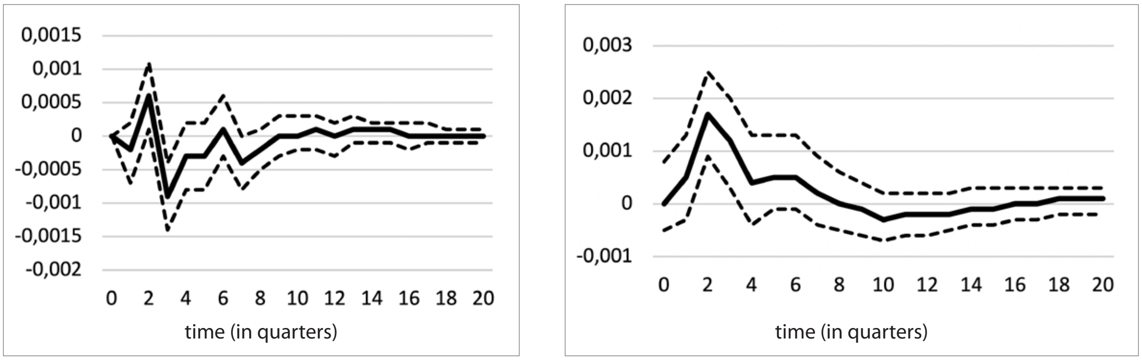
A glance at Table 3 reveals that *TOUR* does not directly feed into *HICP_CRO*. Nevertheless, it does initiate a two-step transmission mechanism. Namely, *TOUR* Granger causes *FURN_CRO* at the conventional significance level. In the subsequent step of the hereby identified mechanism, *FURN_CRO* then Granger-causes *HICP_CRO*.

We also report the impulse response functions for both steps of the just revealed price transmission mechanism (Figure 2).

Figure 2
Impulse response functions (robustness check)

a) The impulse response function of *FURN_CRO* (shock in *TOUR*)

b) Impulse response function of *HICP_CRO* (shock in *FURN_CRO*)



Note. Dashed lines correspond to the 95% confidence interval.

The left panel of Figure 2 identifies a significant increase of *FURN_CRO* (by 0.06%) two quarters after a one standard deviation shock in *TOUR*, while the right panel points to an analogous effect of *FURN_CRO* on *HICP_CRO* (an increase of 0.17% after two quarters).

Finally, the explanatory power of *TOUR* concerning *FURN_CRO*, as well as the importance of *FURN_CRO* for explaining *HICP_CRO*, is captured by the variance decomposition results depicted in Table 4.

Table 4
Variance decomposition (robustness check)

Target variable: FURN_CRO							
Forecast horizon	*OIL*	*GDP_EA*	*HICP_EA*	*GDP_CRO*	*FURN_CRO*	*HICP_CRO*	*TOUR*
1	0.04	0.05	0.01	0.02	0.89	0.00	0.00
4	0.16	0.05	0.01	0.09	0.59	0.04	0.06
8	0.26	0.10	0.02	0.06	0.47	0.03	0.05
12	0.26	0.10	0.02	0.06	0.47	0.04	0.05
16	0.26	0.10	0.02	0.06	0.46	0.04	0.05
20	0.26	0.11	0.02	0.06	0.46	0.04	0.05

Table 4 *(continued)*

Target variable: HICP_CRO							
Forecast horizon	*OIL*	*GDP_EA*	*HICP_EA*	*GDP_CRO*	*FURN_CRO*	*HICP_CRO*	*TOUR*
1	0.39	0.00	0.15	0.03	0.00	0.43	0.00
4	0.39	0.01	0.12	0.03	0.12	0.27	0.06
8	0.40	0.03	0.11	0.03	0.12	0.24	0.06
12	0.40	0.04	0.11	0.03	0.12	0.24	0.06
16	0.40	0.04	0.11	0.03	0.12	0.23	0.06
20	0.40	0.04	0.11	0.03	0.12	0.23	0.06

As shown in Table 4, *TOUR* accounts for a non-negligible 5% of the forecast error variance of *FURN_CRO* in the long run (20 quarters ahead). Although this share may seem small at first sight, one should bear in mind that the analogous shares of *HICP_CRO* and *HICP_EA* are smaller than that, and the share of Croatian GDP as a critical indicator of domestic demand is only slightly higher (6%).

Similarly, *FURN_CRO* explains as much as 12% of the forecast error variance of *HICP_CRO*, more than any other assessed variable except *OIL* and itself.

5. Discussion and conclusion

To the best of our knowledge, our paper represents the first attempt at an inquiry into the tourism-inflation nexus in a systemic empirical framework. Besides analyzing the direct relationship between tourism and the overall price level, we have also tried to identify specific channels through which tourism can influence the total consumer price index dynamics. Using structural vector autoregression, we have modelled a complex network of interrelationships among oil prices, foreign consumer prices, foreign GDP, domestic GDP, tourist overnight stays and domestic consumer prices. Furthermore, we have analyzed several sub-categories of the total consumer price index, assuming their relevance in explaining the tourism-prices mechanism. As discussed in the introduction, it is hard to believe that tourism could directly impact the general price level. However, it is also reasonable to assume that tourism can influence some sub-categories of the overall consumer price index, indirectly affecting the general price level. Since the tourism satellite account methodology proposes tourism characteristic activities (industries) as the most relevant sectors for tourism analysis, we have decided to use this fact in our investigation.

Moreover, we have also decided to respect the most critical specificity of the country under investigation. A careful preliminary analysis of the Croatian economy has shown that, although it is not a part of the core collection of tourism activities (industries) defined by tourism satellite account methodology, the activity of furnishing, household equipment and routine household maintenance should be included in the analysis. The main reason is the structure of the Croatian accommodation supply. Since it is dominated by rooms and apartments owned by households renting them via popular booking websites during the summer months, the end of each tourist season is, therefore, the beginning of a small investment cycle involving the renovation of renting facilities, leading to the growth of demand for furnishing, household equipment and routine household maintenance in the quarters outside the primary tourist season.

Using three different methodological approaches in the structural vector autoregression framework, we have not found any direct relationship between tourism demand and the index of overall consumer prices. As stated before, such a finding is usually expected from a rational point of view. However, following our expectations, we have found a clear relationship between tourism demand and one significant sub-category of the overall index of consumer prices. Concerning the results of all three methodological approaches, the Croatian economy exhibits a clear relationship between the dynamics of tourism demand and the dynamics of prices of furnishing, household equipment and routine household maintenance. Moreover, the impulse response function analysis results state that this relationship is positive, meaning that an increase in tourism demand resulted in a short-lived but significant rise in prices of furnishing, household equipment and routine household maintenance. It happens at a time distance of two quarters.

It should be noted that this empirical finding is entirely in line with intuitive expectations. Since tourism in Croatia is characterized by a strong seasonality pattern, June, July, August, and September represent the peak months of tourist season each year, followed by months with very low tourism intensity. The first quarter of each year means the beginning of preparations for the new tourist season, which usually involves renovations of renting facilities.

Apart from already discussed, the second important finding of our analysis states that this inflationary impulse is consequently transmitted to the general price level. It is confirmed by the results of all three methodological approaches that the growth of prices of furnishing, household equipment and routine household maintenance can induce an increase in the overall consumer price index. It is no surprise since furnishing, equipment, and routine household maintenance account for approximately 5% of Croatia's official basket of goods and services. This means that a positive change of 2 percentage points in prices of furnishing, household equipment and routine household maintenance could add approximately 0.1 percentage points to the general inflation rate. It has an undeniable impact, as confirmed by the forecasting error variance decomposition analysis. Apart from the oil prices, furnishing prices, household equipment and routine household maintenance explain the largest share of variability in the Croatian harmonized index of consumer prices. This is an exact confirmation of its relevance in predicting the overall inflation rate in Croatia.

Regarding policy implications, the direct inflation induced by tourism activity is still not so problematic that the government would need to act with fiscal policy measures. However, as discussed in the theoretical framework section, it could start a vicious circle of price growth across different markets, including housing. Thus, our findings highlight the need to monitor tourism-induced inflation.

The main limitation of our study is its restriction to a particular country. It should be noted that the specific mechanism of tourism demand's indirect impact on the general price level, where the prices of furnishing, household equipment and routine household maintenance play the role of a mediator, is an endogenous specificity related to the Croatian tourism sector as well as the Croatian economy. It is questionable whether the exact mechanism can generally apply to other countries. However, we firmly believe we have successfully defined a general empirical framework of the tourism-inflation nexus. On the one hand, there are dynamics of tourism demand. On the opposite side, there are dynamics regarding the general price level. In-between is one or more specific sub-categories of total consumer price index. These sub-categories serve as the factors of transmission of inflationary impulses produced by the growth of tourism demand. This general pattern should be endogenously identifiable in each country with an enlarged share of tourism in GDP. The crucial question is which sub-categories of the total consumer price index significantly transmit tourism inflationary impulses. We believe it depends on the structure of the national economy and the structure of national tourism supply, i.e., dominant types of tourism. However, we also think that the search for the specific sub-category of the total consumer price index should start with the core collection of tourism characteristic activities (industries) defined by the tourism satellite account methodology. This collection includes visitor accommodation, food- and beverage-serving, passenger transport, transport equipment rental, travel agencies, cultural, and sports and recreational services. The tourism satellite account methodology also defines the category of country-specific tourism characteristic goods and services, which could contain all other economic activities (industries) specifically related to a particular country. Besides all predefined tourism characteristic activities (industries), these non-standard tourism characteristics (industries) could be critical for identifying a specific sub-category of the total consumer price index responsible for transmitting tourism inflationary impulses.

Another significant contribution of our paper is a pioneering attempt at discussing the validity of the tourism-led inflation hypothesis. We believe that we approach this topic employing a more profound consideration than has once been the case with the topic of the tourism-led economic growth hypothesis, which is still missing a solid theoretical background (for more information, see, for instance, Song & Wu, 2022). We present a solid framework which should serve as a role model applicable to other countries and regions. We hope our analysis will soon be reproduced in the case of different countries with a large share of tourism in their national economies. In those countries, other sub-categories of the total consumer price index likely play an essential role in transmitting inflationary impulses from tourism demand to the general price level. The leading candidates should always be the tourism characteristic activities defined by the tourism satellite account methodology. However, it could not be excluded that some other economic activities play the role of mediation. Future research should try to examine all possibilities.

Having all this in mind, we can conclude that assessing the impacts of tourism development on inflation is a complex but highly under-researched topic that warrants more attention from tourism scholars and practitioners. It is beyond doubt that this relevant topic deserves further investigation and a proper place in the ever-evolving landscape of tourism economics. It is crucial regarding the current situation in the world, characterized by intense inflationary pressure, which has not been recorded for more than 30 years. It is obvious that tourism does not play the most crucial role here, but its contribution should be monitored together with the contribution of other, more relevant factors. Assessing tourism's impact on inflation is a logical task for tourism scholars and researchers. Tourism certainly has a specific inflationary potential. The questions for further investigation are in which countries and to what extent it can be actualized.

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Appendix A

Variable labels and descriptions

Label	Description	Source
HICP_CRO	Croatian Harmonized Index of Consumer Prices (HICP) for Croatia, 2015. =100	Eurostat
FOOD_CRO	Croatian subcomponent of the HICP index, tracking food prices, including alcohol and tobacco, 2015. =100	
FURN_CRO	Croatian subcomponent of HICP index, tracking the prices of furnishing, household equipment and routine household maintenance, 2015.=100	
HOLIDAYS_CRO	Croatian subcomponent of HICP index, tracking the prices of package holidays, 2015. =100	
RECR_CRO	Croatian subcomponent of the HICP index, tracking the prices of recreational and cultural services, 2015. =100	
REST_CRO	Croatian subcomponent of the HICP index, tracking the prices of restaurants and hotels, 2015. =100	
TRANS_CRO	Croatian subcomponent of HICP index, tracking transport service prices, 2015. =100	
HICP_EA	EA Harmonized Index of Consumer Prices (HICP) for Croatia, 2015. =100	Eurostat
FOOD_EA	EA subcomponent of the HICP index, tracking food prices, including alcohol and tobacco, 2015. =100	
FURN_EA	EA subcomponent of HICP index, tracking the prices of furnishing, household equipment and routine household maintenance, 2015.=100	
HOLIDAYS_EA	EA subcomponent of HICP index, tracking the prices of package holidays, 2015. =100	
RECR_EA	EA subcomponent of HICP index, tracking the prices of recreational and cultural services, 2015. =100	
REST_EA	EA subcomponent of HICP index, tracking the prices of restaurants and hotels, 2015. =100	
TRANS_EA	EA subcomponent of HICP index, tracking transport service prices, 2015. =100	
TOUR_CRO	Nights spent at tourist accommodation establishments in Croatia	Eurostat
GDP_CRO	Croatian Gross Domestic Product, chain-linked volume in index form, 2015. =100	Eurostat
GDP_EA	EA Gross Domestic Product, chain-linked volume in index form, 2015. =100	Eurostat
OIL	Oil prices, Europe Brent spot price FOB (USD per barrel)	U.S. Energy Information Administration

Appendix B

Unit root test results

Variable	**ADF value** (trend and constant included)	**ADF value** (constant included)	**ADF value** (no deterministic components included)
HICP_CRO	-1.0012 (1)	-2.3670 (1)	3.0802 (1)
ΔHICP_CRO	-5.7186 (0)**	-5.1635 (0)**	-2.4645 (1)*
FOOD_CRO	-1.6494 (1)	-1.3175 (1)	2.4217 (1)
ΔFOOD_CRO	-4.9438 (0)**	-4.8529 (0)**	-3.8816 (0)**
FURN_CRO	-1.1953 (1)	-1.9021 (1)	2.0321 (1)
ΔFURN_CRO	-4.2327 (0)**	-3.9222 (0)**	-3.1685 (0)**
HOLIDAYS_CRO	-3.0440 (0)	-2.5516 (0)	1.1789 (0)
ΔHOLIDAYS_CRO	-8.8701 (0)**	-8.6569 (0)**	-8.2965 (0)**
RECR_CRO	-1.9081 (1)	-2.9957 (4)*	2.1017 (1)
ΔRECR_CRO	-6.2125 (3)**	-5.1504 (0)**	-4.4564 (0)**
REST_CRO	-2.0729 (0)	-1.3511 (0)	5.8035 (0)
ΔREST_CRO	-7.8879 (0)**	-7.8703 (0)**	-5.5678 (0)**
TRANS_CRO	-0.7835 (0)	-2.4259 (0)	2.2291 (0)
ΔTRANS_CRO	-9.1310 (0)**	-8.3512 (0)**	-7.6620 (0)**
HICP_EA	-1.7185 (1)	-1.7007 (1)	3.5487 (1)
ΔHICP_EA	-5.0522 (0)**	-4.8197 (0)**	-2.6894 (0)**
FOOD_EA	-2.2011 (5)	-0.8583 (4)	3.6837 (4)
ΔFOOD_EA	-4.5584 (3)**	-4.5326 (3)**	-1.4185 (4)
FURN_EA	-1.3911 (2)	-1.4894 (2)	1.3175 (2)
ΔFURN_EA	-3.3954 (0)*	-1.9244 (1)	-1.3141 (1)
HOLIDAYS_EA	-3.4213 (0)	-0.1495 (0)	2.0685 (0)
ΔHOLIDAYS_EA	-8.2848 (0)**	-8.2943 (0)**	-7.8377 (0)**
RECR_EA	-0.6733 (0)	-2.4507 (0)	4.8342 (1)
ΔRECR_EA	-6.3650 (0)**	-5.9865 (0)**	-0.5385 (4)
REST_EA	-1.7318 (0)	-1.1547 (0)	20.1565 (0)
ΔREST_EA	-6.5426 (0)**	-6.5082 (0)**	-0.8117 (2)
TRANS_EA	-1.9842 (1)	-0.9818 (0)	4.2556 (1)
ΔTRANS_EA	-6.2746 (0)**	-6.2539 (0)**	-3.7484 (0)**
TOUR_CRO	-4.0238 (0)*	0.3537 (3)	2.1774 (3)
ΔTOUR_CRO	-7.9724 (2)**	-7.8567 (2)**	-8.9412 (1)**
GDP_CRO	-1.2571 (0)	-1.1957 (0)	2.2343 (0)
ΔGDP_CRO	-6.6703 (0)**	-6.7265 (0)**	-6.4039 (0)**
GDP_EA	-2.2734 (1)	-0.9737 (1)	1.7118 (1)
ΔGDP_EA	-4.0028 (0)*	-4.0412 (0)**	-3.5750 (0)**
OIL	-2.5695 (1)	-2.7181 (1)	-0.5674 (1)
ΔOIL	-5.7427 (0)**	-5.6936 (0)**	-5.7229 (0)**

Note. Δ is the first difference operator. One (two) asterisk(s) denotes rejection of the null hypothesis at a 5% (1%) significance level. The optimal lag number is given in brackets.

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