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# Tourism-led food inflation: Exploring economic drivers and long-term impacts in Turkey

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## *ABSTRACT*

Food is not only a basic need but also a vital component of the tourist experience and a strategic element in enhancing destination attractiveness. The literature suggests that about one-third of tourist expenditures are on food. The issue of tourism-induced food inflation is timely and important, especially considering the post-pandemic inflationary environment and the recovery in global tourism. Turkey is an appropriate case study due to its high dependence on tourism and significant food inflation. This paper aims to empirically examine tourism-driven food inflation in Turkey over a lengthy period, 2005 (1) – 2024 (12). In this study, the Gregory and Hansen cointegration test, which investigates the cointegration relationship under a structural break, is used, and the long-run relationship between the series is estimated using FMOLS and CCR methods. The results confirm a long-run relationship between tourism arrivals and food price inflation. Moreover, oil prices, water, electricity, and natural gas prices increase, and income is found to have significant effects on tourism-food prices. Although tourism arrivals caused an increase in food prices, this effect is not as high as expected because food prices exhibit higher volatility due to more inelasticity in their supply and demand relative to other consumer goods.

**Contribution/ Originality:** International tourist arrivals are increasing tourism revenues and supporting the development of the Turkish tourism sector. This study is important in that it sheds light on whether tourists have caused the rapidly rising food inflation. It contributes to the literature by providing empirical evidence on the impact of tourism demand on food inflation and can be described as the first study conducted on this subject for Turkey.

## 1. INTRODUCTION

Millions of people travel for different purposes, and the tourism sector shows rapid development and diversification around the world. International tourism receipts reached US$1.6 trillion in 2024 [1]. Tourism has evolved over the past four decades, and Turkey has become one of the world's leading tourist destinations. As a Mediterranean country, Turkey's economy heavily depends on tourism revenues. According to Global and Regional Tourism Performance by UNWTO, Turkey ranked fifth in the world in tourism in 2024, hosting 52.6 million international arrivals. Additionally, TURKSTAT [2] reports that tourism income in 2024 increased by 8.3%, reaching 61 billion dollars compared to the previous year. One of the most researched concepts in tourism economics literature is undoubtedly the tourism-driven economic growth hypothesis [3]. While extensive research has been conducted on the empirical links between economic growth and international tourism, far less attention has been paid to understanding tourism-led inflation caused by tourism development. It is believed that tourism increases food demand during high seasons and influences inflation [4]. Food price inflation has been a global concern in the post-pandemic period, and rising tourism demand also positively impacts food prices. This study aims to empirically examine tourism-led food inflation by using Turkey as a case study to investigate the inflationary potential of tourism.

Due to having a more substantial weight for food items in the Consumer Price Index (CPI)[1], and recently, this is one of the most significant economic problems facing Turkey, food price inflation is undesirable for policymakers. Higher food inflation increases the cost of living and negatively affects individuals' purchasing power, deteriorating income distribution and public welfare, and causing major economic issues.

Food prices vary from nation to nation. Food prices in Turkey are rising at a faster pace compared to European Union countries. Turkey was the sixth country with the highest food price inflation in 2024. Tourism-led inflation mechanisms start with tourists' demand for local goods and services and lead to higher prices for food and beverages. Tourism demand significantly affects food price indices in Turkey, and rising prices in tourism and accommodation can affect the sustainability and accessibility of destinations and bring about changes in tourist behavior and preferences. The main question of the study is: What are the main factors influencing food price inflation at the country level? In answering this question, the study adds to the existing empirical literature on international tourist arrivals and other macroeconomic variables. In this respect, this paper is the first attempt to use a comprehensive econometric framework to investigate how tourism expansion can influence food price inflation based on time series data. It aims to fill the gap on the tourism-food price inflation nexus in Turkey.

The plan of the study is as follows: Section 2 summarizes the literature that presents studies affecting inflation in the tourism sector. The third section provides the methodology and database in detail. The fourth section reveals estimation results and discussion. The concluding section presents conclusions and suggestions.

## 2. LITERATURE

The impact of tourism on economic growth has primarily been examined within the framework of the tourism-led growth hypothesis (TLGH) in the literature. Various econometric methods have been employed to estimate these relationships [5-10]. In many countries, alongside the robust growth of the tourism sector, the impact of tourism development on economic growth is also significant. The TLGH aids in better understanding the relationship between tourism and economic growth and in measuring tourism's contribution to the economy. However, this study differs from the TLGH by focusing on the impact of an undesirable economic phenomenon, such as inflation, rather than the positive effects of tourism. Our research diverges from previous works by demonstrating that tourism causes inflation for two specific categories: Food & non-alcoholic beverages (FP1) and the prices of Hotels, Cafes, and Restaurants (FP2). While many studies emphasize the positive contributions of the tourism sector to the economy, the relationship between tourism and inflation remains an under-researched area in tourism literature. There are few studies that estimate demand with reference to other economic factors, particularly inflation.

Academic studies investigating the tourism-induced inflation hypothesis follow two methodological approaches: time series analyses focused on a single country, and panel data methods applied to multiple countries. These approaches vary depending on the data structure and research scope, and each offers specific advantages in examining the relationship between tourism and inflation. Some of the prominent studies that conduct panel data analysis include: Tkalec and Vizek [11], Kırca and Özer [12], Athari et al. [13], Yong [14], Fuinhas et al. [15], and Shaheen et al. [16]. Studies conducting time series analysis include: Naidu et al. [17], Shaari et al. [18], Sulasmiyati [19],

[1] Turkish Statistical Institute (TurkSTAT) revised the inflation basket as of 2nd February, 2025. As one of the major groups, the share of food and nonalcoholic beverages in the basket was recorded as 24.97 percent. The main expenditure items of international and domestic tourists are on the food and nonalcoholic beverage items and food prices are measured by the component of the consumer price index corresponding to the food and nonalcoholic beverages sector.

and Kožić et al. [3]. Due to significant variation in country-specific factors affecting food prices and the challenges in controlling these heterogeneous effects, studies focusing on a single country are often preferred in investigating tourism-induced inflation. Recent research demonstrates a growing academic interest in this hypothesis. Okumus [20] stated that an increase in inflation also reflects a rise in food prices, reduces the purchasing power of people, and impacts travel decisions worldwide. Although many studies examine the empirical relationship between international tourism and inflation, research modeling tourism demand to forecast food price inflation remains limited. For instance, Tkalec and Vizek [11] used panel data analysis to examine 15 EU member states, 13 of which are members and two are candidates. The study's findings reveal that increases in tourism lead to price increases, especially in tourism-related recreation, culture, hotels, and restaurants. This study is the first to econometrically analyze the factors determining food price inflation in Turkey, an important tourist country, and it is believed to fill a significant gap in the literature.

## 3. DATA AND METHODOLOGY

### 3.1. Setting

This study proposes that tourism development exerts significant effects on food prices. Many studies on food inflation forecasting reveal that methods such as correction methods, econometric methods, and estimation of the CPI basket by subdividing it into subgroups are used. Therefore, in this study, the following functional relationship is suggested.

$$FP_t = f(TA_t, CV_t) \qquad (1)$$

Where $FP_t$ is the food prices. Our analysis pivots around the food price as an indicator of the general price level in Turkey and around a set of its subcategories, such as the price of Food & non-alcoholic beverages ($FP_1$ hereinafter) and the price of Hotels, Cafes, Restaurants ($FP_2$ hereinafter). All these food price variables are expressed in real terms (2003=100). The main explanatory variable, $TA_t$, is a proxy for tourism in Turkey, indicating total tourist arrivals, which is assumed to represent tourism demand. $CV_t$ stands for control variables. All variables in Equation 1 are expressed in logarithmic form to interpret their elasticity. Furthermore, the consumer price index and real effective exchange rates are included as control variables in Equation 1 because they are closely related to food prices and international tourism [5]. Therefore, Equation 2 can be expressed in the following double logarithmic form:

$$\ln FP_t = \beta_0 + \beta_1 lnTA_t + \beta_2 lnCPI_t + \beta_3 lnREER_t + \beta_4 lnOP_t + \beta 5 lnIPI + \epsilon_t \qquad (2)$$

Where $\beta_1$, $\beta_2$, $\beta_3$, $\beta_4$, and $\beta_5$ are the coefficients of TA and other control variables such as consumer price index (CPI), real effective exchange rates (REER), real oil prices (OP), and industrial production index (IPI), respectively, while $\varepsilon$ is the error disturbance.

### 3.2. Data

This study aims to reveal the impact of tourism on food price inflation in Turkey using monthly data for the period January 2005-December 2024. In the literature, changes in food prices are influenced by exchange rates, energy prices, household income, food crises, and agricultural production costs, global warming, decreasing labor force in agriculture, climate conditions, as well as changes in the policies of major food exporters and importers. In this study, we empirically analyzed some economic indicators. As dependent variables, two types of food price ($FP_1$) and ($FP_2$) index (2003=100) have been extracted from TURKSTAT [2] and used in empirical analyses for explaining the tourism-price mechanism. The share of food and non-alcoholic beverages ($FP_1$) in the food basket is approximately 25 percent, while the share of Hotels, Cafes, Restaurants ($FP_2$) in the basket is 8.75 percent. Therefore, these two datasets were taken and analyzed in this study. As one of the independent variables, the Consumer Price Index, usually abbreviated as CPI (2003=100), includes the water, electricity, and natural gas price indices in this study. It shows monthly changes in prices and measures changes in the price of a basket of goods and services purchased by households. While the CPI is not a measure of overall inflation, it is used as a proxy for food prices in this study. They were collected from the Turkish Statistical Institute (TurkSTAT) database. Another independent variable of the study is tourist arrivals data, which shows that international tourist arrivals (TA) are collected from the TurkSTAT database as well. The explanatory variable of the real effective exchange rate index (REER, 2003=100), obtained from the Central Bank of Turkey (CBRT), and the supply-related indicator, real oil prices (OP), are used in the model as main inputs in either tourism or food industry productions. Since all data in the study are for the base year 2003, the industrial production index (IPI) is taken from TurkStat, converted to the base year 2003, and used as a proxy for income monthly.

### *3.3. Method*

As for the methodology, firstly, the graphs of the series will be analyzed to assess their time series properties. Then, the stationarity of all series used in the study will be examined with the help of unit root tests that consider structural breaks. In the next stage, the cointegration relationship between the series will be evaluated. For this purpose, Gregory and Hansen [21] cointegration test, which investigates the cointegration relationship under a structural break, will be used. Finally, the long-run relationship between the series will be estimated using Fully Modified Ordinary Least Squares (FMOLS) and Canonical Cointegrating Regression (CCR) methods.

#### *3.3.1. Zivot and Andrews (ZA) Unit Root Test*

We first use the Zivot and Andrews (ZA) unit root test, which allows for endogenous estimation of the structural break and considers a single structural break, as an alternative to the test presented by Perron [22], where the structural break is exogenously determined. The ZA unit root test is analyzed within the framework of three different models defined in equations (A), (B), and (C) [23].

$$Model\ A: y_t = \mu + \beta t + \alpha y_{t-1} + \theta_1 DU(\tau) + \sum_{i=}^{k} c_i \Delta y_{t-i} + e_t \quad (3)$$

$$Model\ B: y_t = \mu + \beta t + \alpha y_{t-1} + \theta_1 DT(\tau) + \sum_{i=}^{k} c_i \Delta y_{t-i} + e_t \quad (4)$$

$$Model\ C: y_t = \mu + \beta t + \alpha y_{t-1} + \theta_1 DU(\tau) + \theta_2 DT(\tau) + \sum_{i=}^{k} c_i \Delta y_{t-i} + e_t \quad (5)$$

While Model A only considers the break in the mean of the series, Model B investigates the break in the slope of the series. On the other hand, Model C can consider the structural change in both the constant and the slope of the series. The expression $\tau = T_B/T$ gives break time. The break point is set as the value that minimizes the t-statistic for the null hypothesis $\propto = 1$ (the value of the t-statistic with the smallest value among the possible break points). $\Delta y_{t-i}$ considers autocorrelation in the error term.

#### *3.3.2. Vogelsang and Perron [24] Unit Root Test*

The unit root test developed by Vogelsang and Perron [24] is based on the Augmented Dickey-Fuller (ADF) test and can also be called the "ADF test with structural breaks." The method allows for a structural break in the constant term and/or trend, and the break time is determined endogenously. The equation used for the test is given below.

$$y_t = \mu + \beta t + \alpha y_{t-1} + \theta_1 DU_t(Tb) + \theta_2 DT_t(Tb) + \theta_3 D_t(Tb) + \sum_{i=}^{k} c_i \Delta y_{t-i} + e_t \quad (6)$$

Here, DU and DT are dummy variables representing the break in the constant and trend, respectively. The alternative hypothesis to the null hypothesis of the test, which states that the series is non-stationary under a structural break, is that the series is stationary under a structural break. The critical values required to evaluate these hypotheses are presented in Vogelsang [25]. In the Vogelsang and Perron [24] test, the structural break date is determined as the point at which the sum of squares of the error terms of the model (SSR) is the smallest, instead of the point at which the $t$ statistic of the unit root parameter $\alpha$ is the minimum. However, this method is limited in that it allows only one structural break. Using a monthly data set in this study, it was observed that all series are stationary at their levels because of the Zivot-Andrews and Vogelsang-Perron unit root tests. These tests are used to determine whether the series is stationary or non-stationary for detecting unit root existence. A general-to-specific approach should be used to determine the optimal lag length. Regressions are estimated starting with the maximum number of lags, and the appropriate number of lags is determined by stopping at the first lag where the null hypothesis is rejected according to the critical value [26].

### *3.3.3. Gregory and Hansen [21] Cointegration Analysis*

In the study, the cointegration relationship tests between the series are evaluated using the Gregory and Hansen [21] cointegration test; here, the structural break is determined endogenously and allows for a single structural break.

Three different models have been proposed for the Gregory and Hansen cointegration test to examine long-run relationships: a break in the constant (C), a break in the constant with trend (C/T), and a regime-switching (C/S) model. The Gregory and Hansen cointegration test is expressed by the following equations.

Model C.

$$y_{1t} = \mu_1 + \mu_2\theta_{tr} + \alpha^T y_{2t} + \epsilon_t, \qquad t = 1,\ldots,n \tag{7}$$

Model C/T.

$$y_{1t} = \mu_1 + \mu_2\theta_{tr} + \beta t + \alpha^T y_{2t} + \epsilon_t, \qquad t = 1,\ldots,n \tag{8}$$

Model C/S.

$$y_{1t} = \mu_1 + \mu_2\theta_{tr} + \beta t + \alpha_1^T y_{2t} + \alpha_2^T y_{2t}\theta_{tr} + \epsilon_t, \qquad t = 1,\ldots,n \tag{9}$$

Model C considers only the change in the constant term, and Model C/T accounts for the change in the level with trend. Model C/S is a regime-switching model that considers the change in both the constant and the slope. Test statistics are calculated for each model, and within the framework of the findings obtained from the unit root tests, the existence of a cointegration relationship under a structural break is investigated with the Gregory and Hansen cointegration test.

In the Gregory and Hansen cointegration test, the null hypothesis states that there is no cointegration between the variables, while the alternative hypothesis states that there is cointegration between the variables in the case of a structural break. This cointegration test, like the Zivot-Andrews unit root test, allows for a single break, and the break time is determined endogenously. The Phillips test statistics (Za and Zt) calculated for each model and the time when the ADF test statistics are the minimum are determined as the appropriate break time of the cointegration test. Critical values are given in Gregory and Hansen [21]. In this test, the number of lags can be selected automatically using the Akaike information criterion (AIC), Bayesian information criterion (BIC), or general-to-specific pruning by t-test.

## 4. RESULTS AND DISCUSSION

All series in the model are taken, and the logarithms and time series graphs are given in Figure 1. When the graphs are analyzed, seasonality is observed in the series showing tourist arrivals (TA). Therefore, the series is seasonally adjusted and used in the analysis.

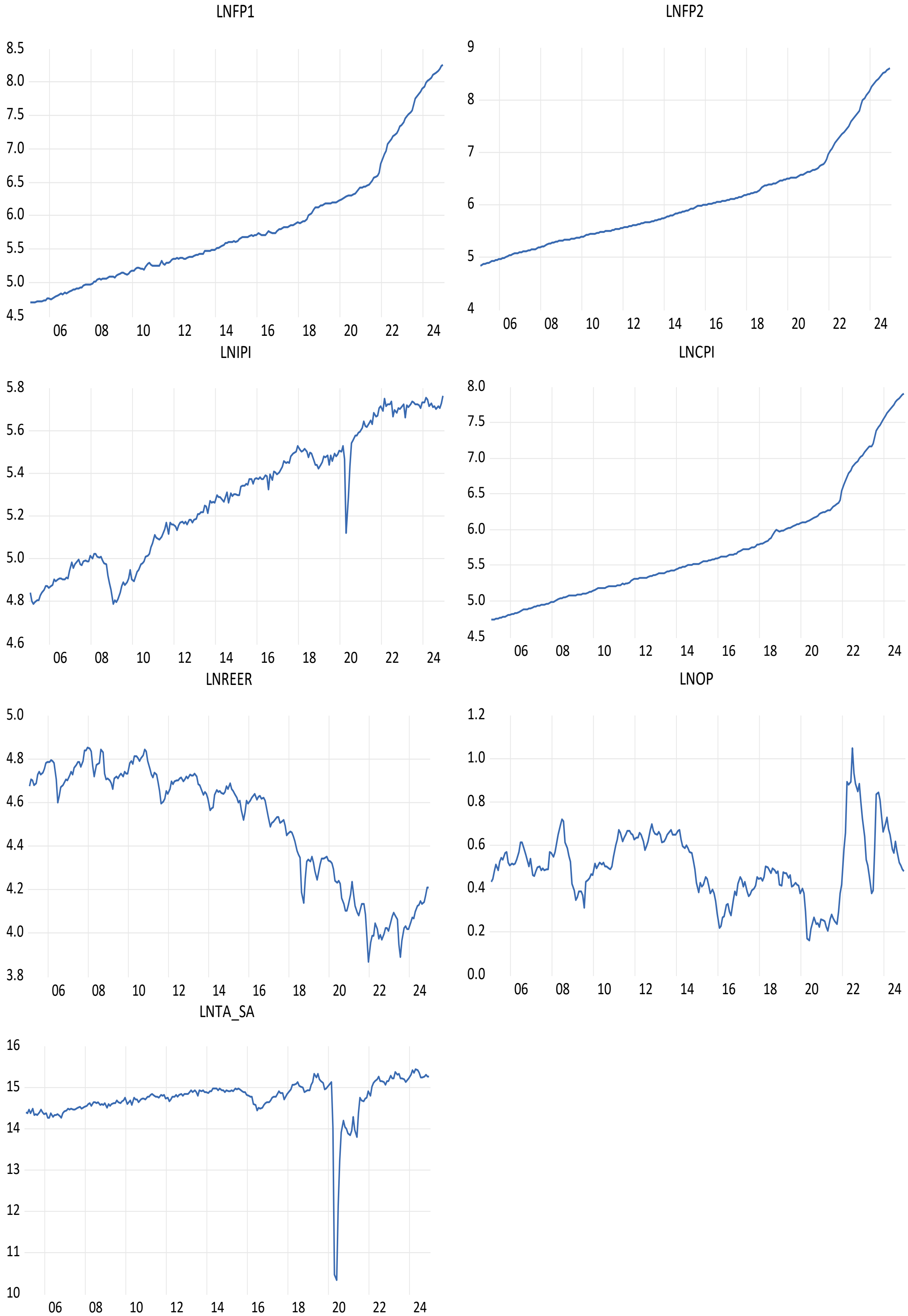

**Figure 1.** Macroeconomic series trends.

As can be seen in Figure 1, the FP1 and FP2 series, which are dependent variables, exhibit a positive trend. In the graphs of the series, especially after COVID-19, it indicates that there may be a structural break. Similarly, the consumer price index for water and energy also shows a similar pattern. Additionally, the seasonally adjusted foreign tourist arrivals series (lnTA_SA) demonstrates the effect of COVID-19. However, the lnOP series, which captures the market price of fuel, shows a significant increase in the post-COVID period. The lnREER series exhibits a negative trend. Since the graphical results indicate a significant break, particularly during the COVID-19 period, a structural break unit root test was performed in the study.

The unit root test results are reported in Tables 1 and 2. The results of the Zivot and Andrews test indicate that, except for $lnFP_2$ in Model B and lnCPI, which are found stationary at the 5% significance level only under Model B, all other results show that the series are not stationary.

**Table 1.** Zivot-Andrews unit root test results at level.

| | **$lnFP_1$** | | | **$lnFP_2$** | | |
|---|---|---|---|---|---|---|
| **Model** | **A** | **B** | **C** | **A** | **B** | **C** |
| Zivot-Andrews test statistic | -4.897 | -4.394 | -4.216 | -4.252 | -5.605 | -4.878 |
| 1% critical value: | -5.340 | -4.810 | -5.570 | -5.340 | -4.800*** | -5.570 |
| 5% critical value: | -4.930 | -4.420 | -5.080 | -4.930 | -4.420 | -5.080 |
| 10% critical value: | -4.580 | -4.110 | -4.820 | -4.580 | -4.110 | -4.820 |
| Chosen break point: | 2021M12 | 2020M06 | 2020M02 | 2021M11 | 2020M10 | 2020M01 |
| | lnIPI | | | lnCPI | | |
| Model | A | B | C | A | B | C |
| Zivot-Andrews test statistic | -4.190 | -4.074 | -4.712 | -4.400 | -4.585 | -4.238 |
| 1% critical value: | -5.340 | -4.810 | -5.570 | -5.340 | -4.810 | -5.570 |
| 5% critical value: | -4.930 | -4.420 | -5.080 | -4.930 | -4.420** | -5.080 |
| 10% critical value: | -4.580 | -4.110 | -4.820 | -4.580 | -4.110 | -4.820 |
| Chosen break point: | 2008M07 | 2008M07 | 2008M08 | 2021M11 | 2020M05 | 2020M01 |
| | lnREER | | | lnOP | | |
| Model | A | B | C | A | B | C |
| Zivot-Andrews test statistic | -3.679 | -2.450 | -2.671 | -4.517 | -3.263 | -4.213 |
| 1% critical value: | -5.340 | -4.810 | -5.570 | -5.340 | -4.810 | -5.570 |
| 5% critical value: | -4.930 | -4.420 | -5.080 | -4.930 | -4.420 | -5.080 |
| 10% critical value: | -4.580 | -4.110 | -4.820 | -4.580 | -4.110 | -4.820 |
| Chosen break point: | 2018M03 | 2010M02 | 2021M03 | 2021M10 | 2020M04 | 2021M11 |
| | lnTA_SA | | | | | |
| Model | A | B | C | | | |
| Zivot-Andrews test statistic | -4.069 | -4.074 | -4.818 | | | |
| 1% critical value: | -5.340 | -4.810 | -5.570 | | | |
| 5% critical value: | -4.930 | -4.420 | -5.080 | | | |
| 10% critical value: | -4.580 | -4.110 | -4.820 | | | |
| Chosen break point: | 2021M12 | 2021M01 | 2020M02 | | | |

**Note:** Model A (Intercept Break): Tests for a structural break occurring in the intercept of the time series. Model B (Trend Break): Tests for a structural break occurring in the trend structure of the time series. Model C (Intercept and Trend Break): Tests for structural breaks occurring in both the intercept and the trend of the time series. ** and *** indicate rejection of the null hypothesis at 5% and 1% significance levels. The maximum lag length is k=6, and the appropriate lag length is determined by AIC.

In the study, in addition to the Zivot-Andrews test, the Vogelsang-Perron unit root test was employed as a robustness check for the unit root analysis. According to the results of the Vogelsang and Perron [24] unit root test, it is concluded that all series are not stationary at the 5% significance level. Subsequently, the stationarity of the series is analyzed by taking its first differences.

**Table 2.** Vogelsang and Perron [24] unit root test results, level.

| | $lnFP_1$ | | $lnFP_2$ | |
|---|---|---|---|---|
| | **Intercept** | **Trend & intercept** | **Intercept** | **Trend & intercept** |
| Vogelsang and Perron [24] | -0.075 | -2.081 | -1.1701 | -4.553 |
| 1% critical value: | -4.949 | -5.348 | -4.949 | -5.348 |
| 5% critical value: | -4.444 | -4.8598 | -4.443 | -4.859 |
| 10% critical value: | -4.193 | -4.607 | -4.193 | -4.607 |
| Chosen break point: | 2019M12 | 2023M06 | 2019M04 | 2022M12 |
| | lnIPI | | lnCPI | |
| | Intercept | Trend & Intercept | Intercept | Trend & Intercept |
| Vogelsang and Perron [24] | 2.713 | -5.186 | -0.177 | -4.678 |
| 1% critical value: | -4.949 | -5.348 | -4.949 | -5.348 |
| 5% critical value: | -4.443 | -4.859** | -4.444 | -4.859 |
| 10% critical value: | -4.194 | -4.607 | -4.194 | -4.607* |
| Chosen break point: | 2020M04 | 2021M04 | 2021M10 | 2021M11 |
| | lnREER | | lnOP | |
| | Intercept | Trend & intercept | Intercept | Trend & intercept |
| Vogelsang and Perron [24] | -3.093 | -3.876 | -4.023 | -4.528 |
| 1% critical value: | -4.949 | -5.348 | -4.949 | -5.347 |
| 5% critical value: | -4.444 | -4.859 | -4.444 | -4.859 |
| 10% critical value: | -4.194 | -4.607 | -4.194 | -4.607 |
| Chosen break point: | 2016M09 | 2017M09 | 2021M09 | 2021M09 |
| | lnTA_SA | | | |
| | Intercept | Trend & intercept | | |
| Vogelsang and Perron [24] | -4.998* | -4.766 | | |
| 1% critical value: | -4.949 | -5.347 | | |
| 5% critical value: | -4.444 | -4.859 | | |
| 10% critical value: | -4.194 | -4.607* | | |
| Chosen break point: | 2020M04 | 2021M04 | | |

**Note:** *, and ** indicate rejection of the null hypothesis at 10%, and 5% significance levels.

The unit root test results for the first-differenced series are displayed in Tables 3 and 4. These results confirm the stationarity of all first-differenced series. The break dates corresponding to the relevant series are presented in the final row of the tables.

**Table 3.** Zivot-Andrews unit root test results, first differenced.

| | $lnFP_1$ | | | $lnFP_2$ | | |
|---|---|---|---|---|---|---|
| **Model** | **A** | **B** | **C** | **A** | **B** | **C** |
| Zivot-Andrews test statistic | -7.784 | -6.44 | -9.408 | -6.984 | -4.5163 | -7.385 |
| 1% critical value: | -5.340*** | -4.800*** | -5.570*** | -5.340*** | -4.800*** | -5.570*** |
| Chosen break point: | 2021M07 | 2016M10 | 2021M12 | 2021M06 | 2018M02 | 2021M11 |
| | lnIPI | | | lnCPI | | |
| Model | A | B | C | A | B | C |
| Zivot-Andrews test statistic | -11.431 | -11.155 | -11.851 | -7.031 | -5.126 | -8.309 |
| 1% critical value: | -5.340*** | -4.810*** | -5.570*** | -5.340*** | -4.800*** | -5.570*** |
| Chosen break point: | 2008M06 | 2008M06 | 2020M06 | 2021M11 | 2017M06 | 2021M11 |
| | lnREER | | | lnOP | | |
| Model | A | B | C | A | B | C |
| Zivot-Andrews test statistic | -10.041 | -10.214 | -10.265 | -11.158 | -11.096 | -11.532 |
| 1% critical value: | -5.340*** | -4.800*** | -5.570*** | -5.340*** | -4.800*** | -5.570*** |
| Chosen break point: | 2021M12 | 2021M12 | 2020M03 | 2016M02 | 2021M11 | 2021M10 |
| | lnTA_SA | | | | | |
| Model | A | B | C | | | |
| Zivot-Andrews test statistic | -9.874 | -9.357 | -10.105 | | | |
| 1% critical value: | -5.340*** | -4.800*** | -5.570*** | | | |
| Chosen break point: | 2020M07 | 2020M04 | 2020M08 | | | |

**Note:** Model A (Intercept break): Tests for a structural break occurring in the intercept of the time series. Model B (Trend Break): Tests for a structural break occurring in the trend structure of the time series. Model C (Intercept and Trend Break): Tests for structural breaks occurring in both the intercept and the trend of the time series. The maximum lag length is k=6, and the appropriate lag length is determined by AIC. *** indicates rejection of the null hypothesis at 1% significance levels.

**Table 4.** Vogelsang and Perron (1998) unit root test results, first differenced.

| | lnFP₁ | | lnFP₂ | |
|---|---|---|---|---|
| **Model** | **Intercept** | **Trend & intercept** | **Intercept** | **Trend & intercept** |
| Vogelsang and Perron [24] | -13.882 | -14.044 | -11.294 | -11.357 |
| 1% critical value: | -4.949*** | -5.347*** | -4.949*** | -5.347*** |
| Chosen break point: | 2021M12 | 2021M12 | 2021M09 | 2021M12 |
| | lnIPI | | lnCPI | |
| Model | Intercept | Trend & intercept | Intercept | Trend & intercept |
| Vogelsang and Perron [24] | -18.610 | -18.718 | -10.865 | -11.151 |
| 1% critical value: | -4.9491*** | -5.347*** | -4.9491*** | -5.347*** |
| Chosen break point: | 2020M06 | 2020M06 | 2021M12 | 2021M12 |
| | lnREER | | lnOP | |
| Model | Intercept | Trend & intercept | Intercept | Trend & intercept |
| Vogelsang and Perron [24] | -13.041 | -13.224 | -12.442 | -12.403 |
| 1% critical value: | -4.949*** | -5.347*** | -4.949*** | -5.347*** |
| Chosen break point: | 2022M04 | 2022M04 | 2023M08 | 2023M08 |
| | lnTA_SA | | | |
| Model | Intercept | Trend & intercept | | |
| Vogelsang and Perron [24] | -14.873 | -15.004 | | |
| 1% critical value: | -4.949*** | -5.347*** | | |
| Chosen break point: | 2020M08 | 2020M08 | | |

**Note:** *** indicates rejection of the null hypothesis at 1% significance levels. Selecting the maximum lag length of k=12, the appropriate lag length is determined based on the F-statistic.

After determining the stationarity levels of the series, all of the series were found to be stationary after taking one difference. Since all the series are I(1), the next step is to analyze the long-run relationship between the series under a structural break. Three different test statistics are used as follows: Table 5-6 shows the Gregory and Hansen cointegration test results. Gregory and Hansen [21] conducted a cointegration test to investigate a long-term relationship between the variables examined. Break times are provided in the first column for all three models in the tables. ADF and Perron-type test statistics are calculated for each model. According to Table 5, a cointegration relationship between food price ($FP_1$) and explanatory variables was found only in Model (C/S): Regime Shift model. In the regime shift model, the break time was identified as the first month of 2018. The findings of the Gregory and Hansen cointegration test indicate that there is a long-term relationship between the dependent variable of Food & Non-Alcoholic Beverages and the explanatory variables in the model, as well as inflation for Food & Non-Alcoholic Beverages in Turkey during the period 2005–2024.

**Table 5.** Gregory & Hansen cointegration test results for $FP_1$.

| **FP₁** | | | | | |
|---|---|---|---|---|---|
| **Model (C): Level shift** | | | | | |
| | | | **Critical values** | | |
| | **Break time** | **Statistic values** | **0.01** | **0.05** | **0.1** |
| ADF procedure | 2016M11 | -4.971 | -6.050 | -5.560 | -5.310 |
| Za-statistics | 2016M11 | -46.762 | -70.180 | -59.400 | -54.380 |
| Zt-statistics | 2016M11 | -4.907 | -6.050 | -5.560 | -5.310 |
| Lag | 1 | | | | |
| Model (C/T): Level shift with trend | | | | | |
| | | | Critical values | | |
| | Break time | Statistic values | 0.01 | 0.05 | 0.1 |
| ADF procedure | 2016M11 | -5.327 | -6.360 | -5.830 | -5.590 |
| Za-statistics | 2021M11 | -53.094 | -76.950 | -65.440 | -60.120 |
| Zt-statistics | 2021M11 | -5.342 | -6.360 | -5.830 | -5.590 |
| Lag | 1 | | | | |
| Model (C/S): Regime shift | | | | | |
| | | | Critical values | | |
| | Break time | Statistic values | 0.01 | 0.05 | 0.1 |
| ADF procedure | 2018M01 | -6.961*** | -6.920 | -6.410 | -6.170 |
| Za-statistics | 2018M01 | -81.108** | -90.350 | -78.520 | -72.560 |
| Zt-statistics | 2018M01 | -6.855** | -6.920 | -6.410 | -6.170 |
| Lag | 0 | | | | |

**Note:** The critical values are those given in Gregory and Hansen's 1996 article. **, and *** 5% and 1% significance levels indicate the existence of cointegration. The maximum lag was set to 12, and the appropriate number of lags was automatically determined based on the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

The results of the Gregory and Hansen cointegration tests examining the cointegration relationship between hotels, cafes, restaurants inflation ($FP_2$) and the explanatory variable are presented in Table 6. The results indicate that the lowest $Z_t$ statistic was found under Model C. Therefore, since the most significant cointegrated relationship was found in Model C, the long-run parameter estimations were carried out according to this model in the next step.

**Table 6.** Gregory & Hansen cointegration test results for $FP_2$.

| **$FP_2$** | | | | | |
|---|---|---|---|---|---|
| **Model (C): Level shift** | | | | | |
| | | | **Critical values** | | |
| | **Break time** | **Statistic values** | **0.01** | **0.05** | **0.1** |
| ADF procedure | 2020M08 | -6.2182*** | -6.050 | -5.560 | -5.310 |
| Za-statistics | 2019M12 | -62.172** | -70.180 | -59.400 | -54.380 |
| Zt-statistics | 2019M12 | -5.904** | -6.050 | -5.560 | -5.310 |
| Lag | 0 | | | | |
| Model (C/T): Level shift with trend | | | | | |
| | | | Critical values | | |
| | Break time | Statistic values | 0.01 | 0.05 | 0.1 |
| ADF procedure | 2020M08 | -6.166** | -6.360 | -5.830 | -5.590 |
| Za-statistics | 2020M07 | -60.915* | -76.950 | -65.440 | -60.120 |
| Zt-statistics | 2020M08 | -5.806* | -6.360 | -5.830 | -5.590 |
| Lag | 1 | | | | |
| Model (C/S): Regime shift | | | | | |
| | | | Critical Values | | |
| | Break time | Statistic values | 0.01 | 0.05 | 0.1 |
| ADF procedure | 2018M06 | -6.619** | -6.920 | -6.410 | -6.170 |
| Za-statistics | 2020M07 | -73.253* | -90.350 | -78.520 | -72.560 |
| Zt-statistics | 2020M07 | -6.637** | -6.920 | -6.410 | -6.170 |
| Lag | 1 | | | | |

**Note:** The critical values are those given in Gregory and Hansen's 1996 article. *, **, and *** 10%, 5% and 1% significance levels indicate the existence of cointegration. The maximum lag length was set to 12, and the appropriate number of lags was automatically determined based on the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC).

After determining the long-run relationship, this study used FMOLS and CCR estimators to estimate the long-run coefficients of the cointegrating equations separately[2]. Since the estimation of the model by traditional methods is inconsistent in the presence of cointegration, FMOLS and CCR methods are used to estimate the long-run coefficients by incorporating the structural breaks obtained from the cointegration analysis as dummy variables into the model. FMOLS corrects for biases arising from collinearity and endogeneity problems. CCR, on the other hand, eliminates biases and inaccuracies arising from the OLS method.

Tables 7-8 present the results of the long-run coefficient estimates. According to the results in Table 7, the coefficients obtained for the long run are significant at the five percent significance level. In the long-run equilibrium model, the effect of the consumer price index on food prices is found to be positive and significant. According to Table 7, a 1% increase in the industrial production index (proxy for income) will increase food prices by approximately 0.02 percent. A 1% increase in oil prices, water, electricity, and natural gas prices will increase food prices by approximately 1.1% (the coefficient is more than 1). This result aligns with economic expectations. Similarly, a 1% increase in real effective exchange rates increases food prices by 0.06%, but this result is not statistically significant. When examining the impact of tourism on inflation, a 1% increase in the number of tourist arrivals increases the prices of Food & Non-Alcoholic Beverages by 0.10%. As a specific feature, tourism activity increases the overall price level, including food prices, in the economy. In other words, the effect of tourism on food prices is inelastic, meaning that the increase in the number of tourists affects food prices at a much smaller rate than the increase in tourist numbers. Therefore, tourism activities influence the rise in food prices, but this effect is not as high as might be expected for Turkey over

[2] Short-term coefficient estimates can be provided upon request.

the period under consideration. Although these values are positive, food prices exhibit higher volatility due to greater inelasticity in their supply and demand relative to other consumer goods. As expected, the real effective exchange rate directly affects food prices. Additionally, an increase in market prices of oil results in higher transportation costs, leading to a rise in food inflation. This indicator is expected to have a positive effect on food inflation; however, energy plays a less significant role. According to these results, a one-unit increase in all variables in the long run will increase food prices by less than one unit, except for water, electricity, and natural gas prices.

**Table 7.** Long-run estimation results for $FP_1$.

| Variables | FMOLS | | | | CCR | | | |
|---|---|---|---|---|---|---|---|---|
| | Coefficient | Std. error | t-Statistic | Prob. | Coefficient | Std. Error | t-Statistic | Prob. |
| LNIPI | 0.019 | 0.040 | 0.486 | 0.628 | 0.016 | 0.041 | 0.391 | 0.696 |
| LNCPI | 1.106 | 0.035 | 31.735 | 0.000 | 1.106 | 0.131 | 8.420 | 0.000 |
| LNREER | 0.063 | 0.041 | 1.519 | 0.130 | 0.063 | 0.041 | 1.525 | 0.129 |
| LNTA_SA | 0.101 | 0.023 | 4.332 | 0.000 | 0.102 | 0.024 | 4.239 | 0.000 |
| LNOP | 0.119 | 0.028 | 4.296 | 0.000 | 0.120 | 0.028 | 4.249 | 0.000 |
| BD | 2.314 | 0.420 | 5.507 | 0.000 | 2.426 | 0.695 | 3.491 | 0.001 |
| BD×LNIPI | -0.134 | 0.075 | -1.798 | 0.074 | -0.153 | 0.089 | -1.715 | 0.088 |
| BD×LNCPI | 0.006 | 0.036 | 0.154 | 0.877 | 0.006 | 0.107 | 0.051 | 0.959 |
| BD×REER | -0.005 | 0.001 | -5.284 | 0.000 | -0.005 | 0.001 | -5.058 | 0.000 |
| BD×LNTA_SA | -0.087 | 0.024 | -3.644 | 0.000 | -0.087 | 0.025 | -3.421 | 0.001 |
| BD×LNOP | 0.113 | 0.035 | 3.202 | 0.002 | 0.112 | 0.036 | 3.128 | 0.002 |
| C | -2.328 | 0.340 | -6.858 | 0.000 | -2.324 | 0.765 | -3.040 | 0.003 |
| R-squared | 0.99 | | | | 0.99 | | | |
| Adjusted R2 | 0.98 | | | | 0.98 | | | |

**Note:** BD stands for break dummy: 1 for 2018M1 onwards, 0 otherwise. This study identifies structural breaks corresponding to financial and political crises, and the COVID-19 pandemic, which have exacerbated inflation rates. This break is due to the Pastor Brunson crisis between Turkey and the US. The Turkish lira has depreciated by around 40 percent against the US dollar since January 2018. This has exacerbated a crisis for Turkey's currency. The lira started to recover some of its losses after the CBRT raised its policy rate by 625 basis points to 24 percent. The interaction terms are represented as the product of the respective variables (×).

Table 8 presents the findings on the effect of the variables considered in the study on the prices of hotels, cafes, and restaurants in the long run. The dummy variable and trend variable for the break period, determined during the cointegration analysis, are included in the model.

According to Table 8, a 1% increase in the industrial production index (proxy for income) will increase hotel, cafe, and restaurant prices ($FP_2$) by approximately 0.09 percent. A 1% increase in the consumer price index will increase $FP_2$) by approximately 1.22%. The findings show that prices for hotels, cafes, and restaurants have increased more than water, electricity, and natural gas prices in Turkey. This result indicates that the increase in $FP_2$ is exponentially reflected in prices. In addition, the effect of tourism on hotels, cafes, and restaurants' prices is positive and significant.

However, it is observed that these price increases are below the rate of increase in the number of tourists. We can interpret this as hotel prices being mostly affected by input costs. They are also less affected by increased tourism as the demand for hotels is not fully met. The effect of the increase in oil prices on hotels, cafes, and restaurants' prices is found to be positive.

This result suggests that, in the long run, an increase in oil prices may reduce the spending power of consumers. In addition, although the competitive pressure in hotels and restaurants increases the costs of oil-price-dependent businesses, it may make it possible to raise their prices in an intensely competitive environment.

**Table 8.** Long-run estimation results for $FP_2$.

| Variables | FMOLS | | | | CCR | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coefficient | Std. error | t-statistic | Prob. | Coefficient | Std. error | t-Statistic | Prob. | |
| LNIPI | 0.090 | 0.021 | 4.230 | 0.000 | LNIPI | 0.090 | 0.022 | 4.159 | 0.000 |
| LNCPI | 1.220 | 0.008 | 144.750 | 0.000 | LNCPI | 1.221 | 0.009 | 139.942 | 0.000 |
| LNREER | 0.210 | 0.024 | 8.671 | 0.000 | LNREER | 0.211 | 0.024 | 8.649 | 0.000 |
| LNTA_SA | 0.011 | 0.005 | 2.114 | 0.036 | LNTA_SA | 0.011 | 0.005 | 2.099 | 0.037 |
| LNOP | 0.155 | 0.017 | 9.157 | 0.000 | LNOP | 0.155 | 0.017 | 9.286 | 0.000 |
| BD | -0.059 | 0.011 | -5.372 | 0.000 | BD | -0.059 | 0.011 | -5.452 | 0.000 |
| C | -2.418 | 0.175 | -13.845 | 0.000 | C | -2.421 | 0.174 | -13.926 | 0.000 |
| R-squared | 0.995 | | | | 0.994 | | | | |
| Adjusted R2 | 0.994 | | | | 0.994 | | | | |

**Note:** BD stands for break dummy: it takes the value 1 for after 2020M8, and 0 otherwise. This captures the period when Turkey's COVID-19 pandemic began. During the COVID-19 pandemic, extensive restrictions were applied to restaurants, such as prohibitions regarding dine-in services, and there were increases in the prices of food services.

In general, when constant and trend coefficients are considered, increasing tourism demand exerts statistically significant and inelastic effects on food price indices. This finding confirms that the growth of tourism in Turkey leads to positive and significant increases in general food prices and hotel and restaurant prices. However, the elasticities suggest that an increase in tourism activity increases prices less than expected.

## 5. CONCLUSION

Inflation is a very real, empirically observable phenomenon in all economies. The topic is timely, relevant, and important for both academics and policymakers. High inflation raises operational expenses for hotels, transportation, entertainment, and other travel costs and lowers tourists' spending power. As a result, travelers may select cheaper destinations. In addition, inflation may lower a country's currency value, making the country less competitive for inbound tourists and hurting the tourism industry.

This study investigates the impact of tourism demand on food price inflation in Turkey. The cost of food in Turkey increased by 30.20 percent in June 2025 compared to the same month in the previous year. Food inflation in Turkey reached an all-time high of 102.55 percent in November 2022.

In this study, our argument is based on the expectation that tourism is likely to be a significant driver of overall food prices in Turkey. The study findings suggest that tourist arrivals affect food prices in the long run, as theory indicates. The effect of water, electricity, and natural gas prices on Food & Non-Alcoholic Beverages ($FP_1$) food prices is positive and significant. This result aligns with our economic expectations. Similarly, an increase in the real effective exchange rate slightly increases food prices, but this result is not statistically significant. The findings show that the effect of tourism on Hotels, Cafes, and Restaurants ($FP_2$) prices is also positive and significant. However, $FP_2$ prices have increased more than the rate of increase in the number of tourists in Turkey.

To understand the relationship between tourism and food prices across different economic contexts and periods, the analysis should be extended in the panel data analysis for certain variables to reveal the relationship between tourism and food inflation more clearly to increase the robustness of the results. Also, this study does not include statistical information about domestic tourists. In future studies, it is recommended that both tourism performances by months of domestic and foreign tourists' arrivals can be studied.

This study contributes to the field by addressing the interaction of tourism and the economy in Turkey from an asymmetric perspective and by revealing previously unobserved relationships. The findings of this study also show that policymakers need to pay attention to sustainable consumer and food prices, and the tourism sector is also concerned. They should take measures to regulate inflation through better use of monetary and fiscal policy to prevent appreciation (or depreciation) of the exchange rates, which leads to food price inflation.

This study demonstrates that tourism causes inflation for two distinct types of food (Food & non-alcoholic beverages (FP1) and the price of Hotels, Cafes, and Restaurants (FP2)). Consequently, the findings obtained from this study highlight the necessity of policies aimed at taking measures against tourism-related food inflation. The findings reveal the need for measures to prevent food waste. These measures can be summarized as follows: strengthening and supporting local production through agricultural incentives and increased production capacity; ensuring price controls and inspections in tourist centers through transparent pricing and inspections; strengthening alternative supply sources, logistics, and storage infrastructure; ensuring import and supply chain optimization; and creating policies to balance the regional distribution of tourism demand by promoting alternative tourist destinations and off-season tourism.

This empirical study has several limitations. The main limitation of our study is that it focused only on Turkey. Future studies should expand the geographic scope to include more countries with different economic and tourism structures to enhance the robustness of the investigation. One of the limitations of this study is the conceptual evaluation of statistical data. The dataset covers 2005 to 2024, including more recent events such as the COVID-19 pandemic and some political and financial risks. These factors significantly disrupted tourism.

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