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The effect of international visitors on poverty alleviation in Mexico: an approach from the misery index

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ABSTRACT

The effectiveness of tourism as an instrument in combating poverty has emerged as an important subject of research. Tourism's impact on poverty has traditionally been analyzed from the perspective of income or household consumption per capita. In contrast to these approaches, we analyzed the effect of the arrival of international visitors on poverty in Mexico by way of its impact on a modified misery index. To carry out this study, we used a bivariate structural vector autoregressive model, which indicates a negative unidirectional relationship from the international visitors to the misery index. Additionally, the historical decomposition shows that during the first COVID-19 wave, the changes in the international visitors highly explained the variations in the misery index.

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1. Introduction

In recent years, there has been a growing interest in analyzing the impact of tourism on economic growth, particularly in the so-called "tourism-led growth hypothesis," which, according to Brida, Olivera, and Segarra (2021), is an extension of the "export-led growth hypothesis." In this sense, Panosso (2008) observed that most tourism research has focused on the capacity of this sector to generate wealth.

There has also been an upsurge of interest in tourism's capacity to alleviate the social problem of poverty from both governments and development organizations (Zhao & Ritchie, 2007). Weinz and Servoz (2013) stated that tourism is a labor-intensive sector, which has benefited migrant workers, women, and young people, and is considered a major driver of economic growth in the least developed countries. According to the same authors, tourism can be an important tool in reducing poverty by promoting local ownership, generating local employment, and addressing current work deficits.

In recent years, various studies have been conducted to determine the efficacy of tourism in reducing poverty. For example, Kim, Song, and Pyun (2016) found that tourism has heterogeneous effects on income per capita in the case of 69 developing nations; in fact, their findings show that, above a certain income level, the effect of tourism on poverty alleviation shifts to being negative. In the case of South Africa,

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Saayman, Rossouw, and Krugell (2012) found that in the short term, the poor receive few benefits from additional tourism income. Njoya and Seetaram (2018) found that in the case of Kenya, the tourism industry has positive effects for those living in poverty.

In Mexico, Garza-Rodriguez (2019) measured the impact of international tourism on poverty by studying the influence of tourism receipts on household consumption per capita, finding a positive effect. However, Wilson (2008) noted that tourism in Mexico has also increased the number of workers in precarious conditions, in addition to intensifying the country's dependency on loans, foreign capital, and foreign patronage.

Regarding the tourism sector in Mexico, before the COVID-19 pandemic, the country was ranked among the ten most visited countries and among the top 20 countries with the highest incomes from tourism according to the UNWTO World Tourism Barometer (Datatur, 2021). Additionally, according to Weiss (2021), in 2020, during the COVID-19 pandemic, Mexico became an oasis for international tourists, reaching third place as the most visited country, just behind Italy and France. Weiss argued that this was because Mexico is one of the few countries that, to date, does not require a negative COVID-19 test to enter its territory. However, the Mexican tourism sector was not exempt from the sharp reductions in international visitors.

In this study, based on the idea that tourism can palliate poverty by reducing unemployment and boosting economic growth, we propose to analyze the impact of international visitors, who, according to Álvarez (2020), are defined as the sum of international tourists and excursionists, on the compensated misery index proposed by Hortalà and Rey (2011) by means of a bivariate structural vector autoregressive model (SVAR).

We consider that this study contributes to the existing literature by proposing a different approach to measuring the impact of tourism on poverty. It will be of interest to policymakers and tourism managers interested in understanding whether tourism is capable of reducing the economic malaise measured in terms of the misery index.

The remainder of the article is organized as follows. In the second section, we present the literature review, which is divided into two subsections which focus on the misery index and the relationship between tourism and the compensated misery index, respectively. The third section is also divided into two subsections, as we present the materials and their sources and the SVAR empirical design. In the fourth section, we present the econometric results. Finally, the discussion and conclusions are presented.

2. Literature review

2.1. The misery index

According to Welsch (2007) and Dornbusch, Fischer, and Startz (2002), Okun's misery index is computed as the unweighted sum of the unemployment rate, (U), and the inflation rate, (\dot{p}) , as shown in Equation (1):

$$MI = U + \dot{p} \tag{1}$$

This polemic index has been extensively criticized for its simplicity, as it reduces socioeconomic problems to only two macroeconomic variables. Nonetheless, it is frequently used to monitor social well-being. Effectively, Okun's misery index attempts to summarize the most evident social costs for a nation, as high inflation raises the cost of living and unemployment prevents people from earning an income. In this sense, such an index, together with other statistics, can be used as a socioeconomic indicator to observe the progression of poverty in a country (Riascos, 2009).

Effectively, according to Grabia (2011), a high unemployment rate does not only make it more difficult for an individual to find a job, but it also reduces the possibility of receiving a decent remuneration for their work; whereas high inflation diminishes the purchasing power of nominal income. Therefore, high levels of inflation and unemployment deteriorate the economic situation of an average citizen. In this sense, Okun's misery index constitutes a type of poverty index.

Despite its simplicity, the misery index has had various applications; for example, Kossov (2014) found that an increase in this index has long-lasting negative effects on male life expectancy. For their part, Saboor, Sadiq, Khan, and Hammed (2017) found a unidirectional relationship from the misery index to the crime rate, pointing out that inflation and unemployment are major drivers of rising crime rates in Pakistan. Moreover, according to Dornbusch et al. (2002), a version of the political business cycle theory indicates that the electoral results of incumbent political parties are inversely related to the misery index.

Various modifications have been proposed to improve Okun's misery index; among them, a particularly important version is Barro misery index, which incorporates GDP and interest rate, since, according to Barro (1999), misery also increases if the long-term interest rate increases, and if the growth rate of real GDP is below the average.

Based on the BMI, Hortalà and Rey (2011) estimate a compensated misery index (CMI), which subtracts the GDP growth rate, (\dot{y}) , from the original index, as shown in Equation (2):

$$CMI = U + \dot{p} - \dot{y} \tag{2}$$

In Equation (2), the negative sign associated with GDP growth rate indicates that economic decline increases misery, whereas economic growth can diminish the negative effects of inflation and unemployment on society's well-being. In support of this approach, Dadgar and Nazari (2018) provided empirical evidence of the long-term negative effect of economic growth on the misery index in the case of the Iranian economy.

As can be noticed in Equation (2), the CMI excludes the interest rate from its components. According to Hortalà and Rey (2011), this modification is because the interest rate can have contradictory effects on the economy; on the one hand, it worsens financial costs, but on the other, stimulates savings.

In this study, we analyze, by way of a bivariate SVAR model, the impact of international visitor arrivals on the CMI. In this way, we aim to assess the impact of international visitor arrivals on poverty reduction in Mexico.

2.2. Tourism and the compensated misery index

The tourism-led growth hypothesis has been one of the most studied topics in the tourism economics literature (Perles-Ribes, Ramón-Rodríguez, Rubia, & Moreno-Izquierdo, 2017). According to Álvarez (1996), tourism is considered an industry in

the sense that it is a set of activities that generate wealth. According to Acerenza (2006), tourism maintains a close relationship with other economic sectors and productive branches, generating positive intersectoral impacts.

Following Panosso and Lohmann (2012), tourism generates direct, indirect, and induced effects in the economy. Direct effects are generated when tourists spend money on lodging, transport, retail purchases, food, beverages, and other items. This kind of expenditure impacts taxes, production levels, imports, and direct incomes. The indirect effects result from the direct effects, and they represent the impact of tourism on nontourism sectors, for example, through the payment that a restaurant makes to its suppliers. Following the same authors, tourism-induced effects are the result of both direct and indirect effects. They result in the development of the local economy and increases in the income level of local residents. Additionally, even if part of the generated income is saved or spent out of the region where the tourism activities occur, some of the income will remain in the region, further stimulating economic activities.

However, the expansive effect of tourism depends on the level of diversification of the economy, as imports diminish the positive effect of tourist consumption (Hernández, 2004). In this sense, imports can be seen as leakages that diminish the positive effect of tourist expenditures on a destination (Hernández, 2007). Moreover, the impact of tourism on the economy also depends on the population size, the level of imports in the economic sectors boosted by tourism activities, and the size of the country or region, because generally, the larger the region, the higher the diversification of the economy (Bote, 1990). Consequently, the direct effects of tourism on the economy are usually less than the total income generated by tourism (Panosso & Lohmann, 2012).

Various studies have provided empirical evidence that tourism boosts economic growth; for example, in the Mexican case, Brida, Sánchez, and Risso (2008) and Sánchez (2020) have demonstrated that there is a long-term relationship between tourism and GDP, using tourist expenditure and tourist arrivals as explanatory variables, respectively. Nonetheless, Phiri (2016) found that in the case of South Africa, there is a levels relationship between tourist arrivals and economic growth when using linear cointegration methods, but not when using nonlinear techniques.

Concerning employment creation, as the tourism sector grows there is a greater need for professionals specializing in the different areas of tourism services (UNWTO, 2019). In fact, tourism is a labor-intensive sector capable of creating many direct and indirect jobs (Dahdá, 2003; Ramírez, 2006). Moreover, according to Ramírez (2006), tourism creates more jobs for medium- and low-skilled workers than for highly skilled workers.

In Mexico, Loría, Sánchez, and Salas (2017) found that the arrival of international visitors, in addition to boosting economic growth, reduces the unemployment rate. However, according to Gómez and Barrón (2019), domestic tourism plays a major role in creating new jobs. Meanwhile, Sánchez (2019) demonstrated a bidirectional relationship between tourism GDP growth and unemployment. More precisely, the author argues that tourism GDP growth reduces unemployment and that unemployment reduces tourism GDP growth. Further evidence on tourism alleviating unemployment has been found in Pakistan (Manzoor, Wei, Asif, Haq, & Rehman, 2019) and Romania (Condratov, 2017).

Tourism can also increase the cost of living in the receiving regions; in particular, it has been noted that tourism can cause land value inflation (Acerenza, 2006; Kumar, Hussain, & Kannan, 2015), as well as price increases in food, transport, entertainment, and events (Kumar et al., 2015). Tourism may even exert inflationary pressures at the national level, impacting national price indexes (Acerenza, 2006).

Some studies have found empirical evidence that tourism can increase inflation. Shaari et al. (2018) found that in the case of Malaysia, tourism causes both short- and long-term inflationary pressures. Coppin (1993) found that tourism development in Barbados, a tourism-oriented economy, has brought about price increases due to demand pressures. According to Acerenza (2006), in March 2005, inflation increased in Mexico due to increases in tour package prices.

There is also evidence that inflation can prevent tourist arrivals from reaching their full potential; for example, Sulasmiyati (2018) found evidence for this effect in Indonesia. Meanwhile, in a study on 14 European countries, Yong (2014) found that inflation costs have long-lasting negative effects on the tourism sector. However, according to Tribe (2011), individuals will be affected differently by increases in tourism prices depending on their particular consumption habits.

According to this literature review, tourism is associated with all three components of the CMI by increasing GDP growth, reducing unemployment, and generating local price increases; in some cases, it can also generate inflationary pressures at the national level. In this sense, we consider the arrival of international visitors as a crucial factor in determining the well-being of a society in terms of the misery index.

This study computed a bivariate SVAR model to study the relationship between the CMI and the international visitor arrivals in Mexico. The results of the model, in addition to demonstrating that international visitor arrivals are a good predictor of the CMI, demonstrate that promoting the arrival of international visitors has a negative effect on the CMI, alleviating the loss of well-being generated by inflation and unemployment.

3. Materials and methods

3.1. Data and sources

To compute the VAR model, we used time-series data from the second quarter of 2000 to the second quarter of 2020 (N = 81). To calculate the CMI (Equation 2), we obtained the following time-series data from the National Institute of Statistics and Geography (INEGI, 2020): Mexico's GDP at market prices (base 2013), the national consumer price index (July2018 = 100), and the unemployment rate. Given that Mexico's GDP is reported in quarterly data, whereas the unemployment rate and the national consumer price index are reported as monthly frequency data, we averaged both of these series into quarterly data. The number of international visitors, (V), was obtained from Banco de México (2020) as monthly data, so it was aggregated into quarterly data.

We seasonally adjusted all four series by using the Census X12 filter, a smoothing method that permits us to more easily identify trends and critical patterns in the data (Pindyck & Rubinfeld, 2001), in addition to eliminating calendar effects (Chatfield, 2003). After seasonally adjusting the series, we obtained the growth rates of Mexico's GDP and national consumer price index to calculate the CMI.

		Innovatio	on Outlier			Additive	e Outlier	
Series	Α	В	С	D	A	В	С	D
ln V	-1.691	-1.688	-1.323	-1.738	-2.104	-2.259	-3.464	-3.387
CMI	-5.476***	-5.520***	-5.425**	-5.576***	-5.586***	-5.520***	-5.795***	-6.986***
<i></i> v	-10.02***	-10.31***	-10.24***	-9.740***	-9.743***	-9.862***	-10.51***	-11.94***

Table 1. Breakpoint unit root tests, 2000Q2 – 2020Q2.

A, intercept only; B, trend and intercept (intercept); C, trend and intercept (trend and intercept); D, trend and intercept (trend); lag length: Schwarz criterion; Max. lags = 8; Breakpoint selection: Dickey–Fuller min-t; *** and ** denote rejection of the unit root hypothesis at the 1% and 5% significance levels, respectively; Symbolization: $\dot{v} = \Delta \ln V$; CMI = compensated misery index.

As the traditional unit root test could be biased in the presence of structural breaks (Glynn, Perera, & Verma, 2007), we performed the unit root breakpoint test to avoid finding spurious results when computing the model (Table 1).

The results in Table 1 demonstrate that the CMI is an I(0) series, while ln V is an I(1) series. As the purpose of this document is to study the influence of international visitors on the CMI, and these series have different integration orders, to avoid finding spurious results when computing the VAR model, following Gujarati and Porter (2009), we have used the first difference of the natural logarithm of the number of international visitors in Mexico, \dot{v} , which is also an I(0) series (Table 1). As the VAR model is estimated using stationary series, there is no need to test for cointegration (Charemza & Deadman, 1997; Enders, 2015).

3.2. Empirical design

A VAR(p) model using two endogenous variables \dot{v} and CMI, a constant, and two exogenous variables, can be written as a system of equations, as illustrated in Equation (3):

$$\dot{v}_{t} = \alpha_{1} + \sum_{i=1}^{p} \beta_{i} \dot{v}_{t-i} + \sum_{i=1}^{p} \gamma_{i} CMI_{t-i} + \tau \delta_{t} + \psi D_{2020Q2} + e_{1t}$$

$$CMI_{t} = \alpha_{2} + \sum_{i=1}^{p} \theta_{i} \dot{v}_{t-i} + \sum_{i=1}^{p} \vartheta_{i} CMI_{t-i} + \lambda \delta_{t} + \Phi D_{2020Q2} + e_{2t}$$
(3)

where α_1 and α_2 are constants, e_{1t} and e_{2t} are the error terms, and δ_t and D_{2020Q2} are exogenous variables, defined as in Equations (4) and (5).

$$\delta_t = \begin{cases} 1 t = 2008Q3; 2008Q4; 2009Q1; 2012Q2; 2013Q1; 2015Q4 \\ -1 t = 2001Q3; 2002Q2; 2005Q4; 2006Q1; 2009Q3; 20019Q1 \\ 0 & Otherwise \end{cases}$$
(4)

$$D_{2020Q2} = \begin{cases} 1 \ t = 2020Q2\\ 0 \ Otherwise \end{cases}$$
(5)

Equation (4) helps the model to achieve an adequate simulation of the series' main breaks, while Equation (5) is a dummy defined to capture the effect of COVID-19 on both series in the model.

In this study, we computed a VAR(2) because with this number of lags, the model adequately fulfills all correct specification tests. As mentioned above, \dot{v} and CMI are both stationary series, and therefore, no cointegration test is required.

We obtained the SVAR model by using the matrix in Equation (6).

$$B = \begin{pmatrix} 1 & 0\\ b_{21} & 1 \end{pmatrix} \tag{6}$$

Following Enders (2015), imposing the restriction $b_{12} = 0$ in Equation (6) means that an innovation in *CMI* has no contemporaneous effect on \dot{v} . In addition, Equation (6) makes it clear that the necessary condition of introducing $(n^2 - n)/2$ restrictions for the model to be exactly identified is satisfied.

In the literature, VAR models have been extensively criticized for being nonparsimonious representations of a time-series vector, leading to problems with degrees of freedom, multicollinearity, and overfitting (Jaramillo, 2009). On the other hand, imposing restrictions in a model should be based on theoretical foundations, particularly when using, as in this case, the Cholesky decomposition (Gottschalk, 2001). Furthermore, SVAR models have been strongly criticized because, in order to make them exactly identified, restrictions coming from economic theory are usually overlooked (Guzmán & García, 2008).

As we computed a bivariate VAR(2) with two endogenous variables, two exogenous variables and a constant, each equation in the VAR only includes seven estimated parameters. In addition, as VAR model equations can be individually computed as ordinary least squares (OLS) regressions (Gujarati & Porter, 2009), we calculated the variance inflation factors (VIF) to test for multicollinearity. Regarding the second criticism that theoretical restrictions are usually ignored, we considered that, according to the evidence found in the literature, the number of international visitor arrivals is related to all three components of CMI. Additionally, the objective of this study, as mentioned above, is to analyze the effect of international visitors on the CMI. In this sense, we forced the restriction $b_{12} = 0$ into the model, assuming that there is no contemporaneous effect of an innovation in CMI on \dot{v} .

4. Econometric results

To study the relationship between CMI and the number of international visitors in Mexico, we computed a bivariate VAR(2) model, which, in addition to the exogenous series and a constant, uses endogenous stationary variables CMI and \dot{v} (Table 2).

After computing the model, we verified that it satisfied the correct specification tests. The results are summarized in Table 3.

We also verified that the model satisfies the stability condition (Figure A1), and we calculated the VIF to test for multicollinearity, finding that the variables in the model are moderately correlated (Table A2). As a final test for the unrestricted VAR, we corroborated that the model is capable of simulating both endogenous series in levels (Figure 1).

Variables	\dot{v}_t	СМ
\dot{v}_{t-1}	-0.161627	-6.999327
	[-1.29509]	[-2.70742]
\dot{v}_{t-2}	-0.159319	-1.920905
	[-1.29082]	[-0.75131]
CMI_{t-1}	-0.002209	0.352802
	[-0.59366]	[4.57718]
CMI_{t-2}	0.002827	0.160034
	[0.77079]	[2.10632]
Intercept	-0.005529	2.227147
	[-0.29822]	[5.79898]
δ_t	0.001601	2.151934
	[0.14988]	[9.72402]
D _{2020Q2}	-1.129461	17.74181
	[-28.5761]	[21.6693]
R-squared	0.927308	0.910846
Adj. R-squared	0.921164	0.903312
F-statistic	150.9528***	120.8956***

Table 2. VAR model.

t-statistic in []; *** denotes rejection of the null hypothesis at the 1% significance level.

Tak	ole	3.	Unrestricted	VAR	joint	correct	specif	ication	tests.
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Test	Statistic	Probability
Doornik-Hansen Normality Test:		
Skewness	3.4340	0.1796
Kurtosis	1.6453	0.4392
Jarque-Bera	5.0794	0.2792
Serial Correlation LM test (12)	0.2638	0.9007
White heteroskedasticity test (no cross terms)	36.3301	0.3162
White heteroskedasticity test (cross terms)	60.7744	0.5561

A full test of serial correlation is presented in Table A1 in the appendix.



Figure 1. Unrestricted VAR simulation (Broyden's algorithm).

As shown in Figure 1, the model adequately simulates the second quarter of 2020, highlighting the importance of introducing the dummy defined in Equation (5). In fact, such a dummy presents the highest t-statistic in both VAR equations (Table 2). In addition, the model acceptably simulates the quarters during the international financial crisis.

Once we verified that the unrestricted VAR satisfied the correct specification tests, we estimated the structural factorization, obtaining the short-run structural relations in Equation (7):

$$\begin{aligned} \varepsilon_{\dot{\nu}} &= e_{\dot{\nu}} \\ \varepsilon_{CMI} &= -0.152041 * e_{\dot{\nu}} + e_{CMI} \end{aligned} \tag{7}$$

According to Loría, De Jesús, and Ramírez (2011), structural relationships do not have a direct interpretation, as they represent contemporaneous structural innovations, and their sign represents the direction of the interrelations.

After obtaining the SVAR, we applied the structural normality test. The results are summarized in Table 4.

We first present the structural impulse response analysis to analyze the model's results (Figure 2), which, following Catalán (n.d.), permits us to describe the progression of a model's variable in reaction to a shock in another variable.

In Figure 2a, it can be observed that the arrival of international visitors has a statistically significant negative effect on the CMI during the second period, and then the effect becomes statistically insignificant. Conversely, in Figure 2b, it can be observed that CMI has no statistically significant effect on the arrival of international visitors in Mexico.

To gain more statistical evidence supporting the results in Figure 2, following Gujarati and Porter (2009), we performed the Granger causality test because this technique allows us to identify if the relevant information to predict the respective variables, \dot{v} and CMI, is contained in the time-series information on these variables (Table 5).

The results in Table 5 illustrate that the arrival of international visitors has a statistically significant effect on the CMI at the 5% significance level. Meanwhile, it is confirmed that the CMI has no statistically significant effect on the arrival of international visitors.

Table 4. Struc	tural factorizatio	n normality test.
Skewness	Kurtosis	Jarque-Bera
2.6491	0.6724	3.3216
(0.2659)	(0.7145)	(0.5055)



Probabilities are in parentheses.

Figure 2. Response to structural VAR innovations \pm 2 S. E.

Table 5. VAR Granger causality test.

Null hypothesis	X ²	df	Probability
<i>v</i> does not Granger-cause CMI	7.454425	2	0.0241**
CMI does not Granger-cause v	0.677691	2	0.7126

**denotes rejection of the null hypothesis at the 5% significance level.

Та	ble	6.	Variance	decomposition	using	structural	VAR	factors
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	Decomposi	tion of \dot{v}_t	Decomposition of CMI _t		
Period	\dot{v}_t	CMIt	\dot{v}_t	CMIt	
1	100.00	0.000	3.983	96.016	
5	99.575	0.424	18.131	81.868	
10	99.574	0.425	18.210	81.789	
15	99.574	0.425	18.210	81.789	
20	99.574	0.425	18.210	81.789	

Only the first three decimal positions are considered in the data.

Table 6 illustrates the variance decomposition analysis, which, according to Catalán (n.d.), permits us to determine the proportion of the forecast error variance that is explained by the innovations of each explanatory variable. The results of this analysis are congruent with those of the impulse response analysis, and they illustrate that the CMI barely explains the variation in the number of visitor arrivals in Mexico (0.42%). Meanwhile, \dot{v} explained 3.98% of the variations in the CMI during the first period and 18.21% during the last-studied period. Concordantly with the impulse response analysis, the variance decomposition demonstrates that the model begins to stabilize from the fifth period.

Figure 3 presents the historical decomposition of the SVAR. Concordantly with the previous analyses, it can be seen that the CMI has not been related to changes in the number of international visitor arrivals (Figure 3a). Conversely, Figure 3b illustrates that the number of international visitors has been linked with changes in the CMI during most of the period studied. Particularly, since the international financial crisis, which began in 2008, it can be seen that the number of international visitors has strongly explained changes in the CMI.



Figure 3. Historical decomposition using structural VAR weights.

In Figure 3b, it is particularly important to note that in 2019, the arrival of international visitors did not seem to explain the CMI, but during the second quarter of 2020, when the number of international visitors in Mexico abruptly fell due to the COVID-19 pandemic and the CMI reached its maximum level during the period studied, the number of international visitors once again explained the CMI.

5. Discussion and conclusions

In this study, we approached the topic of tourism and its palliative effect on poverty from the perspective of the CMI proposed by Hortalà and Rey (2011) using a bivariate SVAR model.

As a first method to analyze the SVAR model, we used impulse response analysis. The results indicate that there is a unidirectional relationship from the number of international visitors to the CMI; i.e., international visitors help reduce the CMI (Figure 2a). Conversely, the results also demonstrate that the CMI does not explain the arrival of international visitors to Mexico (Figure 2b). These results are congruent with the Granger causality test (Table 5).

The impulse response analysis shows that promoting the arrival of international excursionists and tourists is an important policy tool for alleviating the loss of wellbeing generated by increases in inflation and unemployment rates. These results are congruent with empirical evidence that tourism is a main driver of economic growth and employment creation. In Figure 2a, it can be seen that, since the first period, the number of international visitors has helped reduce the CMI, although the effect is not statistically significant during this period.

As a second method to study the SVAR model, we performed variance decomposition, which indicates that the CMI barely explains variations in international visitor arrivals (0.42%), whereas international visitors explain 18.21% of variations in the CMI. These results are congruent with the previous analyses, further showing that international visitor arrivals are a main factor in reducing poverty. However, in both cases, the variance decomposition analysis exhibited highly autoregressive behavior in the series.

As the last method to examine the SVAR results, we used the historical decomposition (Figure 3), which shows that the CMI does not explain the number of visitor arrivals (Figure 3a), but that the number of international visitors in Mexico has been related to the CMI during most of the period studied (Figure 3b).

Figure 3b demonstrates that during the international financial crisis, international visitor arrivals in Mexico explained in great part the changes in the CMI. It is equally important to note that during the second quarter of 2020, when the first COVID-19 wave occurred, international visitor arrivals explained an important part of the change in the CMI. Therefore, the decrease in the number of international visitors was highly related to the increase in misery during the first wave of the pandemic.

In Mexican states, such as Guerrero, tourism has been a main source of economic growth, and tourism activities have permitted local residents to obtain complementary incomes (Andrés-Rosales, Sánchez-Mitre, & Cruz, 2018). Additionally, it is common to find informal street vendors surrounding ports where cruise ships dock, and as mentioned by Brida and Zapata (2010), local salespeople seek to obtain additional income from passengers.

During the first quarter of 2020, measured in thousands of persons, Mexico received 23,160.96 international visitors; however, this number was drastically reduced to only 7,040.72 during the second quarter of the same year, implying a reduction of approximately 69.6% (Banco de México, 2020).

The aforementioned results on Mexico's tourism sector bring to light the importance of this activity for social well-being. Moreover, Loría et al. (2017) found that international visitors boost economic growth, and, following Garza-Rodriguez (2018), economic growth leads to poverty reduction, as it has positive effects on consumption per capita.

According to the World Bank (2021), Mexico has underperformed in its combat against poverty, in addition to having had low economic growth rates during the last three decades. Furthermore, the COVID-19 pandemic brought with it supply and demand shocks, which, combined with the global recession, have caused the Mexican economy to significantly contract during 2020. This study demonstrates that the promotion of international tourist and excursionist arrivals is a critical factor in alleviating the loss of social well-being generated by unemployment, inflation, and low GDP growth rates.

Finally, the association of international visitors with the CMI highlights the necessity to reactivate the tourism sector once sanitary conditions permit it. To promote the arrival of tourists in places like Cancun, hotel rates have been reduced in order to maintain hotel occupancy, although operating costs have increased (Blanco, 2021). This strategy can be strengthened by special offers in flights. However, according to the information provided by Blanco (2021), airlines have maintained or even increased the cost of tickets.

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Data Availability Statement

The data that support the findings of this study are openly available at Mendeley Data at https://doi.org/10.17632/hzgysvg55k.1

Disclosure statement

No potential conflict of interest was reported by the author(s).

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		^a No serial cor	relation at lag h			^a No serial correla	ition at lags 1 to h	
Lag	LRE statistic	Probability	Rao F-statistic	Probability	LRE statistic	Probability	Rao F-statistic	Probability
1	5.069847	0.2802	1.281781	0.2802	5.069847	0.2802	1.281781	0.2802
2	1.685449	0.7934	0.420870	0.7934	6.993308	0.5374	0.877264	0.5375
e	6.126506	0.1899	1.554956	0.1899	13.11442	0.3608	1.105386	0.3614
4	7.17717	0.1268	1.828821	0.1268	18.59938	0.2900	1.182291	0.2912
5	2.394468	0.6636	0.599471	0.6636	20.87507	0.4045	1.053908	0.4069
9	9.006782	0.0609	2.310373	0.0609	29.84301	0.1900	1.280296	0.1932
7	2.635040	0.6206	0.660281	0.6206	36.06673	0.1409	1.337878	0.1451
8	3.852030	0.4264	0.969545	0.4264	36.65898	0.2615	1.171855	0.2695
6	5.383119	0.2502	1.362550	0.2502	43.83184	0.1734	1.261154	0.1828
10	1.684846	0.7935	0.420719	0.7935	44.18341	0.2993	1.124005	0.3150
11	2.403458	0.6620	0.601742	0.6620	45.58226	0.4061	1.039371	0.4279
12	1.059130	0.9007	0.263868	0.9007	51.74342	0.3299	1.089093	0.3573
^a Indicates th	e null hypothesis.							

Table A1. VAR serial correlation LM test.

Appendix

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Variable	VIF
\dot{v}_{t-1}	1.171234
\dot{V}_{t-2}	1.057610
CMI_{t-1}	1.274311
CMI_{t-2}	1.250782
δ_t	1.012809
D _{2020Q2}	1.140469

Table A2. Variance inflation factors (VIF).

1 < VIF < 5 indicates moderate correlation. The test does not apply for constants.



Figure A1. Inverse roots of AR characteristic polynomial.