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The impact of geopolitical risk on tourism

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ABSTRACT
In this paper, we examine the impact of geopolitical risk on the demand for tourism service export. Using structural VAR model and U.S. monthly data from January 1999 to August 2020, we find that geopolitical risk has a negative and significant impact on tourism service exports. Our results reveal that, in the long-run, a one-standard-deviation shock in geopolitical risk shock explains about 12.6% of the variations in tourism net service exports.

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Geopolitical risk; Tourism; Tourism service export; Structural VAR (SVAR)

1. Introduction

The tourism industry plays a pivotal role by creating jobs, new export opportunities, and public services for the economy. In 2018, the U.S. travel and tourism industry generated over $1.87 trillion in economic output, representing 2.8% of the nation's GDP and supporting 7.8 million jobs (BEA, 2019).[1] Given the importance of the tourism industry to the economy, it is crucial to understand the risk factors that may affect the industry. One of these factors is geopolitical risk (GPR) and uncertainties. GPR is defined as 'the risk associated with wars, terrorist acts, and tensions between states that affect the normal and peaceful course of international relations' (Caldara & Iacoviello, 2018, p. 2). The GPR index captures the risk that these events materialize and the new risks linked with an escalation of existing geopolitical events. Recent studies have shown that GPR has a negative effect on tourism service (see e.g. Balli et al., 2019; Demiralay & Kilincarslan, 2019; Lee et al., 2020; Tiwari et al., 2019). Lee et al. (2020) found that GPR negatively affects tourism demand and the economic performance of tourist destination countries. Saint Akadiri et al. (2020) study the causality among GPR, tourism, and economic growth in Turkey and found GPR reduces the number of inbound tourist arrivals and economic growth. Using forecast error decomposition method, Payne and Apergis (2020) find that the U.S. geopolitical risk explains a significant portion of the forecast error variance associated with U.S. citizens' overseas air travel, next to economic policy uncertainty. Ming and Liu (2020) examine the effect of political uncertainty on the tourism industry in China and conclude that political uncertainty has a significant impact on the tourism industry in emerging markets. A similar conclusion is arrived at by other studies (e.g. Demir et al., 2019).

However, existing studies that examine the effect of GPR on tourism use the number of tourist arrivals as a measure of demand for tourism. Tourism service represents a bundle of goods and services purchased by tourists that varies with several aspects of tourists, including demographics, socio-economic background, types of accommodation chosen, length of stay, and reason for visit, among others. These differences lead to variations in tourism expenditures since tourist arrivals do not precisely reflect tourism expenditures and tourist consumption patterns. Consequently, the number of tourist arrivals does not precisely measure tourism's economic impact on the destination. As highlighted by Lim (2006), tourist expenditures are regarded as the most appropriate

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measure of tourism performance since variations in tourism consumption patterns have a direct effect on economic output and foreign exchange earnings. The objective of this study is to examine and quantify the impact of geopolitical risk on tourism service net exports. We formulated a hypothesis that geopolitical risk negatively affects tourism service exports.

The contribution of this paper to the literature is twofold. First, we contribute to the small but growing literature on the nexus between GPR and tourism exports using high-frequency tourist service expenditure data. The advantage of using monthly data in the study of tourism demand is that our model can track the effect of GPR on the economy more closely in real-time (Schorfheide & Song, 2015). The use of monthly data improves the statistical power of the model by increasing the number of observations and provides accurate information on short-term performances of the tourism industry, which is crucial for operational tourism. Surprisingly, previous studies on tourism demand predominantly use annual data (Song et al., 2008; Song & Li, 2008). Second, we employ a structural vector autoregression (SVAR) model to address endogeneity bias and quantify the variations attributed to shocks in geopolitical risk. To the best of our knowledge, no other study has addressed these issues in studying the impacts of GPR on tourism service net exports. While VAR models are found to be successful in the macro-finance literature, they are seldom applied in the tourism literature with a few exceptions of recent studies that apply these methods in other contexts of tourism study (Gunter & Önder, 2015; Payne & Apergis, 2020; Wong et al., 2006). Most importantly, our forecast error variance decomposition method allows us to precisely estimate the variations in tourism service export that is attributed to variations in geopolitical risk.

2. Method

To estimate the impacts of geopolitical risk on tourism service export in the U.S., we employ a structural VAR (SVAR) model. Let $y_t = (\text{GPR}_t, \text{WIP}_t, \text{P}_t, \text{TNX}_t)'$, where GPR_t is the index of geopolitical risk, WIP_t is the log of world industrial production (a proxy for foreign demand), P_t denotes the price level (a measure of competitiveness), and TNX_t represents net spending on tourism exports and imports. Following Kilian and Lütkepohl (2017), SVAR is given by:

$$A_0 y_t = \alpha + \sum_{i=1}^{p} A_i y_{t-i} + \varepsilon_t \tag{1}$$

where α is a vector of constants, A_0 and A_i denote the contemporaneous and lagged coefficient matrices, respectively. $\varepsilon_t = (\varepsilon_t^{\text{GPR}}, \varepsilon_t^{P}, \varepsilon_t^{\text{WIP}}, \varepsilon_t^{\text{TNX}})$ denote structural innovations that are serially and mutually uncorrelated. Assuming that $\boldsymbol{A}_0^{-1}$ exists, the reduced-form of Equation (1) is given by:

$$y_t = \delta + \sum_{i=1}^{p} \boldsymbol{B}_i y_{t-i} + e_t \tag{2}$$

Where $\delta = \boldsymbol{A}_0^{-1}\alpha$ is an $n \times 1$ vector of intercepts, $\boldsymbol{B}_i = \boldsymbol{A}_0^{-1} A_i$ are the reduced-form coefficients and e_t are the reduced form innovations. Assuming that $A_0^{-1}a$ is a recursive structure such that $e_t = \boldsymbol{A}_0^{-1}\varepsilon_t$, the reduced form innovations can be decomposed as follows:

$$e_t = \begin{pmatrix} \varepsilon_t^{\text{GPR}} \\ \varepsilon_t^{\text{WIP}} \\ \varepsilon_t^{P} \\ \varepsilon_t^{\text{TNX}} \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{23} & 0 & 0 \\ a_{31} & a_{32} & a_{23} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix} = \begin{pmatrix} \varepsilon_t^{\text{GPR Shock}} \\ \varepsilon_t^{\text{WIP shock}} \\ \varepsilon_t^{\text{Price shock}} \\ \varepsilon_t^{\text{other shocks to tourism demand}} \end{pmatrix} \tag{3}$$

Equation (3) represents a block-recursive structure on the contemporaneous relationship between the reduced form errors and the underlying structural shocks in the tourism market. We attribute the variations in TNX to three structural shocks: GPR shock, WIP shocks, and P shocks. The last shock refers to an innovation to the tourism specific demand. The impulse response functions of

$y_t = (y_{1t}, \ldots, y_{kt})'$ to a one-time standard deviation in the structural shocks, ε, is given by:

$$\frac{\partial y_{t+i}}{\partial \varepsilon'_t} = \Theta_i, \; i = 1, \ldots, H$$

where Θ_i is a $k \times k$ matrix with element i given by $\theta_{jk,i} = \partial y_{j,t+i}/\partial \varepsilon_{kt}$. The identification strategy is based on Cholesky decomposition of the covariance matrix with the GPR index ordered first, as in Caldara and Iacoviello (2018). The data ranges from 1999:M01 to 2020:M08, which is based on data availability. GPR is sourced from Caldara and Iacoviello (2018). CPI comes from the U.S. Bureau of Labor Statistics. TNX is sourced from the Bureau of Economic Analysis and the National Travel and Tourism Office (NTTO). WIP is obtained from Baumeister and Hamilton (2019). Table 1 shows the summary statistics, while Figure 1 shows the time series plots of GPR and TNX.

3. Results and discussions

3.1. Impulse response analysis

We estimate the impulse response functions (IRFs) to a one-standard-deviation shock to each series to examine the effects of each structural shock on TNX in the U.S using a lag of 24 months. Figure 2 shows the estimated IRF with one-and-two standard error bands. The results show the response of TNX and GPR to shocks in WIP, P, and GPR. The upper panel of Figure 2 presents the response of GPR and the lower panel shows the response of TNX to each of the shocks. The solid blue lines indicate the point estimates of the shocks, whereas the black dashed and dotted lines indicate the one-standard error and two-standard error bands, respectively. Each shock has been normalized to represent a one standard deviation positive shock. Also, the shock to WIP is normalized to represent a negative shock so that all the three shocks present negative responses with respect to TNX.

Considering the lower panel of Figure 2, an unexpected negative shock in WIP leads to a significant decrease in TNX for up to 12 months following the shock. As expected, a positive shock in P reduces TNX with a delay but permanently after five months from the time of the shock. Interestingly, unexpected rise in GPR leads to an immediate decline in TNX in the short-term for up to 3 months. The upper panel of Figure 2 shows that GPR responds positively to a rise in P and a positive shock to itself.

The cumulative impulse responses of TNX to each of the three shocks are illustrated in Figure 3. The bottom panel shows the response of the cumulative impulse responses of TNX to each shock. The upper panel shows the cumulative response of GPR to each shock. As shown in the bottom-right corner of Figure 3, an unanticipated positive shock in GPR causes a decline in TNX for up to 5 months. A positive shock in P has a persistent and negative effect on TNX after some initial delay. A negative shock in WIP has a negative and significant impact on TNX. Comparing this result with Figure 2, the one-time response to a GPR shock, the cumulative effect shows that GPR leads to a strong and persistent decline in TNX, with the effect diminishing after five months.

Table 1. Summary statistics.

Variable	Mean	Std.Dev.	Min	Max	ADF	
WIP	110.27	16.09	80.50	135.08	−3.070	−4.141***
CPI	214.42	27.65	164.30	259.92	−1.596	−2.236**
GPR	102.98	71.34	27.21	545.26	−3.431**	−11.595***
TNX (mil. $USD)	3787.45	2010.73	1003.00	8029.00	−0.785	−12.951***

Notes: $N = 260$.

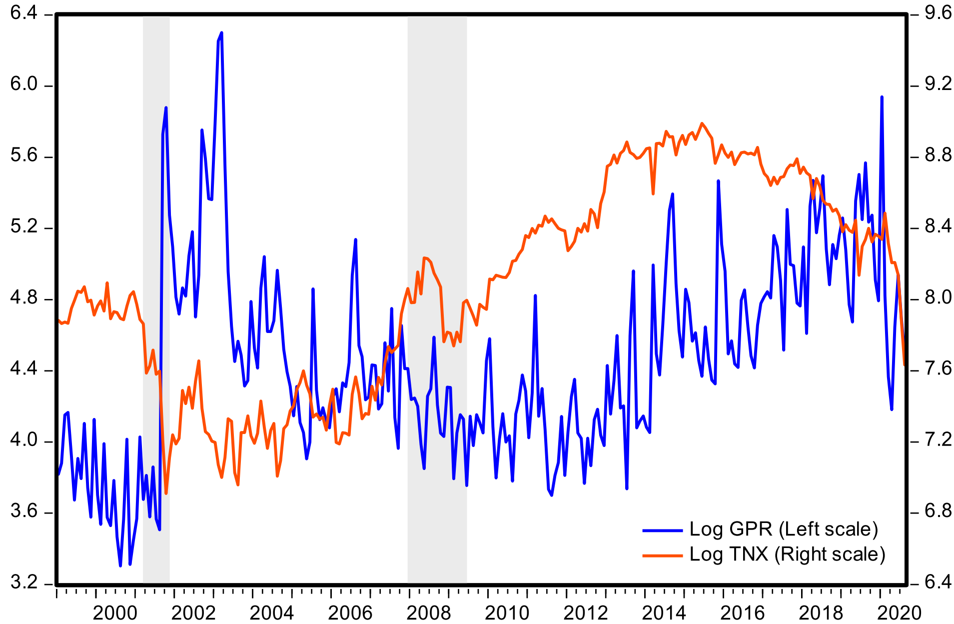

Figure 1. Historical trends (1999:M01 – 2020:M08).

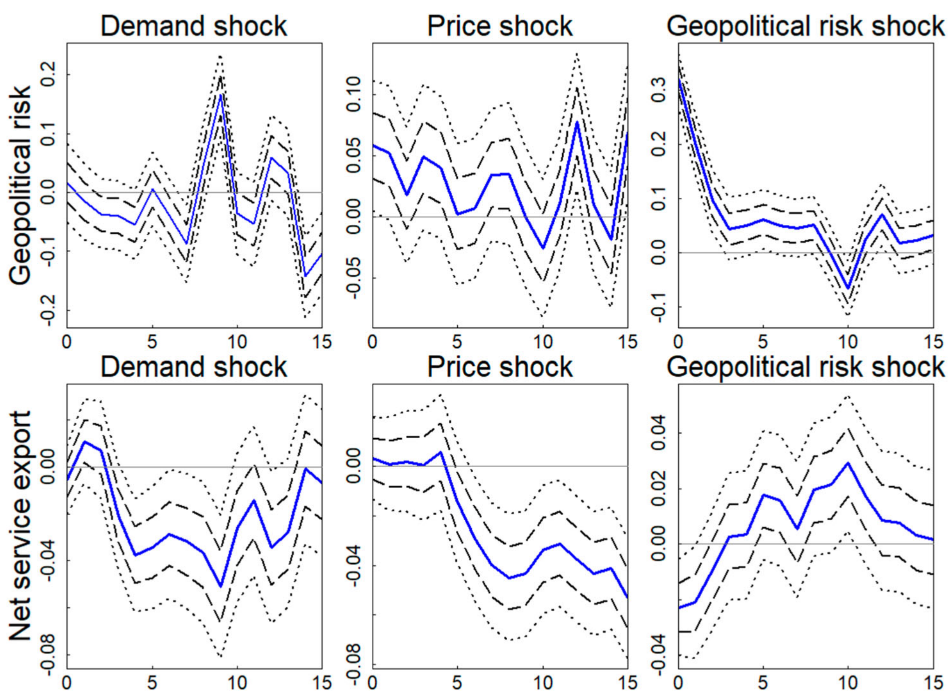

Figure 2. Impulse response functions. Notes: Responses of GPR (upper panel) and TNX (lower panel). Blue solid line along with dashed and dotted lines indicate the point estimates with one and two-standard error bands, respectively.

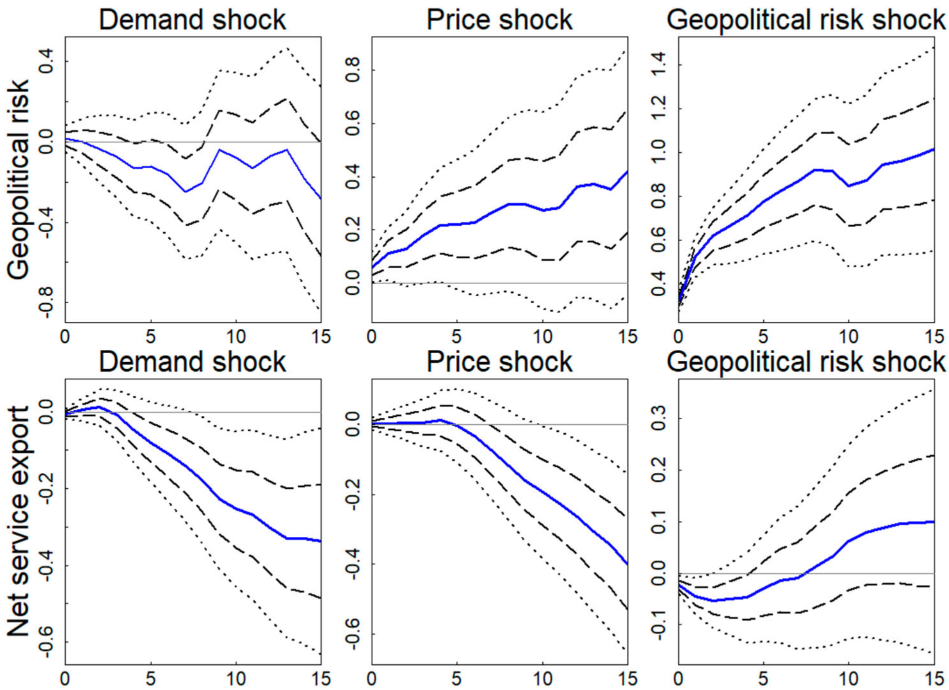

Figure 3. Cumulative response functions. Notes: See note in Figure 2.

3.2. Forecast error variance decomposition (FEVD)

We now examine the contributions of each shock on the variations of TNX. Specifically, we seek to quantify the contribution of each shock (ε_{kt}) to the forecast error variance following the estimates of the structural impulse responses. Table 2 shows the FEVD of the impacts of the structural shocks on TNX from tourism activity. Shocks in GPR contribute about 12.6% of the variations in TNX in the long-run. This contribution in the short-run is limited to 4.8% to 6.5%. In the short-term, tourism demand specific shocks contribute the largest share in the variation of TNX. Changes in WIP play a significant role in driving the variations in TNX in the long-run.

In relation to the literature, our results support the findings of recent studies that document the negative effects of GPR on the tourism industry. Specifically, recent evidence shows that GPR has a significant negative impact on the tourism industry, including on the number of tourist arrivals (Demir et al., 2019; Lee et al., 2020) and on Travel and Leisure industry stock prices (Jiang et al., 2020; Saint Akadiri et al., 2020). However, our results differ in that we use the net tourism service export as our dependent variable, which is arguably the most appropriate measure of tourism demand. Most notably, we address the classical issue of endogeneity bias by taking advantage of the SVAR framework, which quantifies the variations in tourism service net exports attributed to a

Table 2. Forecast error variance decomposition (FEVD) analysis.

Horizon	World I.P. shocks	Price shocks	GPR shocks	Other shocks
1	0.22	0.10	4.81	94.86
2	0.88	0.07	6.53	92.51
3	0.01	0.06	6.22	92.69
15	18.9	23.81	4.67	52.57
∞	64.02	17.74	12.58	56.65

Notes: The FEVD results are derived from the SVAR model in Equation (1).

one-standard-deviation shock in geopolitical risk. In sum, heightened geopolitical uncertainties play a detrimental role in tourism net exports.

4. Concluding remarks

This paper investigates the impact of geopolitical risk on net service export in the tourism industry. The paper aims to quantify the variations in tourism net exports that are attributed to geopolitical risk. We apply an identified structural VAR model on U.S. monthly data from 1999 to 2020. Our findings confirm the validity of the formulated hypothesis that geopolitical risk negatively affects tourism service exports. Specifically, our results reveal that shocks in geopolitical risk have a negative and statistically significant effect on net service export in tourism. In the long-run, geopolitical risk contributes approximately 12.6% of the variations in net service export on tourism. One limitation of our study is that monthly data on tourism service exports are available only from 1999. Although monthly frequency provides sufficient observations for reliable estimations, we are constrained to utilize long historical data to cover the various episodes of economic and geopolitical events throughout history.

Note

1. URL: https://www.commerce.gov/news/blog/2019/11/travel-and-tourism-sector-supports-78-million-jobs-and-accounts-28-us-gdp-2018 and https://apps.bea.gov/scb/2019/11-november/1119-travel-tourism-satellite-account.htm.

Disclosure statement

No potential conflict of interest was reported by the authors.

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