Evaluating methodological issues in the tourism literature:

UK outgoing tourism and trade links

Karen Jackson[1]
Wenyu Zang[2]

Abstract

This paper evaluates the importance of trade in goods when modelling demand for tourism. It is argued that the limited literature testing causality between trade in goods and tourism does not consider the appropriate variables. This study utilises bilateral data for 16 UK tourist destinations in order to test Granger causality between trade in goods and tourism expenditure. UK imports, exports and total trade are tested separately, whilst controlling for real GDP and real bilateral exchange rates. The novelty of this paper is the variable specification, as well as testing the causal relationship for the case of UK outgoing tourists. Our findings suggest a causal relationship between the tourism expenditure of UK residents and trade in goods. These results support the inclusion of a trade in goods variable when estimating tourism demand, as well as adopting appropriate methodologies to account for this causal relationship. Furthermore, there is strong evidence that the trade-tourism link is important for both the UK and host countries.

Keywords: tourism, trade, causality

JEL codes: F14, L83

1. Introduction

Recent literature has highlighted the uneven development of research in the area of tourism economics (Song et. al., 2012; Tugcu, 2014). Studies analysing the demand for tourism have traditionally estimated single log-linear equations, where estimating demand systems and dynamic modelling is a recent development within this body of literature (Li et. al., 2013). Despite these important recent developments, trade in goods, as a determinant for tourism demand, still remains largely ignored. Furthermore, there are very few studies that evaluate whether a causal relationship exists between trade in goods and tourism. In this paper, it will be argued that these causality studies have key deficiencies in terms of the variables deployed. Therefore, this paper proposes a revised variable specification for testing Granger causality between trade in goods and tourism. This novel specification will be applied to UK outgoing tourism data, thereby offering a significant contribution to the very limited literature examining the UK. It is important to establish whether these neglected links are empirically valid, and therefore whether there is evidence of simultaneity bias and omitted variables in the current tourism literature.

In 2011 UK residents were the fourth highest global spenders on tourism, and the second highest within the EU-27 (UN World Tourism Organisation). Destinations for UK residents are intra-EU focused although extra-EU countries such as the USA, Australia and India are also popular (UK Office of National Statistics). This paper will evaluate the causal relationship between trade in goods and tourism for 16 UK tourist destinations, including 11 intra-EU destinations. In the next section of this study, we review the key determinants of demand for tourism, as well as the studies that specifically consider

trade in goods and the theoretical links. The third section will discuss the data and model. We will then turn, in section four, to the interpretation of the empirical results. Finally, we will outline our concluding remarks.

2. Review

There is an extensive body of literature examining tourism demand, as well as a significant number of reviews of this literature (Crouch, 1994; Johnson and Ashworth, 1990; Li et. al, 2005; Lim, 1997, 1999; Song and Li, 2008; Witt and Witt, 1995). Crouch (1994) and Lim (1997, 1999) identify the key determinants of the demand for tourism, namely: income, relative prices, exchange rates and transport costs. This literature also highlights a number of issues with respect to the specification of the variables. Firstly, the commonly used dependent variables are tourist arrivals/departures or tourism expenditure/receipts (in both nominal and real terms; Lim, 1997). Johnson and Ashworth (1990) suggest that while tourist arrivals/departures are more frequently used, policy makers are more likely to be concerned with tourism expenditure/receipts.

In terms of explanatory variables, various measurement issues arise when modeling income. It would be preferential to measure income after spending on necessities, but data on GDP is more readily available and so a commonly used proxy. There is also debate around tourist responsiveness to changes in exchange rates, compared to inflation. There is a significant body of literature (Artus, 1970; Gray, 1966; Lin and Sung, 1983; Little, 1980; Tremblay, 1989; Truett and Truett, 1987) suggesting that tourists tend to be better informed about changes in exchange rates. However, it has been shown by Edwards (1987) that tourists only react differently to these two variables in

the short run. However, due to multicollinearity it is questionable to include both exchange rate and relative price variables (Lim, 1997). Therefore, it is reasonable to include a relative price variable interacted with the exchange rate.

The literature makes little mention of the role of trade as a determinant for tourism demand, where recent studies focusing on the tourism demand of UK residents also fail to consider trade in goods as a driver. The UK studies focus on explanatory variables such as exchange rates, prices and expenditure (De Mello et. al., 2002; Seetaram et. al., 2013; Song et. al., 2000). There is no established theoretical framework explaining the link between tourism and trade in goods (Fischer and Gil-Alana, 2009). Nevertheless, economic theory suggests that the movement of people between countries will promote trade in goods by introducing domestically produced products to migrants as well as foreign tastes to the established local population (Brau and Pinna, 2013). The migration literature also provides theory and evidence that can be applied to tourism. Migrants tend to have a preference towards products from their home country, alongside transmitting information regarding potential markets and distribution channels that may lower the costs for trade in goods (Gould, 1994). The importance of the information channel is dependent on the level of development of the host country. Whereas, more distinct varieties of goods produced across the home and host country suggest a stronger impact on trade via preferences (Head and Ries, 1998). Consumer preferences will also have a larger impact on host country imports of goods if tourism is relatively important within the economy.

Despite the lack of theoretical framework, the tourism literature provides intuitive explanations for a bilateral tourism – trade in goods link, which often mirror the theories proposed in the migration literature. For example, business travel may lead to future trade in goods as well as additional persons accompanying the business traveller for the purpose of a holiday. The development of trade links may also lead to increased awareness of a particular country and therefore, future holidays to this destination. On the other hand, holiday travel may lead to the import of goods to meet the demands of tourists as well as the possibility that individuals may identify possible business opportunities (Kulrendran and Wilson, 2000). Therefore, the current literature investigates the tourism and trade in goods link empirically, with mixed results. Studies by Kadir and Jusoff (2010), Katircioglu (2009) and Massidda and Mattana (2013) investigate the trade–toursim link by using total trade/export/import data, on a unilateral basis, where each study focuses on a different country (Malaysia, Cyprus and Italy respectively). The exact specification varies between studies, with controls for GDP in the latter two studies, but the results of these time-series tests all indicate a uni-directional relationship from trade to tourism. By comparison, the results are much more mixed when time-series tests consider bilateral trade data (Khan et. al., 2005; Kulendran and Wilson, 2000; Santana-Gallego et. al., 2011b; Shan and Wilson, 2001). Each of these studies also have a country focus: Singapore (four partners), Australia (four partners), Canary Islands (six partners) and China (four partners) respectively. It is noteworthy that only the Shan and Wilson (2001) study includes any control variables. There are also two further studies that are of particular interest since they test Granger causality in a panel setting: Fry et. al. (2010) and Santana-Gallego et. al. (2011a). Fry et. al. (2010) considers South African tourist arrivals, and whilst this study includes both time-series and panel tests, controls are only included in the time-series

version. On the other hand, the study by Santana-Gallego et. al. (2011a) takes a broader approach by considering OECD countries, but in doing so uses annual unilateral trade data and no control variables. Both panel test results provide evidence of a bi-directional trade-tourism link, although this result is more clearly identified in the Fry et. al. (2010) study.

A VAR model will be utilised, similar to Shan and Wilson (2001), where we apply the causality method developed by Toda and Yamamoto (1995). The advantage of this methodology is that tests for unit roots and cointegration rank are not required, since they have proved to be problematic. Hence, this methodology is applicable whether the variables are stationary, integrated or cointegrated. However, all the independent variables in the model have identical lag lengths, which may not be valid for many economic time series and also may cause inefficiency in determining the maximum order of lags (Hsiao, 1981). Hsiao's (1981) version of causality test allows each independent variable to have a different number of lags, reducing the number of parameters to be estimated. The novelty of this paper is that tests for Granger causality will be carried out applying both Toda and Yamamoto (1995) method and Hsiao (1981) method using bilateral trade data with controls for real GDP and real bilateral exchange rates for 16 UK tourist destinations. The controls have been selected on the basis of the key variables found to be most consistently statistically significant in previous studies of tourism demand. These variables correspond to those utilised in other UK studies (De Mello et. al., 2002; Seetaram et. al. 2013; Song et. al., 2000).

3. Data and Model

3.1 Toda and Yamamoto (1995) Granger causality method

The following VAR model will be utilized:

$$Y_t = \mu_1 + \sum_{i=1}^{k+d} \alpha_{1i} Y_{t-i} + \sum_{i=1}^{k+d} \beta_{1i} X_{t-i} + \varepsilon_{1t} \quad (1)$$

$$X_t = \mu_2 + \sum_{i=1}^{k+d} \alpha_{2i} Y_{t-i} + \sum_{i=1}^{k+d} \beta_{2i} X_{t-i} + \varepsilon_{1t} \quad (2)$$

The model includes μ_1 / μ_2 to capture the deterministic component, which may include seasonal dummies, a trend and a constant term (Kulendran and Wilson, 2000). *k* is the optimal lag order and *d* is the maximum order of integration of the variables. The optimal lag length (*k*) is determined and the VAR(*p*) model (*p=k+d*) is estimated with additional *d*-max lags as long as *d* does not exceed *k*. Then the conventional Wald test is applied on the first *k* coefficient matrices using the standard χ^2 statistic. It should be noted that the coefficient matrices of the last $d_{\max}$ lagged vectors in the model are ignored since they are assumed to be zero (Toda and Yamamoto, 1995). Therefore, the causal relationships between the variables are determined by the joint significance of the lagged variables. For example, *X* only Granger causes *Y* if the joint test of β_{1i} is statistically different from zero and the joint test of α_{2i} is zero ($i \le k$). *Y* only Granger causes *X* if the joint test of α_{2i} is statistically different from zero and the joint test of β_{1i} is zero ($i \le k$). If both α_{2i} and β_{1i} ($i \le k$) are statistically different from zero, a two-way causal link exists. If both α_{2i} and β_{1i} ($i \le k$) are zero, there is no causal link between the two variables.

3.2 Hsiao (1981) Granger causality method

Hsiao's (1981) procedure of Granger causality method consists of two steps to determine the optimal lag length and the direction of causality using Akaike's final prediction error (FPE). If both of the two variables (*X* and *Y*) have a unit root and no

cointegration is found, the first step is to estimate equation (3) to compute FPE as shown in equation (4), where T is the total number of observations, SSE is sum of squared errors and m is the order of lags varying from one to m. The lag order that have the smallest FPE is chosen as the optimal lag length m*. Equation (5) is estimated in the second step with lag length m* for ΔY and with lag length varying from one to n for ΔX . The minimum value of FPE(m*, n) in equation (6) determines the optimal lag length n* for ΔX . If FPE(m) is greater than FPE(m*, n), *X* Granger causes *Y*, otherwise *X* does not Granger cause *Y*. If one variable is I(1) and the other one is I(0), the variable that is I(1) should be in first difference form and the variable that is I(0) should be in level form in equations (3) and (5). The hypothesis of *Y* Granger causes *X* can be also tested by interchanging *X* and *Y* in the equations (3) to (6).

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{m} \beta_i \Delta Y_{t-i} + u_t \quad (3)$$

$$FPE(m) = \frac{T+m+1}{T-m-1}\frac{SSE}{T} \quad (4)$$

$$\Delta Y_t = \alpha_1 + \sum_{i=1}^{m^*} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \lambda_i \Delta X_{t-j} + u_t \quad (5)$$

$$FPE(m^*, n) = \frac{T+m^*+n+1}{T-m^*-n-1}\frac{SSE(m^*, n)}{T} \quad (6)$$

However, if both of the two variables (*X* and *Y*) have a unit root and there is a cointegrating relationship, the error correction (EC) term should be included in the second step as shown in equation (7) to determine the optimal lag length n* for ΔX (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008). If one variable is found to be I(2)and the other is I(1) or I(2), cointegration is still tested by assuming that both variables are I(1) and the I(2) result is a statistical anomaly (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008).

$$\Delta Y_t = \alpha_1 + \gamma_1 EC_{t-1} + \sum_{i=1}^{m^*} \beta_i \Delta Y_{t-i} + \sum_{j=1}^{n} \lambda_i \Delta X_{t-j} + u_t \quad (7)$$

3.3 Data

16 UK tourist destinations were selected on the basis of data availability: Australia, Czech Republic, Estonia, France, Germany, Hungary, Italy, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Africa, Turkey, US. Quarterly data was collected for the period 1993-2011[3]. The data has been obtained from the *UK Office of National Statistics International Passenger Survey*, *IMF Direction of Trade Database*, *OECD Main Economic Indicators Database* and the *Bank of England*. Exchange rates for Australia, France, Germany, Italy, Netherlands, New Zealand, Portugal, South Africa and US are from the Bank of England. On the other hand, exchange rates for Czech Republic, Estonia, Hungary, Poland, Slovakia, Slovenia and Turkey are from *OECD Main Economic Indicators Database*. UK GDP, Tourism, imports/exports/ trade and exchange rate are real UK GDP, real tourist expenditure, real UK imports/exports/total trade from the tourist destination and real bilateral exchange rate respectively.

4. Empirical Results

4.1 Unit root test

The ADF test has been carried out for each variable to establish the order of integration. The optimum lag length (k) is selected by Modified Akaike Information Criterion (MAIC). According to Ng and Perron (2001), Bayesian Information Critierion (BIC) and Akaike Information Criteria (AIC) tend to select small lag length (k) and therefore suffer from severe small size distortions, the MAIC is proved to yield substantial size improvements and power gains. KPSS test is also reported to check the robustness of the ADF results as Kwiatkowski *et al.* (1992) argue that most economic time series are

not very informative about unit root and the standard unit root tests have low power. KPSS test examines the null hypothesis of stationarity against the alternative hypothesis of non-stationarity, which is the opposite of the ADF test. The inclusion of constant/constant and trend in the ADF and KPSS tests is based on the significance level of constant and trend in the unit root test equation. Details of ADF and KPSS tests are reported in Appendices A and B.

4.2 Toda and Yamamoto (1995) Granger causality method

Table 1 and Table 2 show the maximum number of integration (d) for each VAR based on ADF test and KPSS test. The likelihood ratio (LR) test is used to determine the optimal number of lags (*k*) for each VAR model as shown in Table 3. The size of the VAR is the optimum number of lags plus the maximum number of integration used in the model (*k*+*d*).

<Table 1>

<Table 2>

<Table 3>

Tables 4, 6 and 8 show the causality test results, whereas Tables 5, 7 and 9 summarize the causal relationship between tourism and total trade/exports/imports. Due to different results of ADF and KPSS unit root tests, Hungary shows both bi-directional causality between tourism and trade and uni-directional causality from trade to tourism. Similarly, New Zealand falls into both two-way link and one way link from tourism to trade. France demonstrates both one-way causality from Tourism to exports and two-way causality, Portugal shows one-way causality from exports to tourism and two-way causality. For the causal relationship between tourism and imports, New

Zealand and Slovakia fall into two categories: uni-directional causality from tourism to imports and bi-directional causality. However, for the majority of countries there is evidence of two-way causality between the expenditure of outbound UK tourists and UK total trade/exports/imports.

<Table 4>

<Table 5>

<Table 6>

<Table 7>

<Table 8>

<Table 9>

4.3 Hsiao (1981) Granger causality method

The trade-tourism, exports-tourism and imports-tourism causality test results are presented in Tables 10, 12, 14, 16, 18 and 20 with the summaries shown in Tables 11, 13, 15, 17, 19 and 21 based on ADF and KPSS unit root tests. The maximum lag length is set as 20 per cent of total observations as suggested by Chontanawat *et al.* (2006) and Chontanawat *et al.* (2008). Details of the Johansen cointegration test are reported in Appendix C to Appendix H with optimum lag selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008). The results are different depending on the unit root test. However, in general, most countries experience uni-directional causality running from tourism to trade, one way causal link from tourism to exports and bi-directional causality between tourism and imports.

<Table 10>

<Table 11>

<Table 12>

<Table 13>

<Table 14>

<Table 15>

<Table 16>

<Table 17>

<Table 18>

<Table 19>

<Table 20>

<Table 21>

The results for exports suggest that UK outbound tourism in most cases leads to exports of goods. Migration theory offers an explanation for this result, in that the countries in this sample are likely to have similar varieties of products to those in the UK already available for sale. By contrast, the results for imports provide significant evidence that business links concerning UK goods imports lead to an increased awareness of the exporting country and therefore tourism. In the majority of cases, there is also evidence tourism has developed business links resulting in UK goods imports. This may be via the information channel as well as the exposure to new tastes, where tourists change their preferences and patterns of demand when returning to the UK. Overall, these results provide evidence of more opportunities for foreign countries, rather than the UK, to develop their export sector. Nevertheless, consumers in the UK are likely to experience welfare improvement due to access to a larger variety of products. Therefore, these

results provide strong evidence that the trade-tourism link is important for both the UK and host countries.

5. Concluding Remarks

The previous literature, testing the trade-tourism link, has found mixed results. However, the results presented in this paper suggest a unidirectional/bidirectional causal relationship in the significant majority of cases considered. Therefore, by utilising a novel variable specification, including the use of bilateral data, this paper has provided evidence of a causal relationship between tourism expenditure of UK residents and trade in goods. Given the lack of literature that examines the causal relationship for UK data, this paper provides important new evidence on the importance of the trade-tourism link in terms of attracting UK tourists and the expansion of host country export industries. Policy makers in the UK should also be mindful of the potential of welfare gains from increased product variety.

These results also call into question the findings of the tourism demand modelling literature given the evidence of simultaneity bias and omitted variables. Therefore, further research should adopt an appropriate modelling approach, such as structural equation modelling, to avoid simultaneity bias (Nunkoo, Ramkissoon et.al., 2013).

[1] Division of Economics
School of Social and International Studies
University of Bradford
Bradford

BD7 1DP
Email: k.jackson2@bradford.ac.uk
We gratefully acknowledge valuable comments on earlier versions of the paper from two anonymous referees.

[2] Economics Division
Nottingham Business School
Nottingham Trent University
Nottingham
NG1 4BU
Email: wenyu.zang@ntu.ac.uk

[3] Tourist expenditure data was only available from 1996q1-2011q4 for Czech Republic, 2000q1-2011q4 for Estonia, 1995q1-2011q4 for Hungary, 1995q1-2011q4 for Poland, 1995q1-2011q4 for Portugal, 1997q1-2011q4 for Slovakia, 1996q1-2011q4 for Slovenia, 1998q1-2011q4 for Turkey.

References

Artus, J. R. (1970) 'The effect of revaluation on the foreign trade balance of Germany', *International Monetary Fund Staff Papers*, 17, 602–617.

Brau, R. and A. M. Pinna (2013) 'Movements of people for movements of goods', *The World Economy*, 36, 1318-1332.

Chontanawat, J., L. C. Hunt and R. Pierse (2006) 'Causality between energy consumption and GDP: evidence from 30 OECD and 78 non-OECD countries', Surrey Energy Economics Centre (SEEC), Discussion Paper SEEDS no. 113, University of Surrey.

Chontanawat, J., L. C. Hunt and R. Pierse (2008) 'Does energy consumption cause economic growth? Evidence from a systematic study of over 100 countries', *Journal of Policy Modelling*, 30, 209-220.

Crouch, L. (1994) 'The study of international tourism demand: a survey of practice', *Journal of Travel Research*, 32, 12–23.

De Mello, M., A. Pack and M. T. Sinclair (2002) 'A system of equations model of UK tourism demand in neighbouring countries', *Applied Economics*, 34, 509-521.

Duttaray, M., A. K. Dutt and K. Mukhopadhyay (2008) 'Foreign direct investment and economic growth in less developed countries: an empirical study of causality and mechanisms', *Applied Economics*, 40, 1927-1939.

Edwards, A. (1987), 'Choosing holiday destinations: the impact of exchange rates and inflation', Economist Intelligence Unit Ltd, Special Report no. 1109, London.

Fischer, C. and L. A. Gil-Alana (2009) 'The nature of the relationship between international tourism and international trade: the case of German imports of Spanish wine', *Applied Economics*, 41, 1345-1359.

Fry, D., A. Saayman, and M. Saayman (2010) 'The relationship between tourism and trade in South Africa', *South African Journal of Economics*, 78, 287-306.

Gould, D. M. (1994) 'Immigrant links to the home country: empirical implications for U.S. bilateral trade flows', *The Review of Economics and Statistics*, 76, 302-316.

Gray, P. (1966) 'The demand for international travel by the United States and Canada', *International Review*, 7, 72–82.

Head, K. and J. Ries (1998) 'Immigration and trade creation: econometric evidence from Canada', *The Canadian Journal of Economics*, 31, 47-62.

Hsiao, C. (1981) 'Autoregressive modelling and money-income causality detection', *Journal of Monetary Economics*, 7, 85-106.

Hsiao, F. S. T. and M. C. W. Hsiao (2006) 'FDI, exports and GDP in East and Southeast Asia – panel data versus time-series causality analyses', *Journal of Asian Economics,* 17, 1082-1106.

Johnson, P. and J. Ashworth (1990) 'Modelling tourism demand: a summary review', *Leisure Studies*, 9, 145–160.

Kadir, N. and K. Jusoff (2010) 'The cointegration and causality tests for tourism and trade in Malaysia', *International Journal of Economics and Finance*, 2, 138-143.

Katircioglu, S. (2009) 'Tourism, trade and growth: the case of Cyprus', *Applied Economics,* 41, 2741-2750.

Khan, H., R. S. Toh and L. Chua (2005) 'Tourism and trade: cointegration and Granger causality tests', *Journal of Travel Research*, 44, 171-176.

Kulendran, N. and K. Wilson (2000) 'Is there a relationship between international trade and international travel?', *Applied Economics*, 32, 1001–1009.

Kwiatkowski, D., P. C. B. Phillips, P. Schmidt and Y. Shin (1992) 'Testing the null hypothesis of stationary against the alternative of a unit root', *Journal of Econometrics,* 54, 159-178.

Li, G., H. Song, Z. Cao and D. C. Wu (2013) 'How competitive is Hong Kong against its competitors? An econometric study', *Tourism Management*, 36, 247-256.

Li, G., H. Song and S. F. Witt (2005) 'Recent developments in econometric modeling and forecasting', *Journal of Travel Research*, 44, 82-99.

Lim, C. (1997) 'Review of international tourism demand models', *Annals of Tourism Research*, 24, 835–849.

Lim, C. (1999) 'A meta-analytic review of international tourism demand', *Journal of Travel Research*, 37, 273–284.

Lin, T. B. and Y. W. Sung (1983) 'Hong Kong', in Pye, E. A. and T. B. Lin (ed) *Tourism in Asia: the economic impact*, Singapore: Singapore University Press.

Little, J. S. (1980) 'International travel in the U.S. balance of payments', *New England Economic Review*, May–June, 42–55.

Massidda, C. and P. Mattana (2013) 'A SVECM analysis of the relationship between international tourism arrivals, GDP and trade in Italy', *Journal of Travel Research*, 52, 93-105.

Ng. S. and P. Perron (2001) 'Lag length selection and the construction of unit root tests with good size and power', *Econometrica,* 69, 1519-1554.

Nunkoo R., H. Ramkissoon and D. Gursoy (2013) 'Use of structural equation modelling in tourism research: past, present, and future', *Journal of Travel Research*, 52, 759-771.

Qi, L. (2007) 'The relationship between growth, total investment and inward FDI: evidence from time series data', *International Review of Applied Economics,* 21, 119-133.

Santana-Gallego, M., F. Ledesma-Rodríguez and J. V. Pérez-Rodríguez (2011a) 'Tourism and trade in OECD countries. A dynamic heterogeneous panel data analysis', *Empirical Economics*, 41, 533-554.

Santana-Gallego, M., F. Ledesma-Rodriguez, and J. V. Perez-Rodriguez (2011b) 'Tourism and trade in small island regions: the case of the Canary Islands', *Tourism Economics*, 17, 107-125.

Seetaram, N., H. Song, and S. J. Page (2013) 'Air passenger duty and outbound tourism demand from the United Kingdom', *Journal of Travel Research*

Shan, J. and K. Wilson (2001) 'Causality between trade and tourism: Empirical evidence from China', *Applied Economics Letters*, 8, 279–283.

Song, H., L. Dwyer, G. Li and Z. Cao (2012) 'Tourism economics research: A review and assessment', *Annals of Tourism Research*, 39, 1653-1682.

Song, H. and G. Li (2008) 'Tourism demand modeling and forecasting – A review of recent research', *Tourism Management*, 29, 203-220.

Song, H., P. Romilly and X. Liu (2000) 'An empirical study of outbound tourism demand in the UK', *Applied Economics*, 32, 611-624.

Toda, H. Y. and T. Yamamoto (1995) 'Statistical inference in vector autoregressions with possibly integrated processes', *Journal of Econometrics*, 66, 225-250.

Tremblay, P. (1989) 'Pooling international tourism in Western Europe', *Annals of Tourism Research*, 16, 477–491.

Truett, D. B. and L. J. Truett (1987) 'The response of tourism to international economic conditions: Greece, Mexico and Spain', *Journal of Developing Area*s, 21, 177–189.

Tugcu, C. T. (2014) 'Tourism and economic growth nexus revisited: A panel causality analysis for the case of the Mediterranean Region', *Tourism Management*, 42, 207-212.

UK Office of National Statistics, *International Passenger Survey*

UN World Tourism Organisation, *World Tourism Barometer*

Witt, S. and C. Witt (1995), 'Forecasting tourism demand: a review of empirical research', *International Journal of Forecasting*, 11, 447–475.

Table 1:
Maximum number of integration order for the VAR model based on Toda and Yamamoto (1995) methodology and ADF unit root test

Country	Trade equation	Exports equation	Imports equation
Australia	2	2	2
Czech Republic	1	1	1
Estonia	1	1	1
France	2	2	2
Germany	2	2	2
Hungary	2	2	2
Italy	2	2	2
Netherlands	2	2	2
New Zealand	2	2	2
Poland	2	2	2
Portugal	2	2	2
Slovakia	2	2	2
Slovenia	1	1	1
South Africa	2	2	2
Turkey	1	1	1
US	2	2	2

Table 2:
Maximum number of integration order for the VAR model based on Toda and Yamamoto (1995) methodology and KPSS unit root test

Country	Trade equation	Exports equation	Imports equation
Australia	1	1	1
Czech Republic	2	2	2
Estonia	1	1	1
France	2	1	1
Germany	1	1	1
Hungary	1	1	2
Italy	1	1	1
Netherlands	1	1	1
New Zealand	1	1	1
Poland	1	1	2
Portugal	1	1	1
Slovakia	1	1	1
Slovenia	1	1	1
South Africa	1	1	1
Turkey	2	1	2
US	1	2	1

Table 3:
Optimum number of lags based on Toda and Yamamoto (1995) methodology

Country	LR (Trade)	LR (Exports)	LR(Imports)
Australia	11	11	11
Czech Republic	9	9	9
Estonia	7	7	7

France	10	11	11
Germany	11	11	11
Hungary	10	10	10
Italy	11	11	11
Netherlands	11	11	11
New Zealand	11	11	11
Poland	10	10	10
Portugal	10	10	10
Slovakia	9	9	9
Slovenia	9	9	9
South Africa	11	11	11
Turkey	8	8	8
US	11	11	11

Note: Duttaray *et al.* (2008) set the maximum lag length as 4 using 27 observations and Qi (2007) sets the maximum lag length as 5 using 34 observations. The maximum number of lags is set as 11 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 10 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 9 for Czech Republic (64 observations), Slovakia (60 observations) and Slovenia (64 observations). It is set as 8 for Turkey (56 observations) and as 7 for Estonia (48 observations).

Table 4:
Trade-tourism causality results based on Toda and Yamamoto (1995) methodology

Country	Tourism → Trade	Trade → Tourism
Australia (*k*=11, *d*=1)	38.07*** (0.0000)	48.32*** (0.0000)
Australia (*k*=11, *d*=2)	56.88*** (0.0000)	96.58*** (0.0000)
Czech Republic (*k*=9, *d*=1)	18.52** (0.0296)	63.63*** (0.0000)
Czech Republic (*k*=9, *d*=2)	118.00*** (0.0000)	77.45*** (0.0000)
Estonia (*k*=7, *d*=1)	86.32*** (0.0000)	96.03*** (0.0000)
France (*k*=10, *d*=2)	59.28*** (0.0000)	11.12 (0.3486)
Germany (*k*=11, *d*=1)	51.03*** (0.0000)	77.30*** (0.0000)
Germany (*k*=11, *d*=2)	71.02*** (0.0000)	197.06*** (0.0000)
Hungary (*k*=10, *d*=1)	17.00* (0.0744)	45.44*** (0.0000)
Hungary (*k*=10, *d*=2)	12.07 (0.2806)	140.57*** (0.0000)
Italy (*k*=11, *d*=1)	93.97*** (0.0000)	176.96*** (0.0000)
Italy (*k*=11, *d*=2)	133.99*** (0.0000)	351.98*** (0.0000)
Netherlands (*k*=11, *d*=1)	54.37*** (0.0000)	68.45*** (0.0000)

Netherlands (*k*=11, *d*=2)	91.83*** (0.0000)	160.29*** (0.0000)
New Zealand (*k*=11, *d*=1) New Zealand (*k*=11, *d*=2)	24.50** (0.0108) 61.82*** (0.0000)	4.02 (0.9694) 20.26** (0.0419)
Poland (k=10, d=1) Poland (k=10, d=2)	80.70*** (0.0000) 56.83*** (0.0000)	296.18*** (0.0000) 209.29*** (0.0000)
Portugal (*k*=10, *d*=1) Portugal (*k*=10, *d*=2)	18.76** (0.0435) 53.86*** (0.0000)	66.92*** (0.0000) 59.57*** (0.0000)
Slovakia (*k*=9, *d*=1) Slovakia (*k*=9, *d*=2)	281.40*** (0.0000) 282.53*** (0.0000)	43.40*** (0.0000) 31.72*** (0.0002)
Slovenia (*k*=9, *d*=1)	183.33*** (0.0000)	37.30*** (0.0000)
South Africa (*k*=11, *d*=1) South Africa (*k*=11, *d*=2)	26.96*** (0.0047) 47.08*** (0.0000)	283.69*** (0.0000) 244.52*** (0.0000)
Turkey (*k*=8, *d*=1) Turkey (*k*=8, *d*=2)	41.10*** (0.0000) 53.98*** (0.0000)	60.90*** (0.0000) 154.52*** (0.0000)
US (*k*=11, *d*=1) US (*k*=11, *d*=2)	85.28*** (0.0000) 111.07*** (0.0000)	39.15*** (0.0000) 46.32*** (0.0000)
Notes: (1) ***, ** and * mean significant at 1%, 5% and 10% respectively. (2) The numbers in brackets are chi square probabilities.		

Table 5:
Summary of trade-tourism causality results based on Toda and Yamamoto (1995) methodology

	Countries
Tourism → Trade	France, New Zealand
Tourism ← Trade	Hungary
Tourism ↔ Trade	Australia, Czech Republic, Estonia, Germany, Hungary, Italy, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Africa, Turkey, US
No Causality	

Table 6:
Exports-tourism causality results based on Toda and Yamamoto (1995) methodology

Country	Tourism → Exports	Exports → Tourism
Australia	60.79***	38.17***
(*k*=11, *d*=1)	(0.0000)	(0.0001)
Australia	63.33***	92.80***
(*k*=11, *d*=2)	(0.0000)	(0.0000)
Czech Republic	101.95***	13.85[a]
(*k*=9, *d*=1)	(0.0000)	(0.1277)
Czech Republic	240.71***	18.79**
(*k*=9, *d*=2)	(0.0000)	(0.0270)
Estonia	138.12***	181.12***
(*k*=7, *d*=1)	(0.0000)	(0.0000)
France	87.41***	13.80
(*k*=11, *d*=1)	(0.0000)	(0.2443)
France	120.73***	32.36***
(*k*=11, *d*=2)	(0.0000)	(0.0007)
Germany	48.16***	35.67***
(*k*=11, *d*=1)	(0.0000)	(0.0002)
Germany	138.31***	75.63***
(*k*=11, *d*=2)	(0.0000)	(0.0000)
Hungary	52.33***	23.01**
(*k*=10, *d*=1)	(0.0000)	(0.0107)
Hungary	743.68***	17.21*
(*k*=10, *d*=2)	(0.0000)	(0.0698)
Italy	49.60***	84.89***
(*k*=11, *d*=1)	(0.0000)	(0.0000)
Italy	53.41***	164.01***
(*k*=11, *d*=2)	(0.0000)	(0.0000)
Netherlands	26.06***	64.15***
(*k*=11, *d*=1)	(0.0064)	(0.0000)
Netherlands	64.95***	174.64***
(*k*=11, *d*=2)	(0.0000)	(0.0000)
New Zealand	38.41***	66.28***
(*k*=11, *d*=1)	(0.0001)	(0.0000)
New Zealand	29.54***	78.81***
(*k*=11, *d*=2)	(0.0019)	(0.0000)
Poland	85.55***	140.38***
(*k*=10, *d*=1)	(0.0000)	(0.0000)
Poland	149.03***	103.02***
(*k*=10, *d*=2)	(0.0000)	(0.0000)
Portugal	14.17	39.36***
(*k*=10, *d*=1)	(0.1653)	(0.0000)
Portugal	34.74***	87.20***
(*k*=10, *d*=2)	(0.0001)	(0.0000)
Slovakia	82.24***	98.42***
(*k*=9, *d*=1)	(0.0000)	(0.0000)
Slovakia	140.39***	95.39***
(*k*=9, *d*=2)	(0.0000)	(0.0000)

Slovenia (*k*=9, *d*=1)	105.92*** (0.0000)	35.28*** (0.0001)
South Africa (*k*=11, *d*=1) South Africa (*k*=11, *d*=2)	86.05*** (0.0000) 130.59*** (0.0000)	33.48*** (0.0004) 44.92*** (0.0000)
Turkey (*k*=8, *d*=1)	41.68*** (0.0000)	17.20** (0.0280)
US (*k*=11, *d*=2)	316.04*** (0.0000)	87.91*** (0.0000)
Notes: (1) ***, ** and * mean significant at 1%, 5% and 10% respectively. (2) a means marginally significant at 10% level. (3) The numbers in brackets are chi square probabilities.		

Table 7:
Summary of exports-tourism causality results based on Toda and Yamamoto (1995) methodology

	Countries
Tourism → Exports	France
Tourism ← Exports	Portugal
Tourism ↔ Exports	Australia, Czech Republic, Estonia, France, Germany, Hungary, Italy, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Africa, Turkey, US
No Causality	

Table 8:
Imports-tourism causality results based on Toda and Yamamoto (1995) methodology

Country	Tourism → Imports	Imports → Tourism
Australia (*k*=11, *d*=1) Australia (*k*=11, *d*=2)	85.65*** (0.0000) 61.36*** (0.0000)	96.16*** (0.0000) 269.31*** (0.0000)
Czech Republic (*k*=9, *d*=1) Czech Republic (*k*=9, *d*=2)	29.62*** (0.0005) 161.37*** (0.0000)	63.40*** (0.0000) 91.63*** (0.0000)
Estonia (*k*=7, *d*=1)	11.86[a] (0.1054)	48.60*** (0.0000)
France (*k*=11, *d*=1) France (*k*=11, *d*=2)	26.57*** (0.0053) 26.41*** (0.0056)	51.88*** (0.0000) 133.84*** (0.0000)
Germany (*k*=11, *d*=1) Germany (*k*=11, *d*=2)	31.05*** (0.0011) 33.75*** (0.0004)	49.93*** (0.0000) 81.63*** (0.0000)
Hungary (*k*=10, *d*=2)	10.78 (0.3748)	265.71*** (0.0000)

Italy (*k*=11, *d*=1) Italy (*k*=11, *d*=2)	60.10*** (0.0000) 82.27*** (0.0000)	88.46*** (0.0000) 157.32*** (0.0000)
Netherlands (*k*=11, *d*=1) Netherlands (*k*=11, *d*=2)	44.19*** (0.0000) 71.16*** (0.0000)	74.43*** (0.0000) 92.19*** (0.0000)
New Zealand (*k*=11, *d*=1) New Zealand (*k*=11, *d*=2)	32.26*** (0.0007) 46.52*** (0.0000)	15.07 (0.1793) 41.36*** (0.0000)
Poland (*k*=10, *d*=2)	44.74*** (0.0000)	125.36*** (0.0000)
Portugal (*k*=10, *d*=1) Portugal (*k*=10, *d*=2)	22.46** (0.0129) 71.74*** (0.0000)	82.22*** (0.0000) 52.24*** (0.0000)
Slovakia (*k*=9, *d*=1) Slovakia (*k*=9, *d*=2)	186.01*** (0.0000) 860.80*** (0.0000)	19.39** (0.0221) 7.77 (0.5576)
Slovenia (*k*=9, *d*=1)	241.69*** (0.0000)	29.00*** (0.0006)
South Africa (*k*=11, *d*=1) South Africa (*k*=11, *d*=2)	57.04*** (0.0000) 77.56*** (0.0000)	440.21*** (0.0000) 295.00*** (0.0000)
Turkey (*k*=8, *d*=1) Turkey (*k*=8, *d*=2)	82.19*** (0.0000) 111.52*** (0.0000)	42.19*** (0.0000) 42.26*** (0.0000)
US (*k*=11, *d*=1) US (*k*=11, *d*=2)	56.93*** (0.0000) 53.67*** (0.0000)	32.60*** (0.0006) 66.27*** (0.0000)
Notes: (1) ***, ** and * mean significant at 1%, 5% and 10% respectively (2) a means marginally significant at 10% level. (3) The numbers in brackets are chi square probabilities.		

Table 9:
Summary of imports-tourism causality results based on Toda and Yamamoto (1995) methodology

	Countries
Tourism → Imports	New Zealand, Slovakia
Tourism ← Imports	Hungary
Tourism ↔ Imports	Australia, Czech Republic, Estonia, France, Germany, Italy, Netherlands, New Zealand, Poland, Portugal, Slovakia, Slovenia, South Africa, Turkey, US

No Causality	

Table 10
Trade-tourism causality results based on Hsiao(1981) methodology and ADF unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Trade) Trade=f(Tourism)	NA	8 5	1 4	9.5049E+14 8.3591E+15	9.7989E+14 7.3126E+15	Tourism → Trade
Czech Republic	Tourism=f(Trade) Trade=f(Tourism)	NO	3 1	7 1	1.1200E+14 4.6968E+15	1.1273E+14 4.7266E+15	No Causality
Estonia	Tourism=f(Trade) Trade=f(Tourism)	NO	3 3	2 1	9.6273E+12 3.4091E+15	9.8684E+12 3.3124E+15	Tourism → Trade
France	Tourism=f(Trade) Trade=f(Tourism)	NA	8 3	1 4	5.1827E+15 6.4969E+17	5.1212E+15 6.0579E+17	Tourism ↔ Trade
Germany	Tourism=f(Trade) Trade=f(Tourism)	NO	7 1	13 1	7.1343E+14 4.3791E+17	5.6814E+14 4.2941E+17	Tourism ↔ Trade
Hungary	Tourism=f(Trade) Trade=f(Tourism)	YES	4 7	14 2	5.5457E+13 2.9859E+15	4.6349E+13 2.9867E+15	Trade → Tourism
Italy	Tourism=f(Trade) Trade=f(Tourism)	NA	7 10	3 3	3.5578E+15 7.2758E+16	3.5261E+15 6.6434E+16	Tourism ↔ Trade
Netherlands	Tourism=f(Trade) Trade=f(Tourism)	NO	5 1	3 2	5.5304E+14 2.8243E+17	5.5133E+14 2.6599E+17	Tourism ↔ Trade
New Zealand	Tourism=f(Trade) Trade=f(Tourism)	NO	7 13	2 4	3.8559E+14 6.5887E+14	3.8565E+14 6.0411E+14	Tourism → Trade
Poland	Tourism=f(Trade) Trade=f(Tourism)	NO	4 2	12 1	5.1363E+14 2.0754E+16	4.8919E+14 2.1405E+16	Trade → Tourism
Portugal	Tourism=f(Trade) Trade=f(Tourism)	NA	7 1	9 1	1.6128E+15 2.3449E+16	1.6286E+15 2.4062E+16	No Causality
Slovakia	Tourism=f(Trade) Trade=f(Tourism)	NO	1 11	2 7	1.3097E+13 1.9444E+15	1.3145E+13 1.5258E+15	Tourism → Trade
Slovenia	Tourism=f(Trade) Trade=f(Tourism)	NA	10 11	1 9	1.0235E+13 1.2653E+14	1.0649E+13 8.8573E+13	Tourism → Trade
South Africa	Tourism=f(Trade)	NO	12	11	1.2160E+15	1.1933E+15	Tourism ↔ Trade

	Trade=f(Tourism)		2	3	3.3018E+16	3.1843E+16	
Turkey	Tourism=f(Trade) Trade=f(Tourism)	NA	11 11	7 9	1.1438E+15 1.1822E+16	1.0831E+15 7.5167E+15	Tourism ↔ Trade
US	Tourism=f(Trade) Trade=f(Tourism)	NO	8 7	1 8	7.8425E+15 8.9412E+17	8.0448E+15 7.8458E+17	Tourism → Trade

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 11

Summary of trade-tourism causality test results based on Hsiao (1981) methodology and ADF unit root test

	Countries
Tourism → Trade	Australia, Estonia, New Zealand, Slovakia, Slovenia, US
Tourism ← Trade	Hungary, Poland
Tourism ↔ Trade	France, Germany, Italy, Netherlands, South Africa, Turkey
No Causality	Czech Republic, Portugal

Table 12

Trade-tourism causality results based on Hsiao (1981) methodology and KPSS unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Trade) Trade=f(Tourism)	NA	8 5	1 4	9.5049E+14 8.3591E+15	9.7989E+14 7.3126E+15	Tourism → Trade
Czech Republic	Tourism=f(Trade) Trade=f(Tourism)	NO	3 1	7 1	1.1200E+14 4.6968E+15	1.1273E+14 4.7266E+15	No Causality
Estonia	Tourism=f(Trade) Trade=f(Tourism)	NA	3 1	1 1	9.6273E+12 2.7801E+15	9.7086E+12 2.7002E+15	Tourism → Trade
France	Tourism=f(Trade) Trade=f(Tourism)	NO	8 2	2 3	5.1827E+15 7.3620E+17	5.2804E+15 6.9104E+17	Tourism → Trade
Germany	Tourism=f(Trade)	NA	7	14	7.1343E+14	4.5048E+14	Tourism ↔ Trade

	Trade=f(Tourism)		2	1	4.4113E+17	4.3216E+17	
Hungary	Tourism=f(Trade) Trade=f(Tourism)	NA	4 7	14 1	5.3724E+13 2.9859E+15	4.9545E+13 2.9765E+15	Tourism ↔ Trade
Italy	Tourism=f(Trade) Trade=f(Tourism)	NA	7 10	3 3	3.5578E+15 7.2758E+16	3.5261E+15 6.6434E+16	Tourism ↔ Trade
Netherlands	Tourism=f(Trade) Trade=f(Tourism)	NO	5 1	3 2	5.5304E+14 2.8243E+17	5.5133E+14 2.6599E+17	Tourism ↔ Trade
New Zealand	Tourism=f(Trade) Trade=f(Tourism)	NO	7 13	2 4	3.8559E+14 6.5887E+14	3.8565E+14 6.0411E+14	Tourism → Trade
Poland	Tourism=f(Trade) Trade=f(Tourism)	NO	4 2	12 1	5.1363E+14 2.0754E+16	4.8919E+14 2.1405E+16	Trade → Tourism
Portugal	Tourism=f(Trade) Trade=f(Tourism)	NA	7 1	9 1	1.6128E+15 2.3449E+16	1.6286E+15 2.4062E+16	No Causality
Slovakia	Tourism=f(Trade) Trade=f(Tourism)	NA	2 11	4 8	1.2850E+13 1.9444E+15	1.3034E+13 1.4470E+15	Tourism → Trade
Slovenia	Tourism=f(Trade) Trade=f(Tourism)	NA	10 11	1 9	1.0235E+13 1.2653E+14	1.0649E+13 8.8573E+13	Tourism → Trade
South Africa	Tourism=f(Trade) Trade=f(Tourism)	NA	11 2	11 4	1.1913E+15 3.3018E+16	1.1207E+15 3.2579E+16	Tourism ↔ Trade
Turkey	Tourism=f(Trade) Trade=f(Tourism)	NO	11 4	4 10	1.2290E+15 1.3344E+16	1.2419E+15 9.6000E+15	Tourism → Trade
US	Tourism=f(Trade) Trade=f(Tourism)	NA	8 8	1 8	7.8425E+15 8.9053E+17	7.9641E+15 7.5976E+17	Tourism → Trade

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 13
Summary of trade-tourism causality test results based on Hsiao (1981) methodology and KPSS unit root test

	Countries
Tourism → Trade	Australia, Estonia, France, New Zealand, Slovakia, Slovenia, Turkey, US
Tourism ← Trade	Poland
Tourism ↔ Trade	Germany, Hungary, Italy, Netherlands, South Africa
No Causality	Czech Republic, Portugal

Table 14
Export-tourism causality results based on Hsiao (1981) methodology and ADF unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Exports) Exports=f(Tourism)	NA	8 5	1 3	9.5049E+14 4.8886E+15	9.6174E+14 4.5434E+15	Tourism → Exports
Czech Republic	Tourism=f(Exports) Exports=f(Tourism)	NA	3 1	3 1	1.1200E+14 1.7421E+15	1.0956E+14 1.8125E+15	Exports → Tourism
Estonia	Tourism=f(Exports) Exports=f(Tourism)	NA	3 1	1 1	9.6273E+12 1.3692E+15	1.0051E+13 1.3402E+15	Tourism → Exports
France	Tourism=f(Exports) Exports=f(Tourism)	NA	8 2	1 3	5.1827E+15 4.5579E+17	5.0809E+15 4.3662E+17	Tourism ↔ Exports
Germany	Tourism=f(Exports) Exports=f(Tourism)	NO	7 2	4 2	7.1343E+14 1.3192E+17	6.3866E+14 1.2775E+17	Tourism ↔ Exports
Hungary	Tourism=f(Exports) Exports=f(Tourism)	YES	4 3	1 1	5.5457E+13 3.0813E+14	5.3225E+13 3.0699E+14	Tourism ↔ Exports
Italy	Tourism=f(Exports) Exports=f(Tourism)	NO	7 12	2 1	3.5578E+15 2.1666E+16	3.4807E+15 2.2299E+16	Exports → Tourism
Netherlands	Tourism=f(Exports) Exports=f(Tourism)	NO	5 3	2 1	5.5304E+14 1.7075E+17	5.3737E+14 1.6441E+17	Tourism ↔ Exports
New Zealand	Tourism=f(Exports) Exports=f(Tourism)	NO	7 5	1 3	3.8559E+14 1.8491E+14	3.9536E+14 1.6244E+14	Tourism → Exports
Poland	Tourism=f(Exports) Exports=f(Tourism)	NO	4 2	1 1	5.1363E+14 1.3296E+16	5.3033E+14 1.3661E+16	No Causality

Portugal	Tourism=f(Exports) Exports=f(Tourism)	NA	7 5	1 1	1.6128E+15 3.9198E+15	1.6619E+15 4.0476E+15	No Causality
Slovakia	Tourism=f(Exports) Exports=f(Tourism)	NA	1 2	1 3	1.3097E+13 1.2200E+14	1.3500E+13 1.2422E+14	No Causality
Slovenia	Tourism=f(Exports) Exports=f(Tourism)	NA	10 1	1 8	1.0235E+13 3.7549E+13	1.0499E+13 3.6505E+13	Tourism → Exports
South Africa	Tourism=f(Exports) Exports=f(Tourism)	NO	12 3	1 11	1.2160E+15 3.5858E+15	1.2522E+15 3.3756E+15	Tourism → Exports
Turkey	Tourism=f(Exports) Exports=f(Tourism)	NA	11 5	2 11	1.1438E+15 5.0145E+15	1.1208E+15 3.7151E+15	Tourism ↔ Exports
US	Tourism=f(Exports) Exports=f(Tourism)	NO	8 7	1 8	7.8425E+15 2.9804E+17	7.9843E+15 2.2541E+17	Tourism → Exports

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 15

Summary of exports-tourism causality test results based on Hsiao (1981) methodology and ADF unit root test

	Countries
Tourism → Exports	Australia, Estonia, New Zealand, Slovenia, South Africa, US
Tourism ← Exports	Czech Republic, Italy
Tourism ↔ Exports	France, Germany, Hungary, Netherlands, Turkey
No Causality	Poland, Portugal, Slovakia

Table 16

Export-tourism causality results based on Hsiao (1981) methodology and KPSS unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Exports) Exports=f(Tourism)	NA	8 5	1 3	9.5049E+14 4.8886E+15	9.6174E+14 4.5434E+15	Tourism → Exports
Czech Republic	Tourism=f(Exports)	NA	5	10	1.4520E+14	1.4635E+14	No Causality

	Exports=f(Tourism)		1	1	1.7421E+15	1.8270E+15	
Estonia	Tourism=f(Exports)	NA	3	1	9.6273E+12	1.0051E+13	Tourism → Exports
	Exports=f(Tourism)		1	1	1.3692E+15	1.3402E+15	
France	Tourism=f(Exports)	NA	8	1	5.1827E+15	5.0809E+15	Tourism ↔ Exports
	Exports=f(Tourism)		2	3	4.5579E+17	4.3662E+17	
Germany	Tourism=f(Exports)	NA	7	15	7.1343E+14	6.4866E+14	Tourism ↔ Exports
	Exports=f(Tourism)		2	2	1.1593E+17	1.1093E+17	
Hungary	Tourism=f(Exports)	NA	4	1	5.3724E+13	5.5253E+13	No Causality
	Exports=f(Tourism)		3	2	3.0813E+14	3.1304E+14	
Italy	Tourism=f(Exports)	NA	7	1	3.5578E+15	3.2627E+15	Exports → Tourism
	Exports=f(Tourism)		13	6	2.0952E+16	2.1324E+16	
Netherlands	Tourism=f(Exports)	NO	5	2	5.5304E+14	5.3737E+14	Tourism ↔ Exports
	Exports=f(Tourism)		3	1	1.7075E+17	1.6441E+17	
New Zealand	Tourism=f(Exports)	NA	7	1	3.8559E+14	3.8577E+14	Tourism → Exports
	Exports=f(Tourism)		14	7	1.6621E+14	1.4226E+14	
Poland	Tourism=f(Exports)	NO	4	1	5.1363E+14	5.3033E+14	No Causality
	Exports=f(Tourism)		2	1	1.3296E+16	1.3661E+16	
Portugal	Tourism=f(Exports)	NA	7	1	1.6128E+15	1.6619E+15	No Causality
	Exports=f(Tourism)		5	1	3.9198E+15	4.0476E+15	
Slovakia	Tourism=f(Exports)	NA	2	1	1.2850E+13	1.2333E+13	Exports → Tourism
	Exports=f(Tourism)		2	6	1.2200E+14	1.2211E+14	
Slovenia	Tourism=f(Exports)	NA	10	1	1.0235E+13	1.0499E+13	Tourism → Exports
	Exports=f(Tourism)		1	8	3.7549E+13	3.6505E+13	
South Africa	Tourism=f(Exports)	NA	11	1	1.1913E+15	1.2185E+15	Tourism → Exports
	Exports=f(Tourism)		1	3	3.3050E+15	3.2055E+15	
Turkey	Tourism=f(Exports)	NA	11	1	1.2290E+15	1.2871E+15	Tourism → Exports
	Exports=f(Tourism)		6	10	5.1167E+15	4.1629E+15	
US	Tourism=f(Exports)	NO	8	1	7.8425E+15	7.9843E+15	Tourism → Exports
	Exports=f(Tourism)		7	8	2.9804E+17	2.2541E+17	

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations),

South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 17

Summary of exports-tourism causality test results based on Hsiao (1981) methodology and KPSS unit root test

	Countries
Tourism → Exports	Australia, Estonia, New Zealand, Slovenia, South Africa, Turkey, US
Tourism ← Exports	Italy, Slovakia
Tourism ↔ Exports	France, Germany, Netherlands
No Causality	Czech Republic, Hungary, Poland, Portugal

Table 18

Imports-tourism causality results based on Hsiao (1981) methodology and ADF unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Imports) Imports=f(Tourism)	YES	8 3	4 2	9.5049E+14 2.4216E+15	8.6899E+14 1.6578E+15	Tourism ↔ Imports
Czech Republic	Tourism=f(Imports) Imports=f(Tourism)	NO	3 4	7 1	1.1200E+14 2.6315E+15	9.3321E+13 2.6607E+15	Imports → Tourism
Estonia	Tourism=f(Imports) Imports=f(Tourism)	NA	3 2	1 3	9.6273E+12 7.1097E+14	9.3945E+12 7.2368E+14	Imports → Tourism
France	Tourism=f(Imports) Imports=f(Tourism)	NA	8 5	1 3	5.1827E+15 6.4069E+16	5.3430E+15 6.3607E+16	Tourism → Imports
Germany	Tourism=f(Imports) Imports=f(Tourism)	NA	7 1	14 1	7.1343E+14 2.1377E+17	7.0452E+14 2.0957E+17	Tourism ↔ Imports
Hungary	Tourism=f(Imports) Imports=f(Tourism)	YES	4 1	14 1	5.5457E+13 2.7528E+15	4.5949E+13 2.5722E+15	Tourism ↔ Imports
Italy	Tourism=f(Imports) Imports=f(Tourism)	NA	7 2	7 3	3.5578E+15 2.8725E+16	3.5006E+15 2.5278E+16	Tourism ↔ Imports
Netherlands	Tourism=f(Imports) Imports=f(Tourism)	NO	5 1	1 2	5.5304E+14 5.7770E+16	5.6921E+14 5.6103E+16	Tourism → Imports
New Zealand	Tourism=f(Imports)	NO	7	2	3.8559E+14	3.6192E+14	Tourism ↔ Imports

	Imports=f(Tourism)		13	11	2.9368E+14	2.3286E+14	
Poland	Tourism=f(Imports) Imports=f(Tourism)	NO	4 2	2 1	5.1363E+14 2.7504E+15	5.0595E+14 2.7148E+15	Tourism ↔ Imports
Portugal	Tourism=f(Imports) Imports=f(Tourism)	NA	7 1	9 1	1.6128E+15 1.0473E+16	1.5550E+15 1.0836E+16	Imports → Tourism
Slovakia	Tourism=f(Imports) Imports=f(Tourism)	NO	1 11	2 7	1.3097E+13 1.4097E+15	1.3125E+13 1.0830E+15	Tourism → Imports
Slovenia	Tourism=f(Imports) Imports=f(Tourism)	YES	10 1	1 5	1.0235E+13 6.5720E+13	9.6019E+12 5.4716E+13	Tourism ↔ Imports
South Africa	Tourism=f(Imports) Imports=f(Tourism)	NO	12 2	11 3	1.2160E+15 2.4986E+16	1.1118E+15 2.4293E+16	Tourism ↔ Imports
Turkey	Tourism=f(Imports) Imports=f(Tourism)	NA	11 5	1 11	1.1438E+15 5.1163E+15	1.1882E+15 3.3608E+15	Tourism → Imports
US	Tourism=f(Imports) Imports=f(Tourism)	NO	8 4	1 4	7.8425E+15 3.3086E+17	8.0851E+15 2.9623E+17	Tourism → Imports

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 19

Summary of imports-tourism causality test results based on Hsiao (1981) methodology and ADF unit root test

	Countries
Tourism → Imports	France, Netherlands, Slovakia, Turkey, US
Tourism ← Imports	Czech Republic, Estonia, Portugal
Tourism ↔ Imports	Australia, Germany, Hungary, Italy, New Zealand, Poland, Slovenia, South Africa
No Causality	

Table 20

Imports-tourism causality results based on Hsiao (1981) methodology and KPSS unit root test

Country	Direction of causality	Cointegration	m*	n*	FPE(m*)	FPE(m*, n*)	Causality result
Australia	Tourism=f(Imports) Imports=f(Tourism)	YES	8 3	4 2	9.5049E+14 2.4216E+15	8.6899E+14 1.6578E+15	Tourism ↔ Imports
Czech Republic	Tourism=f(Imports) Imports=f(Tourism)	NO	3 4	7 1	1.1200E+14 2.6315E+15	9.3321E+13 2.6607E+15	Imports → Tourism
Estonia	Tourism=f(Imports) Imports=f(Tourism)	NO	3 3	2 3	9.6273E+12 7.0636E+14	9.7488E+12 7.2365E+14	No Causality
France	Tourism=f(Imports) Imports=f(Tourism)	NO	8 7	1 3	5.1827E+15 6.9294E+16	5.3430E+15 6.9298E+16	No Causality
Germany	Tourism=f(Imports) Imports=f(Tourism)	NO	7 9	2 1	7.1343E+14 2.0768E+17	7.0406E+14 2.1148E+17	Imports → Tourism
Hungary	Tourism=f(Imports) Imports=f(Tourism)	NA	4 11	1 1	5.3724E+13 3.3712E+15	5.1482E+13 3.4736E+15	Imports → Tourism
Italy	Tourism=f(Imports) Imports=f(Tourism)	NA	7 2	7 3	3.5578E+15 2.8725E+16	3.5006E+15 2.5278E+16	Tourism ↔ Imports
Netherlands	Tourism=f(Imports) Imports=f(Tourism)	NO	5 1	1 2	5.5304E+14 5.7770E+16	5.6921E+14 5.6103E+16	Tourism → Imports
New Zealand	Tourism=f(Imports) Imports=f(Tourism)	NA	7 15	3 12	3.8559E+14 2.7434E+14	3.7095E+14 2.1708E+14	Tourism ↔ Imports
Poland	Tourism=f(Imports) Imports=f(Tourism)	NO	4 2	2 1	5.1363E+14 2.7504E+15	5.0595E+14 2.7148E+15	Tourism ↔ Imports
Portugal	Tourism=f(Imports) Imports=f(Tourism)	NA	7 1	9 1	1.6128E+15 1.0473E+16	1.5550E+15 1.0836E+16	Imports → Tourism
Slovakia	Tourism=f(Imports) Imports=f(Tourism)	NA	2 11	2 8	1.2850E+13 1.4097E+15	1.3178E+13 9.8155E+14	Tourism → Imports
Slovenia	Tourism=f(Imports) Imports=f(Tourism)	YES	10 1	1 5	1.0235E+13 6.5720E+13	9.6019E+12 5.4716E+13	Tourism ↔ Imports
South Africa	Tourism=f(Imports) Imports=f(Tourism)	NA	11 2	12 4	1.1913E+15 2.4986E+16	1.0516E+15 2.4645E+16	Tourism ↔ Imports
Turkey	Tourism=f(Imports)	NO	11	1	1.2290E+15	1.2913E+15	Tourism → Imports

	Imports=f(Tourism)		4	8	5.7050E+15	3.0488E+15	
US	Tourism=f(Imports) Imports=f(Tourism)	NO	8 4	1 4	7.8425E+15 3.3086E+17	8.0851E+15 2.9623E+17	Tourism → Imports

Note: (1) NA means not applicable. (2) The maximum lag length is set as 20% of total observations (Chontanawat *et al.*, 2006; Chontanawat *et al.*, 2008). The maximum number of lags is set as 15 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). It is set as 14 for Hungary (68 observations), Poland (68 observations) and Portugal (68 observations). It is set as 13 for Czech Republic (64 observations) and Slovenia (64 observations). It is set as 12 for Slovakia (60 observations), as 11 for Turkey (56 observations) and as 10 for Estonia (48 observations).

Table 21

Summary of imports-tourism causality test results based on Hsiao (1981) methodology and KPSS unit root test

	Countries
Tourism → Imports	Netherlands, Slovakia, Turkey, US
Tourism ← Imports	Czech Republic, Germany, Hungary, Portugal
Tourism ↔ Imports	Australia, Italy, New Zealand, Poland, Slovenia, South Africa
No Causality	Estonia, France

Appendix A: ADF unit root tests

	Level		First difference		Second difference		Order of integration
	k	Test statistic	*k*	Test statistic	*k*	Test statistic	
Australia							
Exchange rate	9	-0.835 (0.9567) (CT)	11	-1.628* (0.0971) (N)			I(1)
Tourism	8	-0.347 (0.9876) (CT)	0	-10.732***(0.0000)(N)			I(1)
Trade	3	-3.167** (0.0261) (C)					I(0)
Exports	3	-2.709* (0.0774) (C)					I(0)
Imports	11	0.012 (0.9956) (CT)	0	-11.842*** (0.0000) (N)			I(1)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)	I(2)
Czech Republic							
Exchange rate	0	-3.404*(0.0599) (CT)					I(0)
Tourism	3	-0.105 (0.6434) (N)	0	-11.241***(0.0000) (N)			I(1)
Trade	0	-2.621(0.2727) (CT)	0	-7.266***(0.0000) (C)			I(1)
Exports	0	-4.369***(0.0048) (CT)					I(0)
Imports	4	-1.679 (0.7481) (CT)	0	-7.744***(0.0000) (C)			I(1)
UK GDP	3	-2.270 (0.1848) (C)	0	-3.111[a] (0.1130) (CT)			I(1)
Estonia							
Exchange rate	0	-2.383 (0.3831) (CT)	0	-7.278***(0.0000) (C)			I(1)
Tourism	3	-0.621 (0.4426) (N)	0	-8.414***(0.0000) (N)			I(1)
Trade	3	-2.194 (0.2112) (C)	0	-10.251***(0.0000) (N)			I(1)
Exports	3	-2.557[a] (0.1096) (C)					I(0)
Imports	0	-4.958*** (0.0011) (CT)					I(0)
UK GDP	3	-2.290 (0.1795) (C)	0	-2.326** (0.0209) (N)			I(1)
France							
Exchange rate	1	-0.166 (0.6228) (N)	2	-3.446*** (0.0008) (N)			I(1)
Tourism	3	0.615 (0.9994) (CT)	0	-12.721*** (0.0000) (N)			I(1)
Trade	0	-3.668*** (0.0065) (C)					I(0)
Exports	0	-3.841*** (0.0039) (C)					I(0)
Imports	0	-4.711*** (0.0015) (CT)					I(0)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)	I(2)

Germany							
Exchange rate	1	-0.140 (0.6321) (N)	3	-3.167*** (0.0019) (N)			I(1)
Tourism	7	-1.759 (0.3974) (C)	0	-9.746*** (0.0000) (N)			I(1)
Trade	0	-2.758 (0.2174) (CT)	0	-7.146*** (0.0000) (N)			I(1)
Exports	0	-2.988 (0.1425) (CT)	0	-7.811*** (0.0000) (N)			I(1)
Imports	0	-3.063[a] (0.1228) (CT)					I(0)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)	I(2)
Hungary							
Exchange rate	1	-2.053 (0.5619) (CT)	10	-1.520[a] (0.1195) (N)			I(1)
Tourism	3	0.056 (0.6972) (N)	0	-12.483*** (0.0000) (N)			I(1)
Trade	7	-2.133 (0.5174) (CT)	0	-12.995*** (0.0000) (C)			I(1)
Exports	3	-1.461 (0.5469) (C)	1	-5.776*** (0.0000) (N)			I(1)
Imports	7	-2.171 (0.4963) (CT)	11	-0.965 (0.2951) (N)	0	-17.516*** (0.0000)	I(2)
UK GDP	3	-2.238 (0.1952) (C)	11	-0.999 (0.2813) (N)	1	-4.713*** (0.0000) (N)	I(2)
Italy							
Exchange rate	0	-1.780 (0.7044) (CT)	2	-4.218*** (0.0001) (N)			I(1)
Tourism	7	-1.615 (0.4697) (C)	0	-10.016*** (0.0000) (N)			I(1)
Trade	3	-2.824* (0.0599) (C)					I(0)
Exports	3	-2.976 (0.1460) (CT)	0	-10.157*** (0.0000) (N)			I(1)
Imports	1	-3.426* (0.0557) (CT)					I(0)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)	I(2)
Netherlands							
Exchange rate	1	-0.373 (0.5468) (N)	2	-3.297*** (0.0013) (N)			I(1)
Tourism	3	-2.307 (0.1728) (C)	0	-10.570*** (0.0000) (N)			I(1)
Trade	0	1.291 (0.9491) (N)	0	-8.010*** (0.0000) (N)			I(1)
Exports	6	-1.501 (0.5272) (C)	0	-9.104*** (0.0000) (N)			I(1)
Imports	0	-1.918 (0.6355) (CT)	0	-7.676*** (0.0000) (C)			I(1)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)	I(2)
New Zealand							
Exchange rate	1	-0.855 (0.3425) (N)	7	-2.300** (0.0217) (N)			I(1)
Tourism	7	-1.658 (0.4476) (C)	0	-12.168*** (0.0000) (N)			I(1)

Trade	8	-0.751 (0.3875) (N)	0	-12.288*** (0.0000) (N)				I(1)
Exports	3	-0.635 (0.4388) (N)	0	-11.034*** (0.0000) (N)				I(1)
Imports	8	-0.141 (0.6313) (N)	0	-11.427*** (0.0000) (N)				I(1)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1	-5.145*** (0.0000) (N)		I(2)
Poland								
Exchange rate	0	-2.635 (0.2668) (CT)	1	-5.136*** (0.0000) (N)				I(1)
Tourism	4	-1.820 (0.6831) (CT)	8	-1.266 (0.1870) (N)	0	-18.971*** (0.0000) (N)		I(2)
Trade	8	-0.383 (0.9860) (CT)	11	-0.379 (0.5433) (N)	0	-10.880*** (0.0000) (N)		I(2)
Exports	9	-0.845 (0.9550) (CT)	0	-9.175*** (0.0000) (N)				I(1)
Imports	11	-0.230 (0.9908) (CT)	0	-6.861*** (0.0000) (CT)				I(1)
UK GDP	3	-2.238 (0.1952) (C)	11	-0.999 (0.2813) (N)	1	-4.713*** (0.0000) (N)		I(2)
Portugal								
Exchange rate	0	-1.966 (0.6088) (CT)	2	-3.254*** (0.0015) (N)				I(1)
Tourism	7	0.311 (0.7724) (N)	0	-8.648*** (0.0000) (N)				I(1)
Trade	0	-4.465*** (0.0035) (CT)						I(0)
Exports	0	-4.330*** (0.0052) (CT)						I(0)
Imports	0	-5.052*** (0.0005) (CT)						I(0)
UK GDP	3	-2.238 (0.1952) (C)	11	-0.999 (0.2813) (N)	1	-4.713*** (0.0000) (N)		I(2)
Slovakia								
Exchange rate	0	-2.402 (0.3747) (CT)	6	-2.356 (0.1592) (C)	0	-12.090*** (0.0000) (N)		I(2)
Tourism	1	-2.429 (0.3612) (CT)	1	-6.548*** (0.0000) (N)				I(1)
Trade	2	-1.779 (0.7017) (CT)	7	-1.192 (0.2106) (N)	0	-17.796*** (0.0000) (N)		I(2)
Exports	1	-3.574** (0.0410) (CT)						I(0)
Imports	1	-1.913 (0.6348) (CT)	7	-1.038 (0.2657) (N)	0	-18.141*** (0.0000) (N)		I(2)
UK GDP	3	-2.281 (0.1814) (C)	0	-2.339** (0.0199) (N)				I(1)
Slovenia								
Exchange rate	0	-3.111[a] (0.1129) (CT)						I(0)
Tourism	10	-0.444 (0.5178) (N)	0	-12.054*** (0.0000) (N)				I(1)
Trade	1	-3.045[a] (0.1288) (CT)						I(0)
Exports	2	-4.093** (0.0106) (CT)						I(0)
Imports	1	-2.750 (0.2211) (CT)	1	-5.736*** (0.0000) (N)				I(1)

UK GDP	3	-2.270 (0.1848) (C)	0	-3.111[a] (0.1130) (CT)		I(1)
South Africa						
Exchange rate	0	-1.923 (0.3203) (C)	2	-4.055 (0.0001) (N)		I(1)
Tourism	7	-1.184 (0.9057) (CT)	0	-11.322*** (0.0000) (N)		I(1)
Trade	2	-2.362 (0.1561) (C)	0	-11.845*** (0.0000) (N)		I(1)
Exports	3	-2.159 (0.2229) (C)	0	-11.662*** (0.0000) (N)		I(1)
Imports	2	-1.724 (0.4150) (C)	0	-12.471*** (0.0000) (N)		I(1)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1 -5.145*** (0.0000) (N)	I(2)
Turkey						
Exchange rate	0	-3.624** (0.0368) (CT)				I(0)
Tourism	0	-6.627*** (0.0000) (CT)				I(0)
Trade	3	-4.692*** (0.0003) (C)				I(0)
Exports	1	-3.037 (0.1321) (CT)	1	-5.423*** (0.0000) (N)		I(1)
Imports	4	-2.694* (0.0820) (C)				I(0)
UK GDP	3	-2.214 (0.2041) (C)	0	-2.286** (0.0228) (N)		I(1)
US						
Exchange rate	2	-2.236 (0.1957) (C)	0	-5.970*** (0.0000) (N)		I(1)
Tourism	7	-1.141 (0.9140) (CT)	0	-9.444*** (0.0000) (N)		I(1)
Trade	7	-1.714 (0.7342) (CT)	5	-2.814*** (0.0055) (N)		I(1)
Exports	10	-0.557 (0.9781) (CT)	0	-14.725*** (0.0000) (N)		I(1)
Imports	7	-2.484 (0.3347) (CT)	0	-10.828*** (0.0000) (N)		I(1)
UK GDP	3	-2.049 (0.2658) (C)	13	-0.733 (0.9657) (CT)	1 -5.145*** (0.0000) (N)	I(2)

Notes: (1) The optimum lag length (k) is selected by MAIC. Hsiao and Hsiao (2006) choose maximum lags as 3 for a sample of 19 observations. The maximum lags are chosen as 13 for Australia (76 observations), France (76 observations), Germany (76 observations), Italy (76 observations), Netherlands (76 observations), New Zealand (76 observations), South Africa (76 observations) and US (76 observations). They are chosen as 11 for Czech Republic (64 observations), Hungary (68 observations), Poland (68 observations), Portugal (68 observations) and Slovenia (64 observations). They are chosen as 10 for Slovakia (60 observations), as 9 for Turkey (56 observations) and as 8 for Estonia (48 observations). (2) ***, **, * denote rejection of null hypothesis at the 1%, 5% and 10% level of significance respectively. a means marginally significant at 10% level of significance. (3) The numbers in the brackets are MacKinnon (1996) one-sided p-values. (4) C: the equation includes only the constant, CT: the equation includes constant and trend, N: the equation does not include constant or trend. C, CT and N are determined based on the significance level of constant and trend in the unit root test equation.

Appendix B: KPSS unit root test

	Level		First difference		Second difference		Order of
	k	LM statistic	*k*	LM statistic	*k*	LM statistic	integration
Australia							
Exchange rate	6	0.262*** (CT)	0	0.060 (CT)			I(1)
Tourism	5	0.319*** (CT)	13	0.180 (C)			I(1)
Trade	5	0.212 (C)					I(0)
Exports	5	0.158 (C)					I(0)
Imports	6	0.262*** (CT)	23	0.315 (C)			I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)			I(1)
Czech Republic							
Exchange rate	5	0.130* (CT)	3	0.138 (C)			I(1)
Tourism	6	0.199** (CT)	46	0.397* (C)	22	0.174 (C)	I(2)
Trade	5	0.197** (CT)	8	0.170 (C)			I(1)
Exports	4	0.052 (CT)					I(0)
Imports	5	0.233*** (CT)	3	0.136 (C)			I(1)
UK GDP	6	0.221*** (CT)	4	0.068 (CT)			I(1)
Estonia							
Exchange rate	5	0.063 (CT)					I(0)
Tourism	4	0.200** (CT)	15	0.187 (C)			I(1)
Trade	3	0.111 (CT)					I(0)
Exports	2	0.102 (CT)					I(0)
Imports	3	0.127* (CT)	21	0.255 (C)			I(1)
UK GDP	5	0.202** (CT)	4	0.055 (CT)			I(1)
France							
Exchange rate	6	0.261 (C)					I(0)
Tourism	32	0.151** (CT)	12	0.192 (C)			I(1)
Trade	5	0.156** (CT)	57	0.351* (C)	17	0.128 (C)	I(2)
Exports	5	0.171 (C)					I(0)
Imports	5	0.167** (CT)	31	0.272 (C)			I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)			I(1)

Germany								
Exchange rate	6	0.251 (C)						I(0)
Tourism	3	0.152** (CT)	13	0.138 (C)				I(1)
Trade	5	0.070 (CT)						I(0)
Exports	5	0.061 (CT)						I(0)
Imports	5	0.124* (CT)	14	0.113 (C)				I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)				I(1)
Hungary								
Exchange rate	6	0.125* (CT)	3	0.143 (C)				I(1)
Tourism	2	0.116 (CT)						I(0)
Trade	5	0.157** (CT)	39	0.331 (C)				I(1)
Exports	5	0.228*** (CT)	25	0.186 (C)				I(1)
Imports	5	0.213** (CT)	66	0.500** (C)	15	0.169 (C)		I(2)
UK GDP	6	0.225*** (CT)	4	0.079 (CT)				I(1)
Italy								
Exchange rate	6	0.251*** (CT)	3	0.229 (C)				I(1)
Tourism	36	0.174** (CT)	12	0.195 (C)				I(1)
Trade	5	0.115 (CT)						I(0)
Exports	4	0.267 (C)						I(0)
Imports	5	0.063 (CT)						I(0)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)				I(1)
Netherlands								
Exchange rate	6	0.232*** (CT)	5	0.170 (C)				I(1)
Tourism	3	0.368*** (CT)	13	0.170 (C)				I(1)
Trade	5	0.155** (CT)	7	0.114 (C)				I(1)
Exports	5	0.136* (CT)	24	0.150 (C)				I(1)
Imports	6	0.156** (CT)	0	0.117 (C)				I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)				I(1)
New Zealand								
Exchange rate	6	0.215** (CT)	3	0.180 (C)				I(1)
Tourism	7	0.180** (CT)	12	0.076 (C)				I(1)

Trade	1	0.181** (CT)	13	0.090 (C)				I(1)
Exports	5	0.111 (CT)						I(0)
Imports	25	0.232 (C)						I(0)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)				I(1)
Poland								
Exchange rate	5	0.130* (CT)	4	0.058 (C)				I(1)
Tourism	5	0.182** (CT)	13	0.112 (C)				I(1)
Trade	6	0.256*** (CT)	11	0.345 (C)				I(1)
Exports	5	0.225*** (CT)	13	0.107 (C)				I(1)
Imports	6	0.269*** (CT)	35	0.250*** (CT)	18	0.146 (C)		I(2)
UK GDP	6	0.225*** (CT)	4	0.079 (CT)				I(1)
Portugal								
Exchange rate	6	0.196** (CT)	4	0.239 (C)				I(1)
Tourism	15	0.150** (CT)	12	0.175 (C)				I(1)
Trade	3	0.067 (CT)						I(0)
Exports	3	0.056 (CT)						I(0)
Imports	3	0.078 (CT)						I(0)
UK GDP	6	0.225*** (CT)	4	0.079 (CT)				I(1)
Slovakia								
Exchange rate	5	0.104 (CT)						I(0)
Tourism	4	0.110 (CT)						I(0)
Trade	6	0.171** (CT)	6	0.162 (C)				I(1)
Exports	3	0.079 (CT)						I(0)
Imports	6	0.173** (CT)	12	0.168 (C)				I(1)
UK GDP	6	0.214** (CT)	4	0.056 (CT)				I(1)
Slovenia								
Exchange rate	5	0.215** (CT)	3	0.103 (CT)				I(1)
Tourism	4	0.133* (CT)	12	0.166 (C)				I(1)
Trade	5	0.094 (CT)						I(0)
Exports	1	0.046 (CT)						I(0)
Imports	5	0.119* (CT)	18	0.316 (C)				I(1)

UK GDP	6	0.221*** (CT)	4	0.068 (CT)			I(1)
South Africa							
Exchange rate	6	0.224*** (CT)	3	0.149 (C)			I(1)
Tourism	1	0.332 (C)					I(0)
Trade	5	0.181** (CT)	9	0.216 (C)			I(1)
Exports	5	0.106 (CT)					I(0)
Imports	6	0.205** (CT)	4	0.138 (C)			I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)			I(1)
Turkey							
Exchange rate	3	0.088 (CT)					I(0)
Tourism	15	0.144* (CT)	12	0.136 (C)			I(1)
Trade	5	0.178** (CT)	15	0.135* (CT)	12	0.192 (C)	I(2)
Exports	4	0.074 (CT)					I(0)
Imports	5	0.191** (CT)	2	0.239*** (CT)	12	0.244 (C)	I(2)
UK GDP	5	0.229*** (CT)	4	0.052 (CT)			I(1)
US							
Exchange rate	6	0.084 (C)					I(0)
Tourism	5	0.285*** (CT)	13	0.208 (C)			I(1)
Trade	6	0.262 (C)					I(0)
Exports	6	0.266*** (CT)	17	0.351* (C)	13	0.179 (C)	I(2)
Imports	6	0.228*** (CT)	44	0.291 (C)			I(1)
UK GDP	6	0.228*** (CT)	4	0.095 (CT)			I(1)

Notes: (1) The optimum lag length (k) is selected by Newey-West Bandwidth using Bartlett Kernel estimation method. (2) ***, **, * denote rejection of null hypothesis at the 1%, 5% and 10% significance levels respectively. (3) C: the equation includes only the constant, CT: the equation includes constant and trend. C or CT is determined based on the significance level of constant and trend in the unit root test equation. (4) If the equation includes both constant and trend, the critical values are 0.215, 0.146 and 0.119 at the 1%, 5% and 10% significance levels respectively. If the equation includes only constant, the critical values are 0.739, 0.463 and 0.347 at the 1%, 5% and 10% significance levels respectively.

Appendix C: Johansen cointegration test between trade and tourism based on ADF unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Czech Republic	2	r=0 r≤1	r>0 r>1	5.011 0.475	15.495 3.841	4.536 0.475	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Estonia	1	r=0 r≤1	r>0 r>1	23.069 7.695	20.262 9.165	15.374 7.695	15.892 9.165	No	Trace test indicates 1 cointegrating equation and Max-eigenvalue test indicates no cointegrating equation	Intercept in the data and CE
Germany	2	r=0 r≤1	r>0 r>1	14.787 0.774	15.495 3.841	14.013 0.774	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Hungary	2	r=0 r≤1	r>0 r>1	25.114 0.213	15.495 3.841	24.901 0.213	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE
Netherlands	4	r=0 r≤1	r>0 r>1	10.535 2.113	20.262 9.165	8.423 2.113	15.892 9.165	No	Both tests indicate no cointegration	Intercept in the data and CE
New Zealand	4	r=0 r≤1	r>0 r>1	8.139 2.091	20.262 9.165	6.048 2.091	15.892 9.165	No	Both tests indicate no cointegration	Intercept in the data and CE
Poland	4	r=0 r≤1	r>0 r>1	4.789 0.208	15.495 3.841	4.581 0.208	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Slovakia	2	r=0 r≤1	r>0 r>1	9.556 0.0002	15.495 3.841	9.556 0.0002	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
South Africa	4	r=0 r≤1	r>0 r>1	11.893 2.914	15.495 3.841	8.980 2.914	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
US	5	r=0 r≤1	r>0 r>1	14.870 4.303	15.495 3.841	10.567 4.303	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE

Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).

Appendix D: Johansen Cointegration test between trade and tourism based on KPSS unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Czech Republic	2	r=0 r≤1	r>0 r>1	5.011 0.475	15.495 3.841	4.536 0.475	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
France	4	r=0 r≤1	r>0 r>1	16.552 3.897	15.495 3.841	12.655 3.897	14.265 3.841	No	Trace test indicates 2 cointegrating equations and Max-Eigenvalue test indicates no cointegration	Intercept and linear trend in the data, intercept in the CE
Netherlands	4	r=0 r≤1	r>0 r>1	6.055 0.015	15.495 3.841	6.040 0.015	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
New Zealand	4	r=0 r≤1	r>0 r>1	7.942 1.925	15.495 3.841	6.017 1.925	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Poland	4	r=0 r≤1	r>0 r>1	4.789 0.208	15.495 3.841	4.581 0.208	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Turkey	4	r=0 r≤1	r>0 r>1	36.367 4.244	15.495 3.841	32.124 4.244	14.265 3.841	No	Both tests indicate 2 cointegrating equations	Intercept and linear trend in the data, intercept in the CE

Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).

Appendix E: Johansen Cointegration test between exports and tourism based on ADF unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Germany	4	r=0 r≤1	r>0 r>1	12.099 1.816	15.495 3.841	10.284 1.816	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Hungary	1	r=0 r≤1	r>0 r>1	36.713 4.917	20.262 9.165	31.796 4.917	15.892 9.165	Yes	Both tests indicate 1 cointegrating equation	Intercept in the data and CE
Italy	5	r=0 r≤1	r>0 r>1	18.384 5.327	15.495 3.841	13.057 5.327	14.265 3.841	No	Trace test indicates 2 cointegrating equations and Max-Eigenvalue test indicates no cointegration	Intercept and linear trend in the data, intercept in the CE
Netherlands	4	r=0 r≤1	r>0 r>1	11.706 2.225	20.262 9.165	9.481 2.225	15.892 9.165	No	Both tests indicate no cointegration	Intercept in the data and CE
New Zealand	4	r=0 r≤1	r>0 r>1	8.583 2.349	20.262 9.165	6.234 2.349	15.892 9.165	No	Both tests indicate no cointegration	Intercept in the data and CE

Poland	4	r=0 r≤1	r>0 r>1	9.898 0.274	15.495 3.841	9.625 0.274	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
South Africa	4	r=0 r≤1	r>0 r>1	9.829 2.028	15.495 3.841	7.801 2.028	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
US	4	r=0 r≤1	r>0 r>1	19.194 3.974	15.495 3.841	15.221 3.974	14.265 3.841	No	Both tests indicate 2 cointegrating equations	Intercept and linear trend in the data, intercept in the CE
Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).										

Appendix F: Johansen Cointegration test between export and tourism based on KPSS unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Netherlands	4	r=0 r≤1	r>0 r>1	9.700 2.043	15.495 3.841	7.657 2.043	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Poland	4	r=0 r≤1	r>0 r>1	9.898 0.274	15.495 3.841	9.625 0.274	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
US	4	r=0 r≤1	r>0 r>1	19.194 3.974	15.495 3.841	15.221 3.974	14.265 3.841	No	Both tests indicate 2 cointegrating equations	Intercept and linear trend in the data, intercept in the CE
Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).										

Appendix G: Johansen Cointegration test between imports and tourism based on ADF unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Australia	4	r=0 r≤1	r>0 r>1	17.385 1.986	15.495 3.841	15.400 1.986	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE
Czech Republic	1	r=0 r≤1	r>0 r>1	6.292 0.287	15.495 3.841	6.006 0.287	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Hungary	2	r=0 r≤1	r>0 r>1	25.214 0.264	15.495 3.841	24.949 0.264	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE
Netherlands	4	r=0 r≤1	r>0 r>1	6.049 0.428	15.495 3.841	5.622 0.428	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
New Zealand	4	r=0 r≤1	r>0 r>1	13.526 2.340	20.262 9.165	11.186 2.340	15.892 9.165	No	Both tests indicate no cointegration	Intercept in the data and CE
Poland	4	r=0	r>0	11.035	15.495	10.643	14.265	No	Both tests indicate no	Intercept and linear trend in the

		r≤1	r>1	0.392	3.841	0.392	3.841		cointegration	data, intercept in the CE
Slovakia	2	r=0 r≤1	r>0 r>1	11.015 0.062	15.495 3.841	10.953 0.062	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Slovenia	1	r=0 r≤1	r>0 r>1	36.360 0.923	15.495 3.841	35.437 0.923	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE
South Africa	4	r=0 r≤1	r>0 r>1	10.454 3.232	15.495 3.841	7.221 3.232	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
US	5	r=0 r≤1	r>0 r>1	13.021 4.148	15.495 3.841	8.873 4.148	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE

Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).

Appendix H: Johansen Cointegration test between imports and tourism based on KPSS unit root test

Country	lags	H_0	H_1	Trace test	5% CV	Max-Eigenvalue	5% CV	Cointegration	Results	Note
Australia	4	r=0 r≤1	r>0 r>1	17.385 1.986	15.495 3.841	15.400 1.986	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE
Czech Republic	1	r=0 r≤1	r>0 r>1	6.292 0.287	15.495 3.841	6.006 0.287	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Estonia	1	r=0 r≤1	r>0 r>1	17.099 5.498	15.495 3.841	11.601 5.498	14.265 3.841	No	Trace test indicates 2 cointegrating equations and Max-Eigenvalue test indicates no cointegration	Intercept and linear trend in the data, intercept in the CE
France	4	r=0 r≤1	r>0 r>1	15.607 3.162	15.495 3.841	12.445 3.162	14.265 3.841	No	Trace test indicates 1 cointegrating equation and Max-Eigenvalue test indicates no cointegration	Intercept and linear trend in the data, intercept in the CE
Germany	4	r=0 r≤1	r>0 r>1	7.988 0.629	15.495 3.841	7.359 0.629	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Netherlands	4	r=0 r≤1	r>0 r>1	6.049 0.428	15.495 3.841	5.622 0.428	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Poland	4	r=0 r≤1	r>0 r>1	11.035 0.392	15.495 3.841	10.643 0.392	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Slovenia	1	r=0 r≤1	r>0 r>1	36.360 0.923	15.495 3.841	35.437 0.923	14.265 3.841	Yes	Both tests indicate 1 cointegrating equation	Intercept and linear trend in the data, intercept in the CE

Turkey	4	r=0 r≤1	r>0 r>1	33.928 5.245	15.495 3.841	28.683 5.245	14.265 3.841	No	Both tests indicate 2 cointegrating equations	Intercept and linear trend in the data, intercept in the CE
US	5	r=0 r≤1	r>0 r>1	13.021 4.148	15.495 3.841	8.873 4.148	14.265 3.841	No	Both tests indicate no cointegration	Intercept and linear trend in the data, intercept in the CE
Notes: (1) CV means critical value. (2)The optimum lag is selected using Schwarz criterion (Chontanawat *et al.,* 2006; Chontanawat *et al.*, 2008).										