In search of the relationship between international tourism and trade: evidence from Poland

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Abstract

The results of growing empirical research provide a basis for believing that the relationship between trade and tourism is significant and bi-directional. Tourism may encourage the international flow of goods and, on the other hand, trade may stimulate tourism. Businessmen traveling to start up new ventures or government agents negotiating new policy agreements promote trade in goods, as well as trade linkages may lead to an intensification of business trips promoting subsequent trips for pleasure purposes. Both types of the discussed international flows – trade and tourism – were taken into account in the Olins' [2002] approach to country brand communication, pointing to the importance of the two vectors, which may indeed remain interrelated.

The aim of the paper is to explore the nature and strength of the relationship between tourist arrivals to Poland and Poland's export flows with its main tourism and trade partners. Empirical investigation is based on two types of VAR models estimated with the use of a yearly (VAR1) and quarterly (VAR2) panel data set for the period 1993-2010 (VAR1) and 2005-2010 (VAR2). To investigate the nature of the relationship between international tourism and international trade, cointegration and Granger causality tests are performed. The results for the country case studies are mixed, although with the use of quarterly data the evidence is stronger for the hypothesis that tourism causes trade.

Trade values (total values and dissagregated ones according to SITC Rev. 3) and total tourism arrivals series come from the Eurostat database. Yearly data on tourist arrivals disaggregated according to the motivations of travelling came from The Institute of Tourism.

Keywords: tourism, trade, cointegration tests, Granger causality tests

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1. Introduction

The phenomenon of increasing globalization manifests itself in a systematic intensification of the international flow of goods and services, including the significant growth of international tourism. Countries opening up their economies, aiming to increase exports and thereby join the network of global economic linkages, usually experience an increase in tourist arrivals. Both phenomena can be treated as two simultaneously occurring features of economy liberalization. In terms of balance of payments, the exports of goods and income from international tourist arrivals form the same current account, and in that sense the relation between them is tautological [Kulendran and Wilson, 2000]. However, the question whether there is any casual link between these two flows remains open. Searching for answers is certainly academically appealing. Although there is still no microeconomic model, which could offer a theoretical justification of the link between trade and tourism, empirical studies developed in selected countries suggest that the discussed interrelations really exist [Kulendran and Wilson, 2000; Shan and Wilson, 2001; Aradhyula and Tronstad, 2003; Fischer and Gil-Alana, 2009 and 2010; Kadir and Jusoff, 2010; Fry, Saayman and Saayman, 2010]. Confirmation of the existence of similar linkages in Poland would be valuable in terms of export policy and would provide a justification for the further development of tourism, with its positive influence on the economy going probably beyond creating jobs and generating income in the sector. The purpose of this study was a preliminary diagnosis of the presence of interdependencies between export flows and tourist arrivals from selected countries – main trade and tourism partners of Poland.

The paper hereafter is organized as follows. In the second section, we present a brief review of recent empirical findings on the linkages between international tourism and trade. In the two subsequent sections we describe the methodology employed in the analysis as well as the sources and properties of the data we used. The fifth section contains the empirical work and the main findings. The subsequent section concludes.

2. Empirical literature review

The first study of the interdependencies between the flow of goods and tourist arrivals was carried out regarding Australia and its four major partners in trade and tourism: the USA, Japan, New Zealand and the United Kingdom [Kulendran and Wilson, 2000]. Using cointegration and Granger causality analyses, the authors identified and tested three hypotheses: the *'Marco Polo' hypothesis, interest and awareness hypothesis* and *opportunity hypothesis*. The first points to the existence of causality from tourist arrivals in business

purposes to trade. The second asserts that trade leads to tourism (in particular for holidays). The third argues that tourism in non-business purposes (as for holidays or visiting friends) might lead to trade. Kulendran and Wilson [2000] found evidence in support of the *'Marco Polo' hypothesis* for two Australian partners (USA and UK) for which they proved that business arrivals Granger-cause exports (to the USA) and imports (from the UK). The second hypothesis was also confirmed in respect to the same partners. Certainly not negligible in these cases was the cultural and linguistic proximity. In the case of Japan, the third, *opportunity hypothesis*, was verified positively, proving that Japanese holiday arrivals Granger-cause Australian exports and total trade with Japan.

The contribution of Kulendran and Wilson [2000] in the development of research on the interdependence between trade and tourism should be considered significant due to: a) the identification of the hypotheses (pointing to the fact that tourist flows should be divided to business and non-business travels), b) the development of the methodology and c) valuable guidelines for further research, in particular with regard to the lag structures between tourism and trade flows. Their approach was used and developed subsequently in the study by Shan and Wilson [2001], whereby a bidirectional causality between trade and tourism in China was proved. With the use of similar procedures Aradhyula and Tronstad [2003] found evidence in support of the view that business trips had a positive impact on exports of agricultural products from the USA. In a study for Malaysia, Kadir and Jusoff [2010] found a one-way causality leading from export and import flows (analyzed separately) to tourist arrivals, and (though at a lower level of significance) from the total trade to tourist arrivals. Fry, Saayman and Saayman [2010] and a study for South Africa, established the presence of a bidirectional causality, but much more often (in the case of a greater number of partners) an increase in tourist arrivals contributed to (Granger-caused) trade growth.

Fischer and Gil-Alana [2009, 2010] in their research went a step further, aiming to establish if there was a causality link between tourism and trade, and also (according to Kulendran and Wilson's [2000] guidelines) to determine the temporal structure of this link. The authors analyzed German tourist arrivals to Spain and the exports of selected wine types. For some wines tourist arrivals Granger-caused export flows, with an average effect lasting 5.5 months (ranging from 3 to 11 months in each case).

The review of the trade-tourism literature gives a rationale for further exploration of the nature and strength of the relationship of the two flows. The confirmation of interrelations, aiming at identifying particular traded goods and travel types as well as the duration of the lag structure, would be interesting from an academic point of view and valuable from a policy

perspective, as it could provide a basis for formulating concrete policy recommendations. In terms of research methodology, the most common procedures are cointegration analyses and Granger causality tests.

3. Research methodology

In the paper we examine the presence and the nature of the relationship between tourist arrivals to Poland and Poland's export flows. We selected such trade and tourism partners of Poland that since 2005 have constantly been among the top ten recipients of Polish goods and have most often chosen Poland as their tourism destination (in terms of tourist numbers traveling to Poland as a fraction of total international arrivals in Poland). With the use of Eurostat data on the bilateral flow of goods and tourist services we identified seven countries that meet both criteria. They are (in alphabetical order): France, Germany, Italy, Russia, Sweden, Ukraine and the United Kingdom.

As in previous studies, we employed cointegration analysis, Granger causality and block exogeneity tests. Tests for cointegration allow to assess whether the relationship between the data series is not spurious, indicating the existence of a long-run equilibrium relationship. Granger causality tests allow to examine whether the specified data series is the cause of the other series and thus may improve its prediction [Sorensen, 2005]. Wald tests for exogeneity complement the above described cointegration and Granger-causality analyses by allowing to determine which endogenous variables could be treated as exogenous ones [Fry, Saayman and Saayman, 2010].

We use a simple VAR (*vector autoregression*) econometric model where some variables are not only explanatory variables for a given dependent variable, but are also explained by the variable that they are used to determine [Asteriou and Hall, 2007]. The VAR model is useful in situations in which is not possible to make an *a priori* decision as to which variable is treated as the dependent variable.

The relationship between the two time series: y_t, x_t takes the following form:

$$y_t = \sum_{j=1}^{p} \alpha_{1j} y_{t-j} + \sum_{j=0}^{k} \beta_{1j} x_{t-j} + \gamma_1 + \varepsilon_{1t},$$

$$x_t = \sum_{j=1}^{p} \alpha_{2j} x_{t-j} + \sum_{j=0}^{k} \beta_{2j} y_{t-j} + \gamma_2 + \varepsilon_{2t},$$

where:

y_t, x_t – dependent variables,

α, β, γ – parameters,

$\varepsilon_1, \varepsilon_2$ – error term.

The above equations describe a system in which each variable is a function of its own lagged values and the lags of other variables in the system, forming a *bivariate vector autoregressive model* with two dependent variables [Adkins, 2012]. In the VAR model, the relationship between the variables *x* and *y* is measured by causality tests and the possibilities of testing are closely linked with the method of the parameters estimation. The Granger causality test may be applied with the use of appropriate variants of known statistical tests (for instance the Wald test and chi-square statistic). The null hypothesis is that the coefficients are zero, and there is no Granger causality.

Two types of bivariate VAR models were estimated (VAR1 and VAR2) with two endogenous variables: foreign tourist arrivals to Poland and Poland's exports to selected trade partners. VAR1 is based on annual and VAR2 on quarterly data series[1]. The specificity of the available data made it necessary to conduct two separate analyses. Such an approach was connected with the temporal incoherence of the data series used and the degree of variable disintegration in each case. For each of the selected seven countries we estimated two separate types of models and on this basis we specified whether tourism arrivals to Poland statistically significantly influence export flows (and *vice versa*) and what is the strength of this interaction. Furthermore, we examined whether endogenous variables can be treated as exogenous, specifying the same Granger causality links.

The analysis of the relationship between tourist arrivals and exports in the VAR1 and VAR2 models was carried out using a multi-stage procedure. The first step was testing the data series for a unit root. The stationarity of the data was examined with the use of an Augmented Dickey-Fuller test (ADF)[2]. The same order of integration is required to carry out the cointegration analysis and test for Granger causality.

Calculation results indicated a nonstationarity of the majority of data series. As stationarity was proved with the use of the first differences – I(1) – we took them on to the next computations. The data used in a time series analysis should be characterized by the stationary processes that generated them. Stationarity might be proven when the value of mean, variance and covariance of the data series do not depend on the period in which they are observed. In regression analysis, nonstationarity must be treated with caution [Osińska,

[1] In the calculation we used the statistical package EViews.

[2] The unit root hypothesis may be rejected, if t statistic is greater than the critical value τ in the ADF tables. The unit root may not be rejected in all the series if at a 5% significance level $p>0.05$.

2008]. Allowing for the nonstationarity of data generating processes requires the verification of additional hypotheses concerning the degree of integration of variables, and then their cointegration [Majsterek 2010]. Causality tests with the use of nonsationary data series is acceptable if the nonstationarity is removed by introducing deterministic components (trend, seasonality) or by transformation of the data, as well as in the case of cointegrated processes. In other cases of nonstationarity, such an approach may be inadequate or adequate only approximately [Osińska 2008]. In the case of nonstationary data series, cointegration analysis is used in order to determine whether there is a long-term interdependence between the series[3]. This allows for the exclusion of spurious interdependencies between variables over time.

Having found that variables are I(1), we proceeded with tests for cointegration between the variables that were not stationary in level but stationary in the first difference. With the use of the Johansen procedure we tested for cointegration between tourist arrivals and export flows, indicating the number of cointegration vectors in each equation. The results prove the existence of long-term interdependencies but not in each case.

In the last step of the research procedure we tested for Granger causality using Wald exogeneity test.

4. Data

Due to the limited data sources our study was conducted in two stages. At each stage either inbound tourism or export flows were further disaggregated. At the first stage (separately for each partner country) we analyzed the interrelations between total exports and tourist arrivals disaggregated according to the purpose (business trips, holiday trips, visiting friends and relatives, and shopping), according to the indications from the literature review pointing to the fact that different purposes of tourists arrivals may influence trade with different strength. At this stage we used annual data covering the period from 1993 to 2010[4].

At the second stage, we disaggregated the export data into different product groups according to SITC Rev. 3 and regressed them against the total inbound tourism. At this stage

[3] It is assumed that long-term interdependencies occur when two or more series are nonstationary, but their linear combination is stationary. In order to test such a hypothesis, cointegration regression is built. If its error term has a lower level of integration than the variables in the model, this means that the variables are cointegrated and there is no concern for obtaining spurious regression.

[4] Since quarterly and monthly data on tourist arrivals disaggregated according to the purpose of their visit were not available, we decided to use yearly data, starting from the early nineties.

we used quarterly data covering the period from 2005 to 2010[5]. Export data disaggregation, though only at the one-digit level, was aimed at gaining at least an initial orientation as to the group of products in which possible relations with tourist arrivals are stronger[6]. Taking into account that the exports of manufactured goods (SITC5, 6, 7, 8) constitutes 85% of Poland's total exports, we expected the exports of these goods to be more related to tourist arrivals.

For objective reasons we failed to collect all the data in a disaggregated form on a quarterly basis. It should be noted, however, that such an approach would allow to conduct a broader comprehensive analysis of the existence, strength and the nature of the relationship between tourist arrivals according to the purpose of their visit to Poland and exports of different product groups. Due to the inaccessibility of a complete quarterly data set, we conducted separate considerations of two different models. Their results are presented in the next section. On their basis, the preliminary recommendations for further empirical research towards a broader comparative analysis were formulated.

The Eurostat COMEXT database served as the main data source. We collected yearly (1993-2010) and quarterly (2005-2010) data on the value of Poland's exports to selected countries – total exports and exports disaggregated according to the SITC product groups. All the data were expressed in current prices in EUR. To express them in real terms we used appropriate export price denominators obtained from the Central Statistical Office of Poland.

The quarterly data on foreign tourist arrivals were also collected from the Eurostat COMEXT database. We used data on hotel nights spent in Poland, because the majority of foreigners stay in a hotel when they travel to Poland. The yearly data on inbound tourism disaggregated according to the purpose of the visit, covering the period from 1993 to 2010, were obtained from Poland's Institute of Tourism, which collects such information as a part of its studies on the basis of border crossings. According to the Institute's methodology, a person who spends in Poland at least one night is treated as a tourist. The data received from the

[5] Quarterly inbound tourism data are available from the first whole year after Poland's accession to the EU – 2005.

[6] SITC 1-digit groups:
- SITC 0 – food and live animals,
- SITC 1 – beverages and tobacco,
- SITC 2 – crude materials, inedible, except fuels,
- SITC 3 – mineral fuels, lubricants and related materials,
- SITC 4 – animal and vegetable oils, fats and waxes,
- SITC 5 – chemicals and related products, N.E.S.,
- SITC 6 – manufactured goods classified chiefly by material,
- SITC 7 – machinery and transport equipment,
- SITC 8 – miscellaneous manufactured articles,
- SITC 9 – commodities and transactions not classified elsewhere.

Institute were unfortunately not complete. Complete figures covering the period from 2001 to 2006 were only available for Germany. The structure of arrivals according to the purpose of the visit was supplemented with the use of the procedure in the *replace missing data* of STATICTICA package.

The data employed in the estimation of both models were necessarily transformed. Data series characterized by seasonal fluctuations (mainly tourist arrivals) were seasonally adjusted, using time series decomposition X-ARIMA available in statistical package EViews. All the data were converted to natural logarithms, before using them in calculations.

5. Research results

5.1. Poland's total exports to selected countries and foreign tourist arrivals from these countries to Poland classified by purpose (VAR1 models)

At the first stage of the research, the VAR1 models we estimated contained the following endogenous data: 1) Poland's exports to certain countries; 2) foreign tourist arrivals from these countries – total and disaggregated according to the purpose of the visit: business trips, holiday trips, visiting friends and relatives (VFR), and shopping.

Granger causality tests on the basis of VAR models require to determine a time lag structure. To select the length of this lag we used Akaike Information Criterion (AIC) and Schwarz Criterion (SC). In all the examined cases we constructed models with four lags, i.e. VAR1(4). The estimated coefficients of the VAR1(4) models with their significance levels are shown in Annex Tables 1-5.

Basing on the results of the VAR1(4) models, we concluded that explanatory variables are generally more statistically significant in the first two lags. An exception in this regard is the model examining the relationship between total exports and tourists shopping arrivals. Among all the coefficients estimated, 23 coefficients statistically significant at a minimum 10% level reached the second lag. Only half of this number was constituted by significant coefficients reaching higher lags. This is explicable, taking into consideration that we analyzed data on a yearly basis. The influence of exports on tourist arrivals (and *vice versa* though it was observable to a lesser extent) cannot be too distant in time. Having quarterly data we would receive significant coefficients reaching higher lags.

It is worth noting that according to the type of variable depicting tourist arrivals, the more statistically significant coefficients were estimated in such models in which exports were a dependant variable (VAR1 (b-e)). Tourist arrivals as an explanatory variable were more suitable to explain export flows if taken without disaggregation. Disaggregation

according to different purposes of arrivals resulted in statistically significance of coefficients (explaining power of variables) running in the opposite direction – from export to tourist arrivals.

Determining the exogeneity of variables was a valuable complement to the earlier analysis of regression (the degree to which variables are linked). We performed Granger causality tests using Wald exogeneity tests. Their results are shown in Annex Tables 6 and 7 with the use of the chi-square statistic. They are also shown graphically in Figures 1-7.

On the basis of the obtained results it can be seen that:

- total exports more frequently Granger-cause tourist arrivals than vice versa (and often may be treated as an exogenous variable); broken down by country this statement applies to: France, Italy, Germany, Russia, Sweden;
- tourist arrivals are the most common cause of exports taking into account business trips (Italy, Germany, Ukraine and Sweden) and shopping visits (France, the UK, Germany and Sweden); the other two types of tourism cause exports definitely to a lesser extent (VFR with respect to Sweden and holiday trips for Ukraine and Sweden);
- a two-way causality between tourism and exports was recorded in two cases – tourist arrivals and total exports in relation to France and business arrivals and total exports for Germany,
- the strongest causality was found in Sweden (there were four variables for which the exogeneity was confirmed by the highest level of statistical significance),
- in each of the countries, we found at least a one-way causality between the tested variables, though the majority of endogenous variables do not Granger-cause the second variable included in the model.

5.2.Poland's exports to selected countries disaggregated according to the SITC groups and total foreign tourist arrivals from these countries (VAR2 models)

At the second stage of the research, the VAR2 models we estimated contained the following endogenous data: 1) foreign tourists total arrivals from certain countries and 2) Poland's exports to these countries – total exports as well as those disaggregated according to the SITC one-digit groups. This time we used quarterly data covering the period 2005-2010.

In Annex Tables 8-17 we present the estimation results for VAR2 (a-j) for the seven analyzed countries. As previously, using Akaike and Schwarz Criteria, we determined the lag

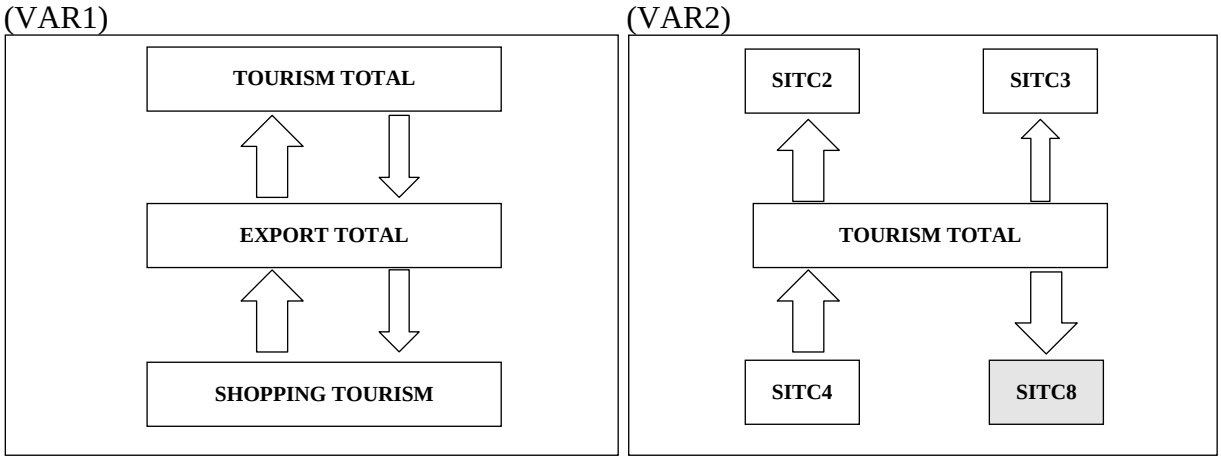
structure of our models – with 6 lags in each case. The results of Granger causality tests are shown in Annex Table 18.

On the basis of the obtained results it can be seen that:

- in contrast to annual data, using quarterly data and disaggregating export flows, we found out that inbound tourism more frequently causes exports, except in product group SITC4 (animal and vegetable oils, fats and waxes), in which in the cases of four countries (France, the UK, Russia and Sweden) export as an exogenous variable explains inbound tourism,
- as far as product groups are concerned, those that caused tourist arrivals most often were the SITC4 (in the case of France, the UK and Russia), SITC1 (Germany and Russia) and SITC0 (Germany and Russia),
- we did not find a two-way causality between exports, except for the UK and SITC7; Granger-causality in the latter case was proved only at a 5 and 10% significance level,
- taking into account all the product groups, causality in relation to exports and inbound tourism was found most often in the case of the three partners of Poland – the UK, Italy and Germany,
- tourism explains the exports of manufactured goods (SITC5-8 considered together) most in the UK, Italy, Germany and Sweden; in the case of SITC5 (chemicals and related products) causality does not exist for four countries (France, Italy, Ukraine and Sweden); in the case of SITC6 (manufactured goods classified chiefly by material) no causality was found for Russia and France; in the case of SITC7 (machinery and transport equipment) – France, Germany, Russia and Ukraine; no causal relation as far as SITC8 (miscellaneous manufactured articles) is concerned, applies to Russia and Ukraine.

Granger causality on the basis of VAR1 and VAR2 estimation results are synthesized in Figures 1-7. With regard to France, the total exports have a strong link with total tourist arrivals as well as shopping arrivals (though the latter to a small extent). Total tourist arrivals and shopping trips explain total exports (though the former to a small extent). We noted, however, that the total tourist arrivals cause an export of goods classified to SITC8.

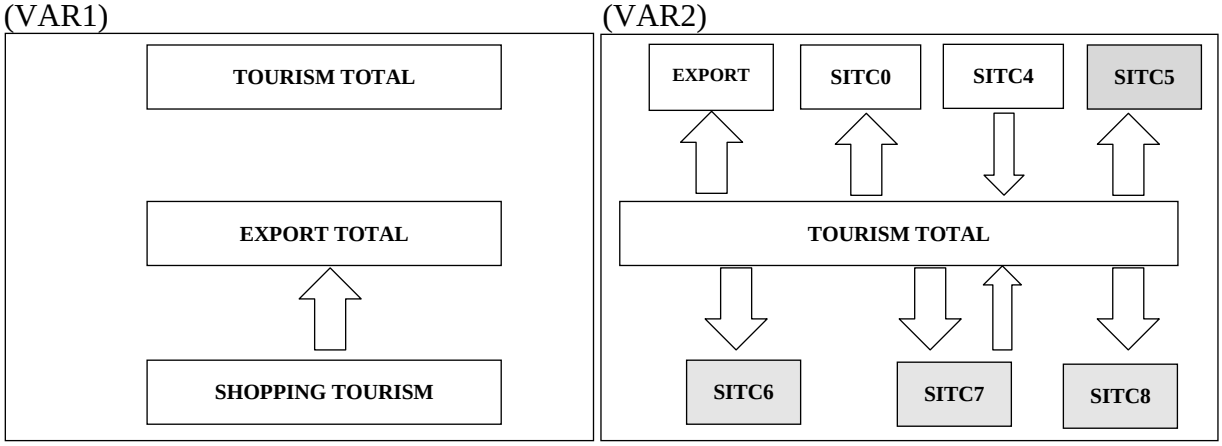
Figure 1. Granger-causality between Poland's export flows and inbound tourism from France (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

In the United Kingdom, in turn, only shopping tourism explains exports in general. No other forms of tourism influence Poland's exports to the UK. It should be noted, however, that on the annual basis some effects may not be possible to grasp. Interdependencies of tourism and exports may arise in shorter periods. The results of the VAR2 models (based on quarterly data broken down into different product groups) indicate that there is actually an interlink between British tourist arrivals to Poland and Poland's exports to the UK, but it is primarily tourism that Granger-causes exports of different kinds of products (and not vice-versa). It is especially evident with regard to manufacturing trade (SITC5-8).

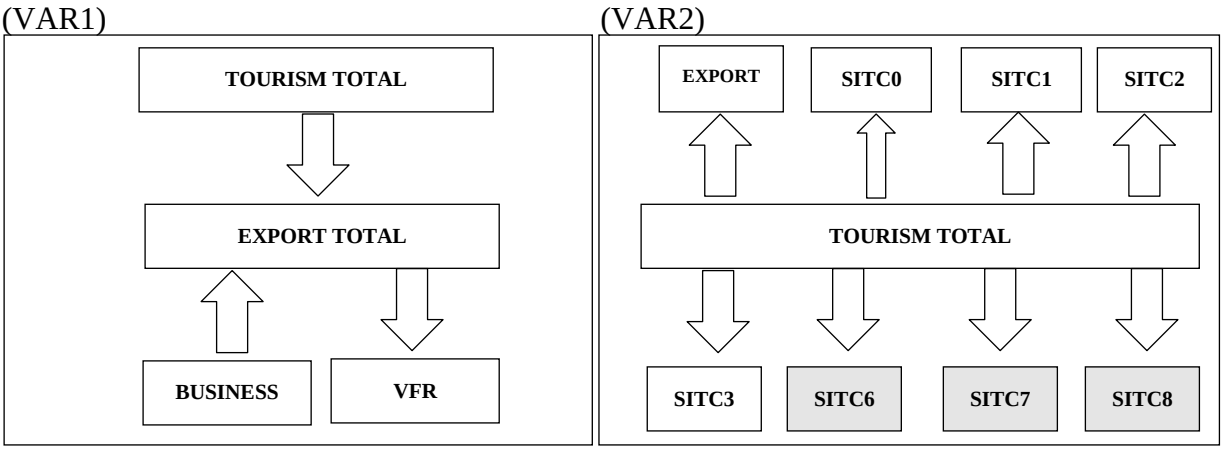
Figure 2. Granger-causality between Poland's export flows and inbound tourism from the United Kingdom (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

Total tourist arrivals of Italians as well as business trips to Poland lead to exports of Polish goods to Italy. These exports, in turn, explain tourism related to visiting friends and relatives. Basing on the analysis of quarterly series, we stated a statistically significant relationship between total tourist arrivals and total exports as well as exports in the selected SITC groups, including manufacturers (SITC6-8). No return effect of exports on tourism was observed.

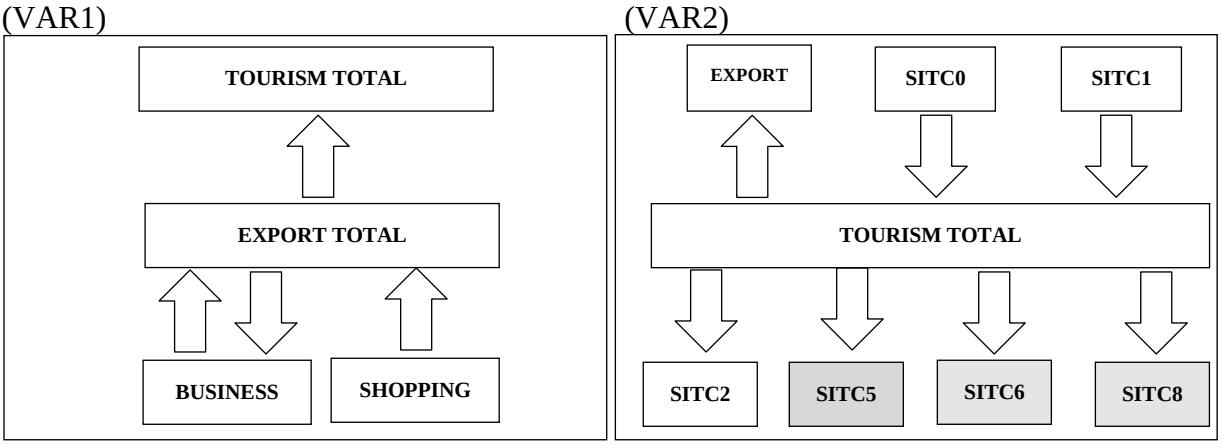
Figure 3. Granger-causality between Poland's export flows and inbound tourism from Italy (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

Unlike in the case of the previous countries considered thus far, Poland's exports to Germany explain the arrival of German tourists to Poland (both in their total value as well as business trips alone). Traveling in business purposes in return Granger-causes for total exports, explained simultaneously by shopping tourism. In the second approach (VAR2) it is German tourism that explains total exports and exports in such product groups as SITC2, 5, 6, 8. The exports of goods classified to SITC0 and 1 Granger-causes tourist arrivals from Germany to Poland.

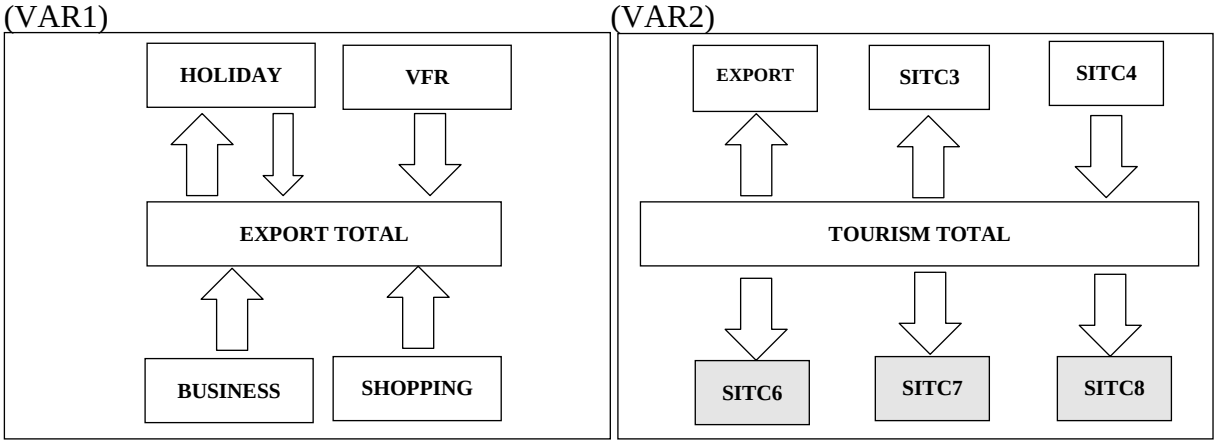
Figure 4. Granger-causality between Poland's export flows and inbound tourism from Germany (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

In the case of Sweden, different types of tourism explain Poland's exports – business trips, shopping tourism, visiting friends and relatives and holiday trips. The latter, though to a little extent, Granger-causes total exports. Basing on the results of the VAR2 models, it has to be noted that tourist arrivals Granger-cause Poland's total exports to Sweden and exports of SITC3 products as well as manufactured goods classified to SITC6, 7 and 8. Poland's exports of SITC4 goods Granger-causes inbound tourism from Sweden.

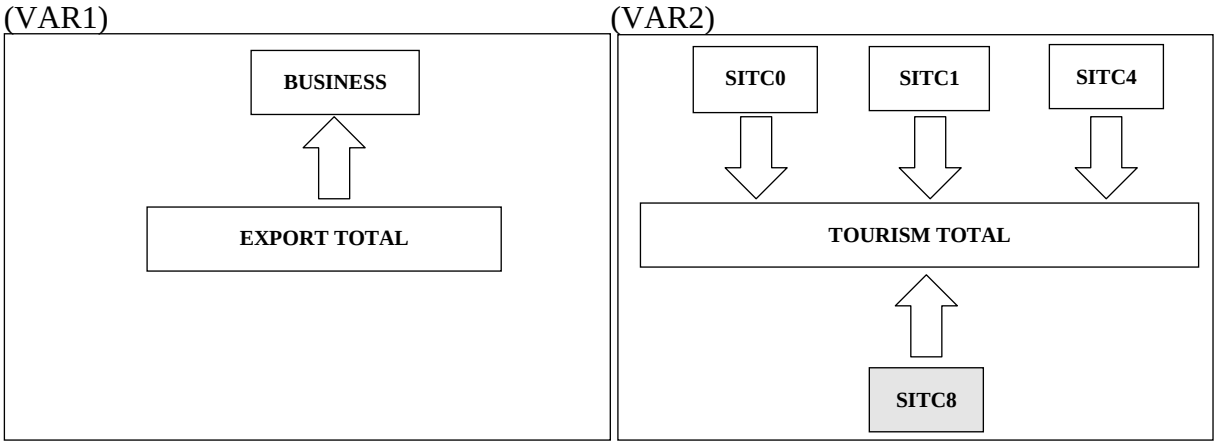
Figure 5. Granger-causality between Poland's export flows and inbound tourism from Sweden (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

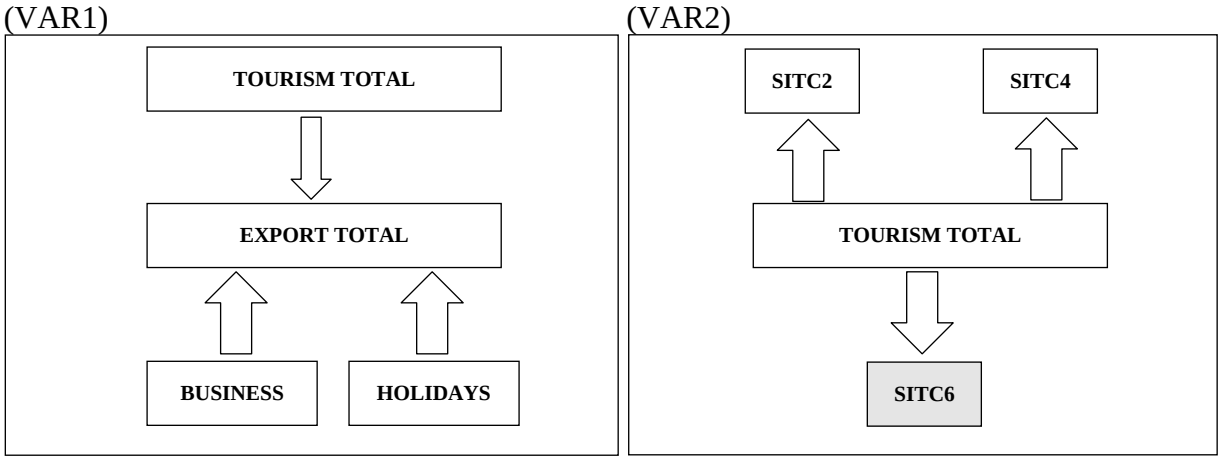
In the case of Russia, Poland's total exports explains inbound business tourism. It is the only Granger causality relationship in the VAR1 models. According to the findings based on VAR2, variables describing exports of goods classified to such SITC groups: 0, 1, 4, 5, 8 might be treated as exogenous. In the case of Ukraine, tourism generally explains Poland's exports, especially taking into account its specific types (holiday and business trips). In addition, basing on the VAR2 models, total tourist arrivals of Ukrainians to Poland are underlying spur behind Poland's exports of SITC2, 4 and 6 products.

Figure 6. Granger-causality between Poland's export flows and inbound tourism from Russia (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

Figure 7. Granger-causality between Poland's export flows and inbound tourism from Ukraine (VAR1 and VAR2 models)



Note: the width of arrows indicates the strength of interaction between variables (the level of statistical significance).

6. Summary and conclusions

In the article we have presented the results of the study on the interdependence between exports and tourist arrivals to Poland regarding seven of Poland's main partners in exports and tourism: France, Germany, Russia, Sweden, Ukraine, the United Kingdom and Italy. In our research we used cointegration, Granger causality and exogeneity tests.

Cointegration analysis indicates that export flows and inbound tourism in the long run show generally similar trends. With the use of yearly data, we tested causality between exports and tourist arrivals disaggregated according to purpose and found out that exports more frequently caused tourism than vice-versa. Granger causality tests showed bi-directional causality only in two cases – tourist arrivals and total exports for France and business arrivals and total exports for Germany.

With the use of quarterly data we tested the interrelations between inbound tourism and exports disaggregated according to the SITC one-digit groups. From this perspective, it was tourism that more frequently was revealed as the cause of exports. This pattern was observed for all product groups except SITC4. Granger causality tests at this stage detected the presence of mainly one-way relationships. Two-way causality was found only at low levels of significance in relation to goods classified to SITC7 exported to the UK and British tourist arrivals to Poland.

In the assessment of causality, we paid particular attention to the exports of manufacturers (groups SITC5, 6, 7 and 8), as in terms of value they account for 85% of Poland's total exports. Inbound tourism explains the exports of the majority of enumerated product groups to the selected partners of Poland, including in particular the UK, Italy, Germany and Sweden. Summarizing the results across countries, we noticed that causality tests showed stronger (though mostly uni-directional) relationships with the EU partners.

Our study was aimed at a preliminary indication as to the presence of any interdependencies between Poland's export flows and tourist arrivals from selected countries to Poland. To the best of our knowledge, such tests have never been conducted in Poland before. Although we achieved our goal by introducing the subject into the agenda of trade and tourism research in Poland, it is far too early for formulating any policy recommendation – which requires to deepen the analyses. Certainly, obtaining detailed quarterly or even monthly data on tourist arrivals according to the purpose of visiting Poland would allow to increase the precision of the study. As the next step, export data should be further disaggregated in search of specific products, the exports of which reveal the closest interrelation to tourist arrivals. Studies cited earlier indicate that even in a cross-section of individual products, the export

enhancing impact of tourism might be disclosed only for selected varieties [Fischer and Gil-Alana 2009, 2010].

Moreover, in the context of the examination of Granger causality between two series – inbound tourism and exports – the possible impact of some other variables explaining both series has to be considered. Thus, some controlling variables should be incorporated into models, in order to test what determines the relationship between trade and tourism and whether the determinants of trade and tourism influence the existence of causality between the two flows [Fry, Saayman and Saayman, 2010].

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Appendix

Table 1. VAR1 (a) results – total exports and total tourist arrivals

VAR1(a)	ARRIVALS TOTAL = export total				EXPORT TOTAL = arrivals total			
Country	**L1**	**L2**	**L3**	**L4**	**L1**	**L2**	**L3**	**L4**
FR	-0.361 (**)	0.682 (***)	-0.174	0.308	0.929 (*)	-1.084 (*)	0.417	-0.356
UK	-0.264	0.508 (**)	-0.196	0.431 (*)	0.685	-0.332	-0.452	-0.216
IT	0.925	0.842	0.659	0.195	1.003	-0.723	-0.150	-0.484
DE	0.124	0.748 (**)	0.327	0.361 (*)	0.565	-0.041	0.072	-0.375
RU	-0.016	0.068	-0.033	0.040	-1.968	1.024	-4.049	-1.359
UA	-0.114	-0.010	-0.100	-0.016	1.765 (*)	-1.246	0.180	-1.314
SE	-0.033	0.083	0.267	-0.181	2.578 (**)	0.814	0.101	0.791

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table. 2. VAR1 (b) results – total exports and business trips

VAR1(b)	BUSINESS TRIPS = export total				EXPORT TOTAL = business trips			
Country	**L1**	**L2**	**L3**	**L4**	**L1**	**L2**	**L3**	**L4**
FR	0.071	-0.039	-0.233	0.117	0.560	-0.445	-0.039	0.068
UK	-0.507	0.396	-0.5097	0.662	0.266	-0.132	-0.298	-0.145
IT	0.317	-0.713	0.895	-1.236	0.758 (**)	0.245	-0.209	-0.200
DE	1.4723 (**)	-0.373	1.229	-0.251	0.757 (***)	-0.267	0.192	-0.285
RU	-0.478	1.098 (**)	-0.667	-0.032	-0.563	-0.176	-0.246	-0.025
UA	0.427	-0.5412	0.533	-0.269	-0.040	0.270 (*)	-0.255	0.402
SE	-0.539	0.2245	0.109	-0.190	1.891 (***)	-0.754 (***)	0.071	0.545 (***)

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 3. VAR1 (c) results – total exports and holiday trips

VAR1(c)	HOLIDAY TRIPS = export total				EXPORT TOTAL = holiday trips			
Country	**L1**	**L2**	**L3**	**L4**	**L1**	**L2**	**L3**	**L4**
FR	0.643	0.885	0.3428	0.220	0.380	0.104	0.099	-0.379
UK	0.354	0.607	0.0068	0.214	0.390	-0.212	-0.139	-0.345
IT	0.497	0.029	0.2039	-0.949	-0.124	0.5639	-0.281	-0.502
DE	-0.388	0.443	0.922	1.338	-0.236	-0.063	0.110	-0.517 (**)
RU	0.245	-0.397	-0.152	-0.454	1.080	1.444	0.317	0.564
UA	-0.529	0.026	-0.034	0.225	0.148	0.479 (*)	-0.114	-0.369
SE	0.481 (**)	-0.353	-0.3674	-0.837 (*)	2.554 (*)	1.680	0.586	1.588

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 4. VAR1 (d) results – total exports and visiting friends and relatives

VAR1(d)	VISITING F&R = export total				EXPORT TOTAL = Visiting F&R			
Country	**L1**	**L2**	**L3**	**L4**	**L1**	**L2**	**L3**	**L4**
FR	-0.207	0.054	-0.625	-0.559	0.071	-0.102	0.290	0.014
UK	0.278	0.337	1.063	-0.247	0.113	-0.199	-0.046	0.018
IT	-0.103	-0.552	1.525	-2.612 (**)	0.147	0.273	-0.079	-0.207
DE	-0.097	0.173	0.1065	-0.790	0.128	0.369	0.091	0.052
RU	-0.469	0.155	-0.365	0.148	-0.179	-0.321	-0.276	-0.726
UA	-1.409	0.615	-0.036	0.089	0.043	0.030	-0.576	-0.709
SE	0.054	-0.539	0.902	-0.435	1.348 (***)	-0.552 (**)	-0.071	0.191

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 5. VAR1 (e) results – total exports and shopping trips

VAR1(e)	SHOPPING TRIPS = export total				EXPORT TOTAL = shopping trips			
Country	**L1**	**L2**	**L3**	**L4**	**L1**	**L2**	**L3**	**L4**
FR	2.762	-7.344	-0.834	-8.041 (*)	0.020	0.089 (**)	0.113 (**)	0.087 (*)
UK	1.832	-3.389	2.381	-1.329	-0.014	0.152 (**)	0.154 (**)	0.071
IT	0.028	-14.65	19.850	-24.66 (*)	0.012	0.039	0.014	-0.007
DE	3.702	3.279	3.223	-0.510	-0.019	0.086	-0.175(*)	-0.058
RU	-0.679	0.450	-1.604	-0.671	-0.223	0.2970	-0.043	0.805
UA	0.417	-0.755	-0.254	-0.205	0.188	-0.310	-0.309	0.047
SE	0.291	1.090	2.779	-3.489	-0.023	0.492 (**)	0.469	0.179

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 6. VAR 1 Granger-causality test results (based on the Wald test)

country	**exogenous variables**		**exogenous variables**		**exogenous variables**		**exogenous variables**		**exogenous variables**	
	arrivals total	**total export**	**business trips**	**total export**	**holiday trips**	**total export**	**VFR**	**total export**	**shopping trips**	**total export**
FR	10.948 (**)	20.281 (***)	1.367	3.311	4.383	3.873	0.569	1.211	17.12 (***)	6.260
UK	0.967	1.700	3.925	1.060	6.362	1.530	0.304	2.490	16.64 (***)	1.36
IT	9.421 (**)	3.695	11.810 (**)	4.768	5.711	3.661	5.884	10.225 (**)	4.375	5.264
DE	1.988	13.046 (**)	16.971 (***)	10.944 (**)	7.134	4.883	0.372	1.799	12.689 (**)	3.166
RU	2.545	0.267	1.519	8.4197 (*)	1.247	1.795	0.318	2.392	2.745	3.305
UA	8.784 (*)	1.679	10.139 (**)	0.300	10.480 (**)	0.638	6.653	3.293	3.9545	1.240
SE	7.177	0.494	90.449 (***)	3.4224	8.898 (*)	25.097 (***)	29.258 (***)	1.059	15.566 (***)	3.277

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 7. Wald exogeneity test results

Contries	exogenous variables					
	arrivals total	business trips	holiday trips	VFR	shopping trips	export total
FR	X				X	X
UK					X	
IT	X	X				X
DE		X			X	X
RU						X
UA	X	X	X			
SE		X	X	X	X	X

Table 8. VAR2 (a) results – total tourist arrivals and total exports

VAR2 (a)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports	L1	-0.222	-0.060	-0.677	-0.210	0.208	0.030	0.186
	L2	-0.338	0.009	-0.676	0.174	-0.499	-0.031	-0.275
	L3	-0.210	-0.531	0.326	-0.407	0.720	-0.005	0.244
	L4	-0.222	-0.095	-0.809	-0.035	-0.741	0.076	-0.517
	L5	0.006	0.072	-0.717	-0.085	0.235	-0.259	0.327
	L6	-0.142	-0.297	0.026	0.356	-0.428	-0.056	-0.017
exports = arrivals	L1	1.924 (*)	1.572*	0.439	2.482***	-0.441	0.059	1.931***
	L2	2.164	0.387	1.387***	2.856**	-0.022	0.117	1.489**
	L3	3.131	1.173	-0.509	3.274**	0.060	0.606	0.764
	L4	2.136	0.427	0.601	1.875**	-0.303	0.863	-0.114
	L5	0.976	-0.454	0.091	1.271**	0.338	0.487	0.838
	L6	1.178	-0.151	-0.185	0.626	0.961	0.268	-0.194

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 9. VAR2 (a) results – total tourist arrivals and exports classified to SITC0

VAR2 (b)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC0	L1	0.141	0.126	0.072	-0.299**	0.739	0.251	-0.369**
	L2	0.135	0.195	-0.485	-0.075	0.001	0.089	0.092
	L3	0.275	0.023	0.045	-0.325*	0.029	0.025	-0.108
	L4	-0.183	-0.185	-0.022	-0.065	-0.536	-0.442	0.231
	L5	-0.518**	-0.225	-0.029	-0.235	0.260	0.177	-0.068
	L6	0.040	0.202	-0.149	-0.097	0.116	-0.137	-0.019
exports SITC0 = arrivals	L1	3.041*	1.217**	0.512	3.168*	-0.679	-0.271	-0.648
	L2	2.497	0.590	0.157	2.127	-0.211	-0.654	0.181
	L3	4.073	0.609	0.320	3.785*	-0.015	0.182	1.709
	L4	3.317	0.565	0.358	1.597	-0.208	0.250	3.349
	L5	2.351	0.334	0.413	0.699	-0.829	0.773**	3.905
	L6	1.339	-0.582	0.546*	0.659	-0.100	0.062	1.809

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 10. VAR2 (a) results – total tourist arrivals and exports classifies to SITC1

VAR2 (c)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC1	L1	0.024	0.039	0.598	-0.025	-0.030	0.195	-0.125
	L2	0.049	-0.006	0.933	-0.039	-0.110	-0.090	0.096
	L3	0.004	0.052	0.491	-0.049	0.038	0.153	0.121
	L4	0.047	0.158*	0.080	-0.077	-0.102	-0.338	-0.045
	L5	-0.035	0.114	0.240	-0.036	-0.216**	0.124	-0.012
	L6	0.018	-0.020	0.823	-0.082	0.042	0.119	0.027
exports SITC1 = arrivals	L1	-4.897	0.371	0.894	9.510**	-0.422	-3.517	0.947
	L2	-3.849	0.732	0.831	6.289	6.537	2.493	1.053
	L3	-1.466	2.075	0.463	8.817	6.013	-3.241	2.486
	L4	1.782	-0.283	0.926	6.172	3.381	-1.221	1.035
	L5	-2.063	-1.210	0.709	4.834	4.344	0.763	-1.611
	L6	-3.894	1.081	0.677	3.024	2.807	-0.987	-2.028

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 11. VAR2 (a) results – total tourist arrivals and exports classifies to SITC2

VAR2 (d)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC2	L1	0.086	-0.288	-0.030	0.122	0.135	0.007	-0.115
	L2	-0.149	-0.314	-0.071	-0.049	-0.079	0.070	-0.389
	L3	0.040	-0.339	-0.4672**	-0.076	-0.197	0.042	-0.225
	L4	-0.061	-0.563	-0.118	-0.009	-0.053	-0.142	-0.368
	L5	-0.172	-0.349	0.047	-0.071	0.053	-0.002	0.133
	L6	0.036	-0.124	-0.395*	0.004	0.080	-0.086	0.185
exports SITC2 = arrivals	L1	0.005	-0.006	0.015	-0.006	0.005	-0.006	-0.011
	L2	1.474	2.987	0.762	1.644	-0.345	1.182	1.131
	L3	3.527**	-0.124	1.338**	5.049***	-0.804	-0.475	1.120
	L4	5.160***	1.221	2.099**	3.148**	-1.821	0.676	1.451
	L5	3.526*	2.729	1.985**	0.891	-1.485	1.533**	1.289
	L6	1.175	2.201	0.976	0.452	1.070	-0.493	1.471

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 12. VAR2 (a) results – total tourist arrivals and exports classifies to SITC3

VAR2 (e)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC3	L1	-0.049	-0.118	0.087	0.235	0.047	0.035	0.028
	L2	0.095	-0.241	0.087	0.092	0.008	0.039	-0.020
	L3	-0.018	-0.182	0.084	0.085	-0.091	-0.009	0.029
	L4	0.011	0.023	0.104	0.081	-0.094	0.101	-0.024
	L5	-0.042	0.106*	0.067	0.089	-0.105	0.017	0.029
	L6	0.047	0.074	0.006	-0.038	-0.121	-0.077	0.018
exports SITC3 = arrivals	L1	-0.005	0.013	0.018	-0.023	0.032	0.005	-0.031
	L2	-2.555	-0.575	-1.051	-0.960	-0.979	0.481	6.140***
	L3	-6.270*	-0.187	-5.267	1.709	-0.201	0.942	7.403***
	L4	-2.354	-0.963	-4.350	2.223	0.450	1.475	13.228***
	L5	0.478	-3.080	2.764	2.514	0.240	2.308	6.599***
	L6	4.924*	-4.042	-8.340***	2.236	-0.992	0.615	0.793

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 13. VAR2 (a) results – total tourist arrivals and exports classifies to SITC4

VAR2 (f)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC4	L1	0.040	0.013	0.030	0.032	0.040	0.008	-0.003
	L2	-0.053**	0.023	0.001	0.004	-0.149*	-0.010	-0.070***
	L3	0.032	0.074*	-0.043	0.030	-0.029	0.006	-0.044
	L4	0.0641**	0.049	-0.013	0.091	-0.048	-0.052	-0.030
	L5	0.061**	0.026	-0.022	0.001	0.073	-0.023	-0.085**
	L6	-0.026	0.010	-0.021	-0.023	0.020	0.039	-0.036
exports SITC4 = arrivals	L1	0.022	-0.062	0.015	-0.008	0.000	-0.015	-0.010
	L2	-14.078	-12.936	1.975	1.625	-0.932	-2.286	-9.811*
	L3	-4.169	10.892	-0.016	0.649	0.550	2.336	-5.802
	L4	-0.152	-9.700	4.205	2.352	-5.040*	-1.896	-6.748
	L5	-10.916	-8.028	-0.740	1.130	0.152	3.982	-20.032**
	L6	-10.041	2.754	2.262	-3.148	-3.078	5.815*	-16.453**

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 14. VAR2 (a) results – total tourist arrivals and exports classifies to SITC5

VAR2 (g)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC5	L1	-0.098	-0.468*	-0.252	0.072	-0.266	0.258	0.366
	L2	-0.104	-0.269	-0.020	-0.294	-0.150	0.014	0.055
	L3	-0.167	-0.064	-0.198	0.011	0.994**	-0.092	0.058
	L4	0.135	-0.117	-0.327	-0.055	-0.982**	-0.063	-0.112
	L5	-0.126	-0.094	-0.020	-0.304	-0.090	0.123	-0.103
	L6	0.073	0.016	-0.132	0.222	-0.299	0.072	0.253
exports SITC5 = arrivals	L1	0.019	0.052	0.032	0.012	-0.001	-0.009	-0.029
	L2	1.880	2.061***	0.264	3.605***	0.045	-1.002	0.976**
	L3	3.337	0.868*	0.848*	3.948***	-0.197	-0.541	0.891
	L4	2.818	0.179	1.034	3.679***	0.030	-0.135	0.297
	L5	1.442	1.338***	0.581	1.707***	0.152	1.909**	0.128
	L6	0.077	1.685**	0.460	1.033**	0.008	0.798	0.531

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 15. VAR2 (a) results – total tourist arrivals and exports classifies to SITC6

VAR2 (h)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC6	L1	-0.700	-0.010	-0.141	-0.153	0.530	0.255	0.486
	L2	-0.199	-0.004	0.041	0.168	-0.963	-0.329	0.078
	L3	-0.344	-0.296	-0.297	-0.263	1.184	0.121	0.306
	L4	-0.133	-0.116	0.037	-0.105	-0.662	-0.104	-0.048
	L5	-0.003	-0.115	-0.299	0.075	-0.186	0.102	0.110
	L6	0.134	-0.081	0.090	0.034	0.058	-0.395	0.025
exports SITC6 = arrivals	L1	0.041	0.004	0.008	0.004	-0.012	-0.006	-0.019
	L2	4.305*	1.146	-0.398	2.288***	-0.656	0.574	0.949
	L3	4.921*	1.788	2.111**	3.064***	0.542	-0.028	1.544
	L4	6.223*	0.583	-0.683	2.878**	-0.150	0.634	0.229
	L5	3.678	0.809	1.503	1.494*	-0.342	0.713	0.013
	L6	0.881	-2.386*	-0.355	1.029*	0.729	0.409	0.688

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 16. VAR2 (a) results – total tourist arrivals and exports classifies to SITC7

VAR2 (i)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC7	L1	-0.071	-0.158	-0.393	-0.405	0.184	0.204	0.138
	L2	-0.006	-0.180	-0.603	0.279	-0.349	0.027	-0.003
	L3	-0.119	-0.416	0.085	-0.609	0.260	0.081	-0.031
	L4	-0.218	-0.169	-0.549	0.077	-0.022	0.012	-0.141
	L5	0.010	0.013	-0.416	-0.397	-0.267	-0.231	0.069
	L6	-0.067	-0.303**	-0.102	0.671	-0.138	0.207	0.086
exports SITC7 = arrivals	L1	0.019	0.024	0.034	0.044	0.000	-0.004	-0.015
	L2	0.995*	1.165	0.242	1.577	-0.015	-0.300	2.537***
	L3	0.447	-1.066	1.950***	2.083	-0.068	-0.202	1.390***
	L4	0.325	1.304	-0.755	2.141	-0.092	0.576	0.443
	L5	0.590	0.087	0.319	0.941	0.145	0.904*	1.796**
	L6	0.593	-0.536	0.090	1.234	0.366	0.847	0.728

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 17. VAR2 (a) results – total tourist arrivals and exports classifies to SITC8

VAR2 (j)	country / lag	FR	UK	IT	DE	RU	UA	SE
arrivals = exports SITC8	L1	0.122	-0.179	-0.481	0.066	-0.459	0.324	0.086
	L2	-0.309	0.056	-0.117	0.007	0.041	0.194	0.102
	L3	0.171	-0.644**	0.189	-0.258	0.843**	-0.050	0.462
	L4	-0.157	-0.143	-0.460	-0.137	-0.846	-0.107	-0.288
	L5	0.069	-0.157	-0.623*	0.095	-0.518	-0.003	0.376
	L6	-0.202	-0.398	0.137	0.165	0.125	0.167	-0.205
exports SITC8 = arrivals	L1	0.002	-0.021	0.032	0.007	0.001	-0.011	-0.015
	L2	3.352**	1.552	-1.460	1.256*	0.878	-0.122	1.210
	L3	3.100*	0.871	1.727	2.510***	-0.462	-0.139	1.241
	L4	4.066*	0.252	-0.148	3.183***	0.142	0.503	0.821
	L5	2.993	0.500	1.422	2.170***	0.537	0.914	-0.554
	L6	0.865	-2.548***	0.469	1.231**	0.780	0.793	-0.080

Note: significance at 1 (***), 5 (**) and 10 (*) levels

Table 18. VAR 2 Granger-causality test results (based on the Wald test)

model	exogenous variabes	FR	UK	IT	DE	RU	UA	SE
VAR2 (a)	tourism	5.655	14.903**	24.598***	19.583***	6.395	4.992	24.495***
	total exports	1.555	7.743	3.999	3.483	4.459	0.474	2.103
VAR2 (b)	tourism	6.432	13.256**	10.666*	6.656	1.213	7.091	4.475
	exports SITC0	10.606	3.834	2.957	21.391***	10.777*	1.917	9.967
VAR2 (c)	tourism	8.207	2.657	15.465**	5.456	7.053	8.096	9.541
	exports SITC1	7.845	5.730	1.426	19.296***	18.565***	4.038	9.541
VAR2 (d)	tourism	15.882**	5.002	21.025***	27.886***	2.347	14.473**	3.234
	exports SITC2	1.634	3.635	8.977	3.069	3.031	2.007	3.234
VAR2 (e)	tourism	10.749*	7.254	30.601***	7.505	0.321	4.395	44.458***
	exports SITC3	3.011	5.423	5.806	3.922	5.357	1.216	1.561
VAR2 (f)	tourism	4.951	8.778	0.997	3.971	6.355	22.474***	9.486
	export SITC4	14.172**	11.872*	1.480	1.879	11.224**	3.982	24.004***
VAR2 (g)	tourism	5.515	68.609***	9.073	25.541***	3.968	9.790	9.543
	exports SITC5	5.896	5.019	1.404	4.502	10.864*	1.561	1.049
VAR2 (h)	tourism	7.874	23.634***	12.123*	14.635**	5.999	13.884**	19.527***
	exports SITC6	5.608	3.492	4.800	1.738	5.311	2.410	3.617
VAR2 (i)	tourism	10.113	12.779**	17.965***	7.668	2.785	7.172	73.233***
	exports SITC7	0.678	10.693*	5.067	10.099	3.740	0.997	1.537
VAR2 (j)	tourism	13.042**	32.600***	13.800**	20.380***	4.159	4.862	14.709**
	exports SITC8	4.023	9.927	8.497	1.731	11.248*	0.952	5.179

Note: significance at 1 (***), 5 (**) and 10 (*) levels