Time-Varying Interdependencies of Tourism and Economic Growth: Evidence from European Countries

Antonakakis, Nikolaos and Dragouni, Mina and Filis, George

University of Portsmouth, Bournemouth University

1 August 2013

Time-Varying Interdependencies of Tourism and Economic Growth: Evidence from European Countries

Mina Dragouni[1], George Filis[2]*, Nikolaos Antonakakis[3]

[1,2]Bournemouth University, Department of Accounting, Finance and Economics, Executive Business Centre, 89 Holdenhurst Road, BH8 8EB, Bournemouth, UK.

[3]University of Portsmouth, Department of Economics and Finance, Portsmouth Business School, Richmond Building, Portland Street, PO1 3DE, Portsmouth, UK.

*Corresponding Author: Tel: +44 (0) 1202968739, fax: +44 (0) 120296883, email: gfilis@bournemouth.ac.uk

August 2013

Abstract

In this study, we employ the novel measure of a VAR-based spillover index, developed by Diebold and Yilmaz (2012) to investigate the time-varying relationship between tourism and economic growth in selected European countries. Overall, the findings suggest that (i) the tourism-economy relationship is not stable over time in terms of both its magnitude and direction, (ii) the relationship exhibits patterns in its magnitude and/or direction during major economic events, such as the Great Recession of 2007 and the Eurozone debt crisis of 2010, and (iii) the impact of these economic events on the relationship between the tourism sector and the economy is more apparent to Cyprus, Greece, Portugal and Spain, which are the European countries that have experienced the most severe economic downturn since 2009. These results are important to tourism actors and policy makers, suggesting that they should pay particular attention to this time-varying relationship and the factors that influence it when designing their tourism strategies. In addition, the findings of this study carry significant implications for researchers, as they underline a strand of the literature which deserves further attention.

Keywords: Tourism-Led Economic Growth, Economic-Driven Tourism Growth, Spillovers, Time-Varying Relationship, Variance Decomposition, European Countries

JEL: C32, F43, L83, O52

1. Introduction

The tourism industry accounts for 5% of the world GDP and about 30% of the global exports of services (UNWTO, 2012a). In a plethora of countries, the tourism sector does not merely represent a significant revenue stream, but also a vital source of employment and entrepreneurial vitality. Thus, tourism development is established as a popular strategy for economic growth across many areas (Andereck, Valentine, Knopf and Vogt, 2005; Matarrita-Cascante, 2010). Still, although it is assumed that there is a strong correlation between tourism-related activities and economic development, the specific characteristics of this relationship are, in essence, very likely to reveal heterogeneous patterns among different destinations.

Over the past decades, a considerable body of literature attempted to disentangle the connective strands and lines of causality between tourism and the wider economy (see, *inter alia*, Balaguer and Cantavella-Jordá, 2002; Brida, Risso, Lanzilotta and Lionetti, 2010; Chatziantoniou, Filis, Eeckels and Apostolakis, 2013; Fayissa, Nsiah and Tadesse, 2011; Hazari and Sgro, 1995; Oh, 2005; Ridderstaat, Croes and Nijkamp, 2013; Seetanah, 2011; Schubert, Brida and Risso, 2011). Empirical findings offer a broad array of potential correlations that converge on four main hypotheses (Chatziantoniou, Filis, Eeckels and Apostolakis, 2013). The first two hypotheses postulate a unidirectional causality between the two variables, either from tourism to economic development (*tourism-led economic growth hypothesis*) or its antithesis (*economic-driven tourism growth hypothesis*). The third theory supports the existence of a bidirectional relationship between tourism and the economy (*bidirectional causality hypothesis*) whereas the forth proposes that there is no relationship at all (*no causality hypothesis*).

Despite the fact that there is a wealth of literature that concentrates on the tourism-economy relationship, the examination of the latter in a time-varying environment has been largely ignored. It is only recently that Arslanturk, Balcilar and Ozdemir (2011), Lean and Tang (2010), and Tang and Tan (2013) questioned the stability of the tourism-economic growth connection, showing that the magnitude of their relationship fluctuates over time. In this light, there is scope for extending this line of research. For this reason, the purpose of this study is to investigate the relationship between tourism and economic growth in a time-varying environment. To that end, we employ the novel measure of a VAR-based spillover index, developed by Diebold and Yilmaz (2012), to evaluate the link between the two factors.

The focus of this study is located within the European region. Europe is a prominent tourist destination, holding approximately a 40% share of the global tourism arrivals (European Commission, 2012). The European Union (EU) has placed much emphasis on the tourism sector as an engine of economic prosperity for its member countries (Lee and Brahmasrene, 2013). For this reason, this study aspires to define the relationship between tourism and the broader economy in the European context, by examining a selection of EU member-countries. The determination of the time-varying causal linkage between economic and tourism growth for the specific sample of countries would be

valuable for informing current and future EU and national policy frameworks (Chen and Chiou-Wei, 2009). Moreover, by virtue of the recent socio-economic developments that originate in the 2007-08 global financial crisis and its subsequent European sovereign debt crisis, there is scope for examining whether and how these incidents impact on the tourism-economy causality.

In short, the findings reveal that the tourism-economy relationship is not stable over time for all sample countries in terms of both its magnitude and direction. Furthermore, we document that the abovementioned relationship tends to exhibit changing patterns in either its magnitude or direction during major economic events, such as the Great Recession of 2007-08 and the Eurozone debt crisis of 2010. Finally, results suggest that the impact of these economic events on the relationship between the tourism sector and the economy is more apparent to Cyprus, Greece, Portugal and Spain, which are the European countries that have experienced the greatest economic downturn since 2009.

The rest of the paper is organised as follows: Section 2 analyses the existing literature that connects tourism activity to economic prosperity by presenting, for each hypothesis, a selection of recent studies along with their findings. Section 3 describes the methodology and the data sets used for the countries in question. Section 4 describes the empirical results for each sample country and to discuss their potential interpretation and finally, Section 5 summarises the main conclusions of the study.

2. The tourism and economic growth nexus

In recent years, the relationship between tourism expansion and economic development has attracted considerable attention. As related studies focus on diverse regions and time spans or employ different methodologies, their output comprises mixed and often contradictory findings (Tang and Jang, 2009). A plethora of researchers addressed the question of whether tourism activity leads to economic growth of the host countries or, economic development drives tourism expansion. At the same time, some authors subscribed to the belief that the impact between the two factors runs in both or neither directions. This section provides a comprehensive account of the four main hypotheses regarding the causal links between international tourism and national economies. It also discusses some recent observations and key results for each theoretical strand.

To begin with, the first and most popular interpretation of the tourism-economic growth causality is the tourism-led economic growth (TLEG) hypothesis. According to this, there is a flow of benefits from international tourism to the economy, which spillover through multiple routes (Schubert et al., 2011). In particular, it is believed , among others, that tourism (i) increases foreign exchange earnings, which in turn can be used to finance imports (Brida and Pulina, 2010; McKinnon, 1964), (ii) it encourages investment and drives local firms towards greater efficiency due to the increased competition (Ballaguer and Cantavella-Jorda, 2002;Bhagwati and Srinivasan, 1979; Krueger, 1980), (iii) it alleviates unemployment, since tourism activities are heavily based on human capital (Brida and Pulina, 2010) and (iv) it leads to positive economies of scale thus, decreasing production costs for local businesses (Andriotis, 2002; Croes, 2006).

Consequently, it is reasonable to suggest that tourism contributes to the raise of income levels and GDP per capita (Croes and Vanegas, 2006; Sugiyarto, Blake and Sinclair, 2003). For all these reasons, the TLEG hypothesis suggests that tourism activity could form a strategic direction to stimulate the economic development of destinations (Hazari and Sgro, 1995; Proenca and Soukiazis, 2008; Sanchez Carrera, Brida and Risso, 2008; Vanegas and Croes, 2003).

Recent empirical work that validates this hypothesis is located in both developed and developing countries. Indicative studies include the research of Brida et al. (2010), Croes and Vanegas (2008) and Fayissa et al. (2011), which focus on the Latin American region. More specifically, Brida et al. (2010) employ quarterly data from 1987 to 2006 to demonstrate the positive impact of tourism expenditure on Uruguay's GDP per capita. Similar findings are also reported by Croes and Vanegas (2008) for Nicaragua and Fayissa et al. (2011) for a cross-section of destinations. In addition, Schubert et al. (2011) hold that the increased tourism demand in Antigua and Barbuda leads to economic development and better terms of trade.

In the Mediterranean, Dritsakis (2012) focuses on tourism receipts, tourism arrivals, exchange rate and GDP per capita for seven countries, covering the period 1980-2007, to confirm the contribution of tourism to economic growth. Eeckels, Filis and Leon (2012) produce favourable evidence for the TLEG hypothesis by examining the cyclical components of GDP and tourism income in Greece over 1976-2004. Furthermore, Parrilla, Font and Nadal (2007) document that tourism impacts on the development of the Spanish regions positively. Similarly, Mello-Sampayo and Sousa-Vale (2010) verify the tourism-led growth in Europe although interestingly, the levels of impact are found higher in the North than the South. Continuing along the same lines, Surugiu and Surugiu (2013) explore tourism spending, GDP growth rate and real exchange rate between 1988 and 2009 to report a positive causality from tourism to the Romanian economy.

Examples from other regions also abound. Indicatively, Holzner (2011) shows that tourism-based countries exhibit higher than average economic rates, by investigating the records of 134 countries around the globe. Additionally, Ivanov and Webster (2013) evaluate the positive contribution of tourism to real per capital growth in 167 countries. Pratt (2011) also documents that the higher the level of tourism arrivals in Hawaii, the greater the impact of tourism on the economy. Finally, Matarrita-Cascante (2010), recognise the potential role of tourism as a catalyst for economic growth, although he underlines that in order for growth to evolve into long-term development other elements, such as good communication among stakeholders and the participation of the local community are also required.

Even though much of the recent evidence is in favour of the TLEG, there is a strand in the literature that paints the opposite picture, i.e. that it is the tourism sector which is positively affected by economic fluctuations. As Payne and Mervar (2010) explain, the economic-driven tourism growth (EDTG) hypothesis maintains that the development of a country is mobilised by the application of well-designed economic policies, governance structures and investments in both physical and human

capital. These create a socio-economic climate that encourages tourism activities to proliferate and flourish, given the availability of resources, infrastructure and political stability.

On the empirical side, Narayan's (2004) study on Fiji over the period 1970-2000 reveals that the rise of per capita incomes raised the number of tourism arrivals in the island. In South Korea, Oh (2005) uses quarterly data from 1975 to 2001 to propose that the country's economic expansion had a short-run positive effect on international visits. Similar observations are made by Payne and Mervar (2010), who focus on Croatia during 2000-2008 and document a remarkably positive impact of GDP on the country's tourism revenues. Moreover, Tang (2011), by using monthly data from Malaysia between 1995 and 2009, provides evidence that tourism markets support the EDTG hypothesis in the long run. Interestingly enough, the findings of Payne and Mervar (2010) and Tang (2011) contradict those of Mello-Sampayo and Sousa-Vale (2010) and Holzer (2011), respectively.

Portraying to the readily available information, bidirectional causality (BC) could also exist between tourism income and economic growth (see, *inter alia*, Chen and Chiou-Wei, 2008 and Ridderstaat et al., 2013). From a policy view, a reciprocal tourism-economy relationship implies that government agendas should cater for promoting both areas simultaneously. Evidence which supports this assertion is found, *inter alia*, in the work of Apergis and Payne (2012), who recognise a short- and long-term bidirectional effect at nine Caribbean countries throughout 1995-2007. These results, though, are inconsistent with the previous TLEG findings which are reported by Holzner (2011) and Schubert et al. (2011). Likewise, Chen and Chiou-Wei (2009) redefine South Korea's tourism–economy connection as mutually beneficial, which contradicts Oh's (2005) earlier claims in favour of the EDTG hypothesis.

Furthermore, Lee and Chang (2008) identify bidirectional relationships in non-OECD countries between the period 1990 and 2002, whereas, Ribberstaat et al. (2013) also conclude to a bilateral causation through their study of Aruba from 1972 to 2011. Seetanah (2011) seconds these findings, confirming a bi-causal tourism-growth link through a sample of island economies for the time span 1990-2007. Nevertheless, it is worth reporting that his evidence conflicts with this provided by Holzner (2011), Mello-Sampayo and Souza-Vale (2010), Narayan (2011) and Schubert et al. (2011).

Finally, there are some studies that do not offer support to any of the aforementioned theories, introducing the no causality (NC) hypothesis. Based on this standpoint, the impact relationship between tourism and economic growth is insignificant. A recent study which maintains the NC hypothesis is this of Figini and Vici (2009), who utilise cross-country data of GDP per capita and tourism receipts over 1980-2005. In contrast to Holzner (2011), Figini and Vici (2009) opine that tourism dependent countries do not grow differently from countries with less developed tourism sectors.

Analogously to Figini and Vici (2009), Po and Nuang (2008) also employ cross-sectional annual data, for 1995-2005, to present some interesting findings. These advocate for the NC hypothesis within countries that share specific characteristics, including a medium to small size, dispersed incomes and

low ratios of services/GDP and of forest area to country area.In addition, the study of Katircioglu (2009) in Turkey, which covers the period from 1960 to 2006, finds no integration between international tourism and economic expansion. Furthermore, Tang and Jang (2009) conclude that the NC hypothesis is also held in the US, by analysing the long-run tourism-growth relationship on a sub-industry level.

To provide a synopsis, the tourism-economic growth relationship has been the subject of considerable study and debate. The current theoretical and empirical work along with its diversified results illuminate that there is not a generally applicable hypothesis which can be a priori accepted as axiomatic. Rather, it seems that the relationship between tourism and economic growth stems from the specific economic and policy context of a destination during different time periods. Thus, there is scope for examining the tourism-growth link in a time-varying environment, which has been largely ignored by the existing literature.

It was only recently that some authors started to question the stability of the tourism-economic growth connection over time (see, Arslanturk et al., 2011; Lean and Tang, 2010;; Tang and Tan, 2013). More specifically, Arslanturk et al. (2011), using a rolling-window Vector Error Correction Model, show that the impact of tourism receipts on Turkish GDP is negative until 1983 and turns into a positive effect in the post-1983 period. Lean and Tang (2010) use rolling subsample TYDL Granger causality analysis (Dolado and Lutkepohl, 1996 and Toda and Yamamoto, 1995) with monthly data of industrial production and international tourism arrivals from January 1989 to February 2009 for Malaysia. Although their findings support the TLEG hypothesis, they show that the tourism-growth link changes over time by becoming either more or less pronounced. Tang and Tan (2013) also focus on Malaysia, using a recursive Granger-causality test to study the time-varying relationship between international tourism arrivals and industrial production. Their results reveal that the positive effect of tourism on economic growth is not stable over time.

In this light, it is necessary to extend this strand of the literature in order to examine further the time-varying relationship between tourism and economic growth. To achieve this, our study utilises the newly introduced version of a VAR-based spillover index, developed by Diebold and Yilmaz (2012, 2009). This method allows the time-varying examination of the total spillovers along with the directional and net spillovers among variables. The VAR-based spillover index has already attracted a considerable attention in the economic literature (see, *inter alia*, Antonakakis, 2012; Bubák, Kočenda, and Žikeš, 2011; Duncan and Kabundi, 2013; McMillan and Speight, 2010; Zhou, Zhang and Zhang, 2012) and it is applied in the tourism context for the first time. The next section provides a detailed description of the chosen method.

3. Methodology and description of data

3.1 Methodology

The purpose of this paper is to examine the spillover effects between tourism and economic growth over time for selected European countries. We employ the spillover index by Diebold and Yilmaz (2012), which generalises the original index, first developed by Diebold and Yilmaz (2009). Spillovers allow for the identification of the inter-linkages between the variables of interest. Diebold and Yilmaz (2009) framework allows the estimation of the *total* spillover index, whereas Diebold and Yilmaz (2012) extend the work of Diebold and Yilmaz (2009) in two respects. First they provide refined measures of *directional* spillovers and *net* spillovers, providing an `input-output' decomposition of *total* spillovers into those coming from (or to) a particular source/variable and allowing to identify the main recipients and transmitters of shocks. Second, in line with Koop et al. (1996) and Pesaran and Shin (1998), Diebold and Yilmaz (2012) use a generalized vector autoregressive framework, in which forecast-error variance decompositions are invariant to the ordering of the variables (in contrast to Cholesky-factor identification used in Diebold and Yilmaz, 2009). In the context of the present study, this is particularly important since it is hard, if not impossible, to justify one particular ordering of the variables on tourism and economic growth, given the fact that there are four distinct hypotheses dealing with the tourism-economic growth relationship. The use of the generalized VAR framework of Diebold and Yilmaz (2012), and thus, the full account for the observed correlation pattern between shocks, increases the relevance from a policy perspective.

Following Diebold and Yilmaz (2012), we estimate a VAR model, which takes the general form as follows:

$$\mathbf{y}_t = \sum_{i=1}^{q} \mathbf{A}_i \mathbf{y}_{t-i} + \varepsilon_t, \tag{1}$$

where, $\mathbf{y}_t$ is a M×1 vector of endogenous variables, $\mathbf{A}_i$ are M×M autoregressive coefficient matrices, ε_t is a M×1 vector of error terms, assumed to be serially uncorrelated. The VAR model for each country contains two variables (M=2), namely the international tourism arrivals and industrial production growth rates. The *total*, *directional* and *net* growth rate spillovers are produced from the generalised forecast-error variance decompositions of the VAR model in Equation (1). The advantage of the generalised variance decomposition is that it eliminates any possible dependence of the results on the ordering of the variables. Pesaran and Shin (1998) define the *H*-step-ahead generalised forecast-error variance decomposition as:

$$\theta_{ij}(H) = \frac{\sigma_{jj}^{-1} \sum_{h=0}^{H-1} \left(e_i' A_h \Sigma e_j \right)^2}{\sum_{h=0}^{H-1} \left(e_i' A_h \Sigma A_h' e_i \right)}, \tag{2}$$

where Σ denotes the variance matrix of the error vector ε, σ_{jj} denotes the error term's standard deviation for the *j*-th equation and e_i is a selection vector with ones as the *i*-th element and zeros otherwise. In this study the forecast horizon is set to 10 months, thus *H*=10.

Considering that under the generalised decomposition, the sum of the own and cross-variable variance contribution is not equal to one, i.e. $\sum_{j=1}^{N}\theta_{ij}(H)\neq 1$, all entries of the variance decomposition matrix were normalised by the row sum, as follows:

$$\tilde{\theta}_{ij}(H)=\frac{\theta_{ij}(H)}{\sum_{j=1}^{N}\theta_{ij}(H)}. \tag{3}$$

We should note here that by construction $\sum_{j=1}^{N}\tilde{\theta}_{ij}(H)=1$ and $\sum_{i,j=1}^{N}\tilde{\theta}_{ij}(H)=N$.

Hence, based on Equations (2) and (3), we are able to construct the *total* growth rate spillover index (TS), as:

$$TS(H)=\frac{\sum_{i,j=1,i\neq j}^{N}\tilde{\theta}_{ij}(H)}{\sum_{i,j=1}^{N}\tilde{\theta}_{ij}(H)}\times 100=\frac{\sum_{i,j=1,i\neq j}^{N}\tilde{\theta}_{ij}(H)}{N}\times 100. \tag{4}$$

The *total* spillovers show the average contribution of spillovers of shocks across variables to the total forecast error variance.

Furthermore, we construct two types of *directional* growth ratespillovers (DS). The first type measures the spillovers *TO* variable *i* from all other variables *j*, such that:

$$DS_{i\leftarrow j}(H)=\frac{\sum_{j=1,i\neq j}^{N}\tilde{\theta}_{ij}(H)}{\sum_{i,j=1}^{N}\tilde{\theta}_{ij}(H)}\times 100=\frac{\sum_{j=1,i\neq j}^{N}\tilde{\theta}_{ij}(H)}{N}\times 100. \tag{5}$$

The second type of *directional* spillovers measures the spillovers *FROM* one variable *i* to all other variables *j*:

$$DS_{i\rightarrow j}(H)=\frac{\sum_{j=1,i\neq j}^{N}\tilde{\theta}_{ji}(H)}{\sum_{i,j=1}^{N}\tilde{\theta}_{ji}(H)}\times 100=\frac{\sum_{j=1,i\neq j}^{N}\tilde{\theta}_{ji}(H)}{N}\times 100 \tag{6}$$

Finally, from Equations (5) and (6) we are able to obtain the *net* growth rate spillovers (NS) from variable *i* to all other variables *j*, as:

$$NS_i(H) = DS_{i \to j} - DS_{i \leftarrow j}. \quad (7)$$

The spillovers allow us to measure the level of interdependence among variables. In turn, by concentrating on the net transmitters and the net receivers, we can identify the main source of these spillovers.

Taking into consideration that we have a two-variable VAR model, the *directional* spillovers *FROM* industrial production growth rate to tourism arrivals growth rate are identical to the *directional* spillover *TO* tourism arrivals growth rate from industrial production growth rate. Therefore, we do not present both of them as they are obsolete. The same applies for the *net* spillovers.

3.2 Data description

As it is mentioned earlier, the focus of this study is on Europe. The paper uses monthly data of ten European countries, collected by Eurostat, covering different time spans between 1995 and 2012. In particular, the data sets concern the periods 1995:01-2012:12 for Germany, Italy and Spain, 1995:03-2011:12 for Greece, 1996:01-2012:12 for Austria, 1998:01-2010:12 for the UK and 2000:01-2012:12 for Cyprus, the Netherlands, Portugal and Sweden. The examination of the specific time spans is purely based on data availability. Still, the analysis embraces destinations with varied tourism activity and economic performance, across the Central, North and South of Europe, forming a sufficiently representative sample.

The variables taken into consideration are industrial production, as a proxy of economic growth (similarly with Espinoza, Fornari and Lombardi, 2012; Lombardi and Van Robays, 2011; Peersman and Van Robays, 2011; Bjornland and Leitmeno, 2009; Laopodis, 2009, among others) and the number of international tourism arrivals, as a proxy of tourism income (similarly with Dritsakis, 2012; Narayan, 2004, Tang, 2011; Tang and Tan, 2013). All variables are seasonally adjusted and are expressed in their growth rates.

Table 1 presents the descriptive statistics of the variables under consideration.

[TABLE 1 HERE]

As evident from Table 1, industrial production (Panel A) exhibits a lower volatility compared to the tourism series (Panel B). In addition, we observe that, apart from Cyprus, the changes in tourism arrivals are positive for all other countries. On the other hand, six out of ten countries experience, on average, a negative growth in their industrial production. These countries include Cyprus, Greece, Italy, Portugal, Spain and the UK. This is not a surprising result considering that these regions

suffered a significant decline in their economic performance, especially during the latter part of the sample period. Finally, none of the series is normally distributed, as indicated by the skewness, kurtosis and Jarque-Bera statistics.

The evolution of the series growth rates over the sample period is depicted in Figure 1.

[FIGURE 1 HERE]

4. Empirical findings and discussion

4.1. VAR estimates and total growth rate spillover table

We begin our analysis with the examination of the VAR estimates in order to provide some preliminary evidence on the relationship between international tourism arrivals and economic growth in the countries under investigation. Since the focus of this paper is on the spillover effects and for the sake of brevity, the actual VAR estimates, along with their impulse response functions, are not reported here but are available upon request. Table 2 presents a summary of the causality direction between our series for each country.

[TABLE 2 HERE]

Table 2 suggests that different countries provide support to a different hypothesis. The TLEG hypothesis is evident only for Italy and the Netherlands, while the EDTG is observed in Cyprus, Germany and Greece. Furthermore, there is evidence of bidirectional causality in the cases of Austria, Portugal and Spain, whereas no causality can be identified for Sweden and the UK.

The findings for Cyprus, Italy, Netherlands and Spain are consistent with those of Cortes-Jimenez and Pulina (2010), Dritsakis (2012), Proenca and Soukiazis (2008), Lee and Chang (2008), Mello-Sampayo and Souza-Vale (2010) and Katircioglu (2009b). In turn, they contradict the arguments of Balaguer and Cantavella-Jorda (2002), Dritsakis (2012; 2004), Eeckels et al. (2012), Lee and Chang (2008), Mello-Sampayo and Souza-Vale (2010), Nowak, Sahli and Cortes-Jimenez (2007), Proenca and Soukiazis (2008) regarding all other countries. It should be noted that since no causality is found for Sweden and the UK, these countries are not included in the remaining analysis.

The next step of our study is to examine the *total* growth rate spillover table, by first presenting its generic form in Table 3. The rows in Table 3 (contributions FROM others) report the contribution to the forecast error variance of series *i and j,* stemming from innovations to series *j and i*, where *i*, *j* are the industrial production and international tourism arrivals growth rates, respectively. The reverse contribution is illustrated in the columns of Table 3 (contributions TO others). The table also exhibits the total contribution of each series, including own contributions. The difference between the contributions TO others and contributions FROM others provides the *net* growth rate spillovers. A positive figure suggests that a particular series is a net transmitter of shocks, whereas a negative figure denotes that the series is a net receiver. Finally, Table 3 reports the *total* growth rate spillover index,

which is the sum of the contributions FROM or TO others relative to the sum of the total contributions including own. Thus, the *total* growth rate spillover index indicates the average effect on both series across the whole sample.

[TABLE 3 HERE]

Table 4 reports the *total* spillover index results for the sample countries.

[TABLE 4 HERE]

The *total* spillover indices reveal a quite low average effect. The only exceptions are Austria and Portugal which exhibit a moderate level of *total* spillovers. The lowest score is reported for Cyprus. This result is somewhat unexpected as Cyrpus is considered a country with a tourism sector of substantial size. Overall, the *total* spillover indices illustrate that, on average, there is a weak to moderate interdependence between tourism and economic growth for most countries.

The *net* spillovers for the whole sample demonstrate that tourism is the transmitter of shocks, especially for Italy and the Netherlands. This complements the findings from the VAR results, which showed that the TLEG hypothesis stands for both countries. The reverse holds true primarily in the cases of Austria and Greece. For the remaining countries the *net* spillovers are relatively small.

Our analysis so far is based on single fixed parameters (i.e. a static environment). Although these results reveal some useful information, we should not lose sight of the fact that during the sample period, the global economy witnessed some major changes (for example, the Great Recession of 2007 and the on-going Eurozone debt crisis). Thus, it is unlikely that the values presented in Table 4 hold for the whole time span investigated here and hence, it would be valuable to examine how these spillovers evolve over this period. In order to do so, the next sections present the *total*, *directional* and *net* spillovers using 60-month rolling samples. It should be underlined that different forecast horizons (from 5 up to 15 months) and different window lengths (48 and 72) were also considered and the results were qualitatively similar. Thus, we maintain that the results are not sensitive to the choice of the forecast horizon or the length of the rolling-windows.

4.2. Rolling-sample total spillovers

Figure 2 presents the 60-month rolling-sample *total* spillover indices for all countries and Table 5 summarises the main descriptive statistics of these indices.

[FIGURE 2 HERE]

[TABLE 5 HERE]

As it is demonstrated in Figure 2 and Table 5, the *total* spillovers indices fluctuate significantly in almost all countries. The greater fluctuations are observed in the cases of Germany (between 2% and 26%), Spain (between 2% and 18%) and Portugal (between 7% and 27%). Likewise, there are large fluctuations in Austria (between 3% and 18%), Greece (between 1% and 18%) and Italy (between 5% and 22%). Conversely, the lower fluctuations belong to Cyprus (between 3% and 13%) and the Netherlands (between 2% and 14%).

Furthermore, the time-varying *total* spillover indices illuminate that there are periods in which the tourism and the economy tend to be more/less related. This is the first indication that the strength of the tourism-economy relationship does not remain stable over time in the countries under examination. More interesting in this respect is that nearly all countries exhibit episodes of either important increases or considerable decreases of the *total* spillover index. Such observation exposes the existence of two separate clusters. The first cluster comprises Austria, Cyprus and Greece, which experience a sudden decrease in their *total* spillover index between 2006 and 2007. The second cluster consists of Italy, the Netherlands, Portugal and Spain, where a significant increase in their spillover index is observed during 2007 and 2008. This is evidence of a structural break in the tourism-economy link during and after the financial crisis of 2007-08 although not in the same direction for all the countries of our sample. Germany is marked off from these clusters as it is the only one which presents two important peaks in 2000 and early 2003, respectively.

To encapsulate, it is established that the strength of the tourism-economy relationship dynamically varies over time and that there are several episodes of sudden increases or decreases of the *total* spillovers indices. The question that follows on from such observations is whether the direction of the said relationship remains stable over time. To answer this question, the study expands its line of enquiry into the *directional* and *net* spillovers over time.

4.3. Rolling-sample directional and net spillovers

This section focuses on the *directional* and *net* spillovers for each country. The *directional* spillovers show the effect of one variable's shock to the other, whereas the *net* spillovers document which variable is the main transmitter/receiver of these shocks. It needs to be highlighted that a *net* spillover index which fluctuates around the level of zero suggests equal spillover effects from/to both variables rather than zero spillover effects.

4.3.1. Austria

In the case of Austria, we observe in Figure 3 (Panel A) that after an increasing trend of the *directional* spillovers from the economy to tourism growth from 2001 to 2004, they begin to decline continuously, until the mid-2007. Thenceforth, a reverse behaviour is identified, reaching its peak – almost at 15% level – at the end of 2012. On the contrary, the *directional* spillovers from tourism to the economy are relatively low throughout our sample period, with the only exception the period from

mid-2005 to mid-2007, when they reach the level of about 12.5%. The *directional* spillovers show that the effects from the economy to the tourism growth and *vice versa* are moving in an almost opposite direction. This suggests that there is not a stable relationship between the two indicators. This is more easily observed in the *net* spillovers index plot (Figure 3 – Panel B), where the economic growth is the main transmitter of shocks to the tourism sector (i.e. EDTG is identified), except for the time span from mid-2005 to mid-2007, when the reverse causality holds (i.e. TLEG is observed considering that the net transmitter is the tourism activity).

[FIGURE 3 HERE]

These results constitute a distinctive narrative which needs decoding. A closer reading of the country's wider context illuminates that Austria experienced its highest average real GDP growth rate of 3.7% during the period when tourism impacted on the national economy. Since the onset of the Great Recession, which led the Austrian economy to slow down, we notice that the main driver of the tourism-economy relationship is the GDP growth rate.

Thus, we maintain that for the case of Austria the tourism-economy relationship is dynamic and seems to alter when there is an important change in the economic conditions of the country. Put differently, when the economy is growing, the main transmitter is the tourism sector, whereas the reverse holds true when the Austrian economy slows down or even experiences a decline, as in 2009 (-3.8% real GDP growth rate).

4.3.2. Cyprus

As with Austria, in Cyprus we observe a similar pattern of *directional* spillovers behaviour from the economy to the tourism growth and the reverse (Figure 4 – Panel A). Specifically, the economic spillovers to tourism are low until 2009, while the opposite spillovers are moderate throughout the same period, suggesting a TLEG. From 2010 onwards, we notice a continuous rise of the economic spillovers and a decrease of tourism spillovers. This is also evident in the *net* spillovers figure, where after 2009 the main transmitter on the tourism-economy relationship is the latter (Figure 4 – Panel B).

[FIGURE 4 HERE]

Once again we find evidence in favour of an unstable relationship, which alters its behaviour in the post-2009 period. A plausible explanation for this change might lie in the broader European conditions that emerged at that time and particularly, in the beginning of the Eurozone debt crisis. Greece's request for financial aid from the EU and the IMF had resonances for Cyprus, as the two economies are closely interconnected in terms of financial transactions and trade. Since that time the Cypriot economy began to show turbulence in its economic growth with low or even negative real GDP growth rates, resulting eventually to the slowdown of its tourism sector.

Another possible reason of the transformation of the tourism-economy relationship in Cyprus is the fact that the country pursued to expand its banking operations over the years and especially after joining the EMU, in 2008. From 2009 onwards, the main contributor to the Cypriot economy was indeed, the banking sector rather than the tourism sector, which was hitherto the traditional service industry that dominated the Cypriot economy.

4.3.3. Germany

In the case of Germany, the results reveal that the *directional* spillovers from both the economic and tourism growth are exhibiting a steady decline over the sample period apart from some notable exemptions (Figure 5 – Panel A). In particular, in the end of 2002, we observe a peak of 22% in the *directional* spillovers, which flow from tourism growth. Furthermore, two peaks in the *directional* spillovers from economic growth occur at the end of 2005 and 2008. Moreover, the *net* spillovers also suggest that the tourism-economy relationship changes over time. To be more precise, Figure 5 (Panel B) shows that in the first part of our study period (i.e. until 2005), as well as, during the Great Recession, the main transmitter of the shocks is the tourism industry. The reverse holds true for the remaining periods. Yet, in post-2009, the *net* spillovers fluctuate almost to zero.

[FIGURE 5 HERE]

Overall, the evidence from both the *directional* and *net* spillovers suggests that there is a weak tourism-economy relationship, especially in the post-2009 period. To some extent, this is a reasonable finding, considering two facts. First, that Germany is the leading economy of Europe and the second exporter on a global scale, specialising in non-tourism related sectors, such as automobiles, machinery, electrical equipment and chemicals. Thus, it is almost inevitable that within this framework, its tourism activity would play a less central role to the country's finances. Second, a closer look to the German tourism sector reveals that the volume of visits from abroad is low compared to the number of international departures (OECD, 2012). This means that there is actually a significant deficit to Germany's tourism account.

4.3.4. Greece

Greece is considered to be heavily dependent on tourism income with the tourism activity to account for about 16% of the national GDP, representing a vital source of foreign exchange (OECD, 2012). It is thus surprising that, according to the *directional* spillovers, the relationship between the Greek tourism sector and the national economy is not very strong until 2006 (see Figure 6 – Panel A). This contradicts the findings from previous studies which suggest a strong link between the two variables (see Dritsakis, 2012; Eeckels et al., 2012). Between 2006 and 2008 we observe that the tourism sector has an increasing effect towards the economy, while the exact reverse behaviour is observed for the

economic growth. After 2009, the picture is changing as the economic spillovers exhibit a rising pattern, whereas the reverse holds true for the tourism spillovers.

In addition, the *net* spillovers verify that before 2006, the link between tourism and economic growth is relatively weak (Figure 6 – Panel B). Post 2006, though, and for a period of about three years, the tourism growth is a net transmitter, suggesting a TLEG for the case of Greece. However, after 2009 this relationship changes in favour of the EDTG. The latter finding can be attributed to the important effects of the Greek debt crisis on the tourism-economy relationship. The European slowdown has seriously affected the economy of Greece, plunging it into a sharp downturn. It is indicative that the annual growth rate of the national GDP remains negative since 2008, reaching -7.1% in 2011 (Bank of Greece, 2012). Thus, it is maintained that the economic downturn in Greece has a direct impact on the tourism industry.

[FIGURE 6 HERE]

4.3.5. Italy

In Italy we observe that overall the extent of *directional* spillovers from tourism growth are larger compared to the spillovers from economic growth (Figure 7 – Panel A). Nevertheless, the *directional* spillovers suggest that both variables tend to influence each other.

[FIGURE 7 HERE]

In addition, although the EDTG is evident in the pre-2002 period, in the post-2002 period the *net* spillovers paint a very clear picture in favour of the TLEG (Figure 7 – Panel B). This is expected as Italy is among the most popular tourism destinations, ranking 5th in both tourism arrivals and tourism receipts internationally (UNWTO, 2012b). It should be also added here that although the TLEG hypothesis seems to hold in the post-2002 period, the magnitude of the tourism growth effect on economic growth fluctuates significantly. Hence, it is maintained that even in the case of Italy there is a time-varying shift in the behaviour of the two series.

4.3.6. Netherlands

The *directional* spillovers for Netherlands reveal that the relationship between tourism and the economy is not very strong, as on average these spillovers account for about 4% (Figure 8 – Panel A). Furthermore, the *net* spillovers provide a mixed picture of the interaction between the two factors (Figure 8 – Panel B). In particular, there are some periods during which the main transmitter of shocks is flowing from tourism and other, when it flows from the economy. Even though the magnitude of both the *directional* and *net* spillovers is relatively small, it is apparent that the tourism-economy relationship does not have a stable character.

[FIGURE 8 HERE]

4.3.7. Portugal

The examination of Portugal reveals that the causality between tourism and the economy experiences a clear break in the post-2008 period. More specifically, from 2005 to 2008 the tourism spillovers are quite large, accounting for approximately 12% (Figure 9 – Panel A). During the same period, the economic spillovers are only 5%. Nonetheless, this situation reverses in the wake of the Great Recession. Thus, overall, based on the *net* spillovers (Figure 9 – Panel B), we observe that the TLEG relationship in the pre-2008 period is transformed into an EDTG connection in the post-2008 period.

[FIGURE 9 HERE]

As it is shown earlier, a similar behaviour is also noticed in the cases of Cyprus and Greece and it is suggestive of the impact of the major economic difficulties that these countries experience in the period after the financial crisis of 2007-08 and especially, with the onset of the Eurozone debt crisis, which has been transmitted in their tourism sectors.

4.3.8. Spain

The results of Spain suggest that tourism growth does not have a significant effect on economic growth prior to 2008, given that the *directional* spillovers from tourism to the economy accounted for merely 3-4% (Figure 10 – Panel A). However, after 2008 there is a considerable increase in the magnitude of the tourism spillovers, which reaches a peak of almost 13%. The *net* spillovers provide a clearer picture of the change in the tourism-economy relationship in the post-2008 period in favour of the TLEG (Figure 10 – Panel B). This finding can be explained by the fact that Spain enjoys huge success as one of the top destinations worldwide, coming forth in international tourism arrivals and second in global tourism receipts (UNWTO, 2012b). Tourism activities represent about 10% of the country's GDP whereas they contribute significantly to compensating for trade deficit (OECD, 2012).

[FIGURE 10 HERE]

Once again, though, we notice that the financial crisis of 2007-08 has a profound impact on the tourism-economy causality, although in the Spanish case, its results are the opposite from that in Cyprus, Greece and Portugal. Still, this finding provides further evidence in favour of the unstable relationship between the economic and tourism growth over time.

4.3.9. The Tourism-Economy relationship in the post-Great Recession era

The tourism industry is vulnerable to both external and internal factors, which implies that it is easily influenced by crisis incidents (Pforr and Hosie, 2009). The severe economic downturn and its subsequent climate of uncertainty tend to have a negative domino effect on tourism activities (Hederson, 2007; Papatheodorou, Rossello and Xiao, 2010; Smeral, 2009). Austerity measures, such as those implemented in Cyprus, Greece, Ireland, Italy, Portugal and Spain, translate into lower investments, disposable incomes and thus, reduced tourism demand and spending. In fact, there is evidence that the recent crisis did not merely result in lower visitor numbers but also in declined expenditure per visitor (Pizam, 2009). In parallel with this, the negative political scenery that prevails among certain European host countries is very likely to lead to negative tourist perceptions which in turn, can undermine demand and further decrease the number of arrivals at destinations (Pforr and Hosie, 2009).

After 2011, the global tourism market began to return to its pre-crisis growth levels (Blanke and Chiesa, 2011; UNWTO, 2012b). However, most European peripheral countries that continued to suffer from debt problems and political turmoil did not stop to report a poorer tourism performance. A case in point is Greece, which, between 2007 and 2010, saw a decline in arrivals from all its leading origin markets (indicatively, arrivals from the UK decreased by 31.2%, from Italy by 27.1% and from Germany by 10%, OECD, 2012: 187). Furthermore, the Greek tourism witnessed a drop of 5.5% in 2012 whereas its turnover index in the first quarter of 2013 was 16.9% lower than that of the previous year, according to the Hellenic Statistical Authority. Pressure on tourism product prices (e.g. VAT on food and drink increased by 10% in 2011) coupled with political instability (e.g. two national elections in May and June 2012, lack of confidence regarding Greece's stay in Euro) may have indeed discouraged visitation decisions.

Another country that was proved particularly susceptible to European macroeconomic tensions is Cyprus. Although in recent years, tourism growth was overtaken by the rapid expansion of the Cypriot banking sector, the industry remained highly important for the economy. Yet, the island is suffering an on-going fall in tourism arrivals and spending that was further intensified by the crisis (OECD, 2012). The latter exert a negative influence in dual ways – first by altering the travelling behaviour of the main origin markets of Cyprus (primarily the UK) and second, by raising the price of the tourism product, which in turn weakens its competitiveness compared to similar destinations such as Turkey, Spain and Portugal (Boukas and Ziakas, 2012).

Portugal is also an interesting case, as one of the most deeply affected Eurozone countries with severe domestic socio-economic problems. In the post-crisis era, the causality between the well-performed tourism sector and the poor-state economy of Portugal is EDTG. An examination of the tourism-related figures of the country reveals that although the Portuguese tourism performs better than these of Greece or Cyprus after the crisis, still tourism expansion seems much constrained from 2008 onwards (OECD, 2012). To put it simply, even in the case of Portugal it is clearly observed that the economic climate decelerated the positive growth rate that Portugal's tourism enjoyed until 2007.

On the other hand, Spain reported some growing numbers in tourism arrivals and receipts throughout 2010-2012, despite being a crisis-stricken area (OECD, 2012). These results do not suggest the immunity of the Spanish product to the economic recession but rather relate to the specific circumstances inside and outside the destination. This means that the reversal of a falling trend between 2008 and 2009 to a positive one after 2010 is not so much attributable to internal changes but rather to external events, including the outbreak of political conflicts in North Africa, i.e. the main competitor of Spain (PerlesRibes, Ramon Rodriguez, Rubia Serrano, Moreno Izquierdo, 2012; Ritchie, Molinar and Frechtling, 2010). Hence, Spain's fate is better than this of Greece and Cyprus first, because it has a cheaper product that remains appealing to cost-conscious tourists and second, because its main competitors suffer from anomalous political circumstances.

Overall, what these examples demonstrate is that the specific context of each sample country exposes multiple facets and parameters that may affect their tourism-economy causality over time.

5. Conclusion

The purpose of this paper is to examine the time-varying relationship between tourism and economic growth. We employ the spillover index by Diebold and Yilmaz (2012), which generalises the original index, first developed by Diebold and Yilmaz (2009). Spillovers allow for the identification of the inter-linkages between the variables of interest. Diebold and Yilmaz (2009) framework allows the estimation of the *total* spillover index, whereas Diebold and Yilmaz's (2012) work provides refined measures of *directional* and *net* spillovers. The *directional* and *net* spillovers offer an `input-output' decomposition of *total* spillovers into those coming from (or to) a particular source/variable and allow the identification of the main recipients and transmitters of shocks and forecast-error variance decompositions that are invariant to the ordering of the variables. The latter is particularly important in the context of the present study, as it is almost impossible to justify one particular ordering of the variables on tourism and economic growth.

The paper focuses on the European region and in particular, on ten EU member-countries for the period 1995 to 2012. We consider the industrial production index, as a proxy of economic growth and international tourism arrivals, as a proxy of tourism income, on a monthly basis for each country.

Overall, the findings reveal that the tourism-economy relationship is not stable over time for all countries in terms of both its magnitude and direction. In addition, we show that the abovementioned relationship tends to exhibit a change in its magnitude and/or direction during major economic events, such as the Great Recession of 2007 and the Eurozone debt crisis of 2010. Finally, results illuminate that the impact of these economic events on the relationship between the tourism sector and the economy is more apparent to Cyprus, Greece, Portugal and Spain, which are the European countries that have experienced the greatest economic downturn since 2009.

These results are particularly important to tourism actors and policy makers, suggesting that the strategic planning of the tourism sector, when aimed at stimulating the national economy, should take

into consideration this time-varying relationship. Moreover, the new findings are significant for researchers as they show that this strand of the literature deserves more of their attention. On this note we provide some interesting ideas for further research. Although it is beyond the scope of this paper, future work could further investigate the tourism-economy relationship using a variety of other time-varying measures such as multivariate GARCH models (e.g. the DCC of Engle, 2002; and BEKK of Baba, Engle, Kraft and Kroner, 1991; Engle and Kroner, 1995) and the CoVaR measure of Adrian and Brunnermeier (2008). Finally, another avenue for future research is the examination of the determinants of the time-varying relationship between the tourism sector and the economy.

References

Adrian, T., &Brunnermeier, M. (2008).CoVaR. Staff Report 348, Federal Reserve Bank of New York.

Andereck, K., Valentine, K., Knopf, R., & Vogt, C. (2005).Resident's perceptions ofcommunity tourism impacts.*Annals of Tourism Research, 32*(4), 1056–1076.

Andriotis, K. (2002). Scale of hospitality firms and local economic development – evidence from Crete. *Tourism Management*, *23*(4), 333-341.

Antonakakis, N. (2012). Exchange return co-movements and volatility spillovers before and after the introduction of euro. *Journal of International Financial Markets, Institutions and Money, 22*(5), 1091-1109.

Apergis, N., & Payne, J. E. (2012). Research note: Tourism and growth in the Caribbean evidence from a panel error correction model. *Tourism Economics*, *18*(2), 449-456.

Arslanturk, Y., Balcilar, M., &Ozdemir, Z. A. (2011).Time-varying linkages between tourism receipts and economic growth in a small open economy.*Economic Modelling*, 28(1), 664-671.

Baba, Y., Engle, R.F., Kraft, D.F., Kroner, K.F. (1991). Multivariate simultaneous generalized ARCH, Unpublished manuscript, Department of Economics, University of California, San Diego.

Balaguer, J., &Cantavella-Jordá, M. (2002). Tourism as a long-run economic growth factor: the Spanish case. *Applied Economics, 34*(7), 877-884.

Bank of Greece (2012), The Bank of Greece Interim Report on Monetary Policy 2012.

Bhagwati, J., &Srinivasan, T. (1979).Trade policy and development. In R.Dornbusch, &J. A. Frenkel (Eds.), *International economic policy: Theory and evidence* (pp. 1-35). Baltimore: Johns Hopkins University Press.

Bjornland, H. C., &Leitemo, K. (2009).Identifying the interdependence between US monetary policy and the stock market.*Journal of Monetary Economics, 56*, 275-282.

Blanke, J., &Chiesa, T. (2011). The travel and tourism competitiveness report 2011: Beyond the downturn. Geneva: World Economic Forum.

Boukas, N., &Ziakas, V. (2012).Impacts of the Global Economic Crisis on Cyprus Tourism and Policy Responses.*International Journal of Tourism Research* [online version]

Brida, J. G., &Pulina, M. (2010).*A literature review on the tourism-led-growth hypothesis.* Centro RicercheEconomiche Nord Sud (CRENoS), Working paper 17.

Brida, J., Risso, W. A., Lanzilotta, B., &Lionetti, S. (2010). The tourism-led-growth hypothesis for Uruguay.*Tourism Economics*, *16*(3), 765-771.

Bubák, V., Kočenda, E., &Žikeš, F. (2011).Volatility transmission in emerging European foreign exchange markets.*Journal of Banking & Finance, 35*(11), 2829-2841.

Chatziantoniou, I., Filis, G., Eeckels, B., &Apostolakis, A. (2013). Oil prices, income and economic growth: A structural VAR approach for European Mediterranean countries. *Tourism Management*, *36*, 331-341.

Chen, C. F., &Chiou-Wei, S. Z. (2009). Tourism expansion, tourism uncertainty and economic growth: New evidence from Taiwan and Korea. *Tourism Management*, *30*(6), 812-818.

Croes, R. (2006). A paradigm shift to a new strategy for small island economies: Embracing demand side economics for value enhancement and long term economic stability. *Tourism Management*, *27*, 453-465.

Croes, R., &Vanegas, M. (2008).Cointegration and causality between tourism and poverty reduction.*Journal of Travel Research*, *47*, 94–103.

Diebold, F. X., &Yilmaz, K. (2009). Measuring Financial Asset Return and Volatility Spillovers, with Application to Global Equity Markets*. *The Economic Journal, 119*(534), 158-171.

Diebold, F. X., &Yilmaz, K. (2012). Better to give than to receive: Predictive directional measurement of volatility spillovers. *International Journal of Forecasting, 28*(1), 57-66.

Dolado, J. J., &Lütkepohl, H. (1996). Making Wald tests work for cointegrated VAR systems. *Econometric Reviews, 15*(4), 369-386.

Dritsakis, N. (2012). Tourism development and economic growth in seven Mediterranean countries: a panel data approach. *Tourism Economics*, *18*(4), 801-816.

Duncan, A. S., &Kabundi, A. (2013).Domestic and foreign sources of volatility spillover to South African asset classes.*Economic Modelling, 31*, 566-573.

Eeckels, B., Filis, G., & Leon, C. (2012). Tourism income and economic growth in Greece: empirical evidence from their cyclical components. *Tourism Economics*, *18*(4), 817-834.

Engle, R. (2002). Dynamic conditional correlation: A simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business & Economic Statistics, 20*(3), 339-350.

Engle, R.F., &Kroner, K.F. (1995). Multivariate simultaneous generalized ARCH. *Economic Theory, 11*, 122–150.

Espinoza, R., Fornari, F., & Lombardi, M. J. (2012).The role of financial variables in predicting economic activity.*Journal of Forecasting, 31*, 15-46.

European Commission (2012). The EU in the world 2013: A statistical portrait. Luxembourg: Publications Office of the European Union.

Fayissa, B., Nsiah, C., &Tadesse, B. (2011). Research note: tourism and economic growth in Latin American countries – further empirical evidence. *Tourism Economics*, *17*, 1365–1373.

Figini, P., &Vici, L. (2009).Tourism and growth in a cross-section of countries.*RCEA Working Papers*: The Rimini Centre for Economic Analysis.

Hazari, B. R., &Sgro, P. M. (1995).Tourism and growth in a dynamic model of trade.*Journal of International Trade and Economic Development*, *4*(2), 143-252.

Henderson, J. C. (2007). Tourism Crises: Causes, Consequences & Management. London: Elsevier.

Holzner, M. (2011). Tourism and economic growth: the beach disease? *Tourism Management*, *32*(4), 922–933.

Ivanov, S., & Webster, C. (2013). Tourism's impact on growth: the role of globalisation. *Annals of Tourism Research, 41*, 231-236.

Katircioglu, S. T. (2009). Revisiting the tourism-led-growth hypothesis for Turkey using the bounds test and Johansen approach for cointegration.*Tourism Management*, *30*(1), 17-20.

Koop, G., Pesaran, M. H., &Potter, S. M.(1996).Impulse response analysis in nonlinear multivariate models.*Journal of Econometrics*, *74*(1), 119-147.

Krueger, A. (1980). Trade policy as input to development.*American Economic Review*, *70*, 188–292.

Laopodis, N. T. (2009). Are fundamentals still relevant for European economies in the post-Euro period.*Economic Modelling, 26*, 835-850.

Lean, H. H., & Tang, C. F. (2010). Is the tourism-led growth hypothesis stable for Malaysia? A note.*International Journal of Tourism Research, 12*(4), 375-378.

Lee, J. W., &Brahmasrene, T. (2013).Investigating the influence of tourism on economic growth and carbon emissions: Evidence from panel analysis of the European Union.*Tourism Management*, *38*, 69-76.

Lombardi, M. J., & Van Robays, I. (2011). Do financial investors destabilise the oil price? *European Central Bank*, Working paper 1346.

Matarrita-Cascante, D. (2010). Beyond growth: Reaching tourism-led development. *Annals of Tourism Research, 37*(4), 1141-1163.

McKinnon, R. I. (1964). Foreign exchange constraint in economic development and efficient aid allocation, *TheEconomic Journal*, *74*(294), 388-409.

McMillan, D. G., & Speight, A. E. (2010). Return and volatility spillovers in three euro exchange rates. *Journal of Economics and Business, 62*(2), 79-93.

Mello-Sampayo, F. D., & Sousa-Vale, S. D. (2012). Tourism and growth in European countries: an application of likelihood-based panel cointegration. *School of Economics and Management, Technical University Lisbon.*Working paper 17.

Narayan, P. K. (2004). Fiji's tourism demand: the ARDL approach to cointegration. *Tourism Economics*, *10*(2), 193-206.

OECD (2012), OECD Tourism Trends and Policies 2012, OECD Publishing.doi: 10.1787/tour-2012-en.

Oh, C. O. (2005). The contribution of tourism development to economic growth in the Korean economy.*Tourism Management*, *26*(1), 39-44.

Papatheodorou, A., Rosselló, J., & Xiao, H. (2010). Global economic crisis and tourism: consequences and perspectives. *Journal of Travel Research*, 49(1), 39-45.

Parrilla, J. C., Font, A. R., &Nadal, J. R. (2007). Tourism and long-term growth a Spanish perspective.*Annals of tourism research, 34*(3), 709-726.

Payne, J. E., &Mervar, A. (2010). Research note: The tourism-growth nexus in Croatia. *Tourism Economics*, *16*(4), 1089-1094.

Peersman, G., & Van Robays, I. (2011).Cross-country differences in the effects of oil shocks.*Energy Economics*, http://dx.doi.org/10.1016/j.eneco.2011.11.010.

PerlesRibes, J., Ramón Rodríguez, A., Serrano, A., &Izquierdo, L. (2012). Cycles, Economic Crisis and Tourism Competitiveness in Spain: Mechanisms of Transmission and Structural Effects. Available at SSRN 2201776.

Pesaran, H. H., &Shin, Y.(1998). Generalized impulse response analysis in linear multivariate models.*Economics Letters*,*58*(1), 17-29.

Pforr, C. &Hosie, P. (2009).Crisis Management in the Tourism Industry.Farnham: Ashgate.

Pizam, A. (2009). The global financial crisis and its impact on the hospitality industry.*International Journal of Hospitality Management, 28*, 301.

Po, W. C., & Huang, B. N. (2008).Tourism development and economic growth–a nonlinear approach.*Physica A: Statistical Mechanics and its Applications*, *387*(22), 5535-5542.

Pratt, S. (2011). Economic linkages and impacts across the TALC.*Annals of Tourism Research*, *38*(2), 630-650.

Proenca, S., &Soukiazis, E. (2008). Tourism as an economic growth factor: a case study for Southern European countries. *Tourism Economics*, *14*(4), 791.

Ridderstaat, J., Croes, R., &Nijkamp, P. (2013).Tourism and Long-run Economic Growth in Aruba.*International Journal of Tourism Research*. [available online]

Ritchie, J. B., Molinar, C. M. A., &Frechtling, D. C. (2010). Impacts of the world recession and economic crisis on tourism: North America. *Journal of Travel Research*, 49(1), 5-15.

Sanchez Carrera, E., Brida, J., &Risso, W. A. (2008).Tourism's impact on long-run Mexican economic growth.*Economics Bulletin*, *23*(21), 1-8.

Schubert, S. F., Brida, J. G., & Risso, W. A. (2011). The impacts of international tourism demand on economic growth of small economies dependent on tourism. *Tourism Management*, *32*(2), 377-385.

Seetanah, B. (2011). Assessing the dynamic economic impact of tourism for island economies.*Annals of Tourism Research*, *38*(1), 291-308.

Smeral, E. (2009). The impact of the financial and economic crisis on European tourism.*Journal of Travel Research, 48*(1), 3-13.

Sugiyarto, G., Blake, A., & Sinclair, M. T. (2003). Tourism and globalization: economic impact in Indonesia. *Annals of Tourism Research*, *30*(3), 683-701.

Surugiu, C., &Surugiu, M. R. (2013). Is the tourism sector supportive of economic growth? Emprirical evidence on Romanian tourism.*Tourism Economics, 19*(1), 115-132.

Tang, C. F. (2011). Is the tourism-led growth hypothesis valid for malaysia? A viewfrom disaggregated tourism markets.*International Journal of Tourism Research*, *13*(1), 97-101.

Tang, C. H. H., & Jang, S. S. (2009). The tourism–economy causality in the United States: A sub-industry level examination. *Tourism Management*, *30*(4), 553-558.

Tang, C. F., & Tan, E. C. (2013). How stable is the tourism-led growth hypothesis in Malaysia? Evidence from disaggregated tourism markets.*Tourism Management, 37*, 52-57.

Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of econometrics, 66*(1), 225-250.

United Nations World Tourism Organisation (2012a).Annual report 2011. Madrid: UNWTO.

United Nations World Tourism Organisation (2012b). UNWTO tourism highlights 2012 edition. Madrid: UNWTO.

Vanegas, M., &Croes, R. (2003). Growth, development and tourism in a small economy: evidence from Aruba. *International Journal of Tourism Research*, *5*, 315–330.

Zhou, X., Zhang, W., & Zhang, J. (2012).Volatility spillovers between the Chinese and world equity markets.*Pacific-Basin Finance Journal, 20*(2), 247-270.

Table 1. Descriptive statistics of the variables under investigation. The sample period runs from January 1995 to December, 2012.

Panel A: Industrial production growth rates

Descriptive Statistic	Austria	Cyprus	Germany	Greece	Italy	Netherlands	Portugal	Spain	Sweden	United Kingdom
Mean	0.003	-0.001	0.001	-0.001	-0.001	0.001	-0.002	0.000	0.001	-0.001
Std. Dev.	0.017	0.031	0.014	0.027	0.013	0.026	0.027	0.016	0.021	0.009
Skewness	-0.420	0.616	-0.770	-0.142	-0.320	-0.132	-0.641	-0.129	-0.441	-1.371
Kurtosis	4.623	7.354	5.440	4.405	4.227	4.882	5.401	4.931	3.577	10.225
Jarque-Bera	28.268***	132.222***	74.562***	17.194***	17.151***	23.316***	47.834***	34.011***	7.164**	385.729***
Observations	203	155	215	201	215	155	155	215	155	155

Panel B: International tourism arrivals growth rates

Descriptive Statistic	Austria	Cyprus	Germany	Greece	Italy	Netherlands	Portugal	Spain	Sweden	United Kingdom
Mean	0.003	-0.003	0.002	0.003	0.002	0.001	0.002	0.004	0.003	0.002
Std. Dev.	0.067	0.091	0.030	0.097	0.059	0.054	0.051	0.056	0.057	0.085
Skewness	-0.021	-0.409	-0.015	1.326	-0.406	0.210	-0.851	-0.791	0.754	0.373
Kurtosis	5.926	6.676	12.603	42.639	4.375	5.899	6.818	14.335	12.404	4.291
Jarque-Bera	72.455***	91.585***	826.152***	13218.160***	22.845***	55.412***	112.887***	1173.416***	585.874***	14.357***
Observations	203	155	215	201	215	155	155	215	155	155

***, ** and * denote statistical significance at the 1%, 5% and the 10% level, respectively.

Table 2: Causality direction between tourism and economic growth from the VAR model.

Table 3: Generic growth rate spillovers table

Shock by → / Response from ↓	Industrial Production growth rate (i)	Tourism Arrivals growth rate (j)	*Contribution FROM others*
Industrial Production growth rate (i)	A	B	B
Tourism Arrivals growth rate (j)	C	D	C
Contribution TO others	C	B	
Contribution including own	A+C	B+D	*Total spillover index:*
Net spillovers	C-B	B-C	*(B+C)/200%*

Note: A, B, C and D correspond to the contribution to the forecast error variance of series i and j, stemming from innovations to series j and i, where i, j are the industrial production and international tourism arrivals growth rates.

Table 4: Growth rate spillover table. The sample period runs from January 1995 to December, 2012.

AUSTRIA	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	94.70%	5.30%	5.30%
Tourism Arrivals	11.90%	88.10%	11.90%
Contribution TO others	11.90%	5.30%	
Contribution including own	106.60%	93.40%	*Total spillover index:*
Net spillovers	6.60%	-6.60%	*8.60%*

CYPRUS	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	98.70%	1.30%	1.30%
Tourism Arrivals	1.80%	98.20%	1.80%
Contribution TO others	1.80%	1.30%	
Contribution including own	100.50%	99.50%	*Total spillover index:*
Net spillovers	0.50%	-0.50%	*1.55%*

GERMANY	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	96.60%	3.40%	3.40%
Tourism Arrivals	1.90%	98.10%	1.90%
Contribution TO others	1.90%	3.40%	
Contribution including own	98.50%	101.50%	*Total spillover index:*
Net spillovers	-1.50%	1.50%	*2.65%*

GREECE	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	99.90%	0.10%	0.10%
Tourism Arrivals	6.50%	93.50%	6.50%
Contribution TO others	6.50%	0.10%	
Contribution including own	106.40%	93.60%	*Total spillover index:*
Net spillovers	6.40%	-6.40%	*3.30%*

ITALY	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	92.40%	7.60%	7.60%
Tourism Arrivals	3.90%	96.10%	3.90%
Contribution TO others	3.90%	7.60%	
Contribution including own	96.30%	103.70%	*Total spillover index:*
Net spillovers	-3.70%	3.70%	*5.75%*

NETHERLANDS	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	95.40%	4.60%	4.60%
Tourism Arrivals	1.90%	98.10%	1.90%
Contribution TO others	1.90%	4.60%	
Contribution including own	97.30%	102.70%	*Total spillover index:*
Net spillovers	-2.70%	2.70%	*3.25%*

PORTUGAL	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	91.60%	8.40%	8.40%
Tourism Arrivals	7.70%	92.30%	7.70%
Contribution TO others	7.70%	8.40%	
Contribution including own	99.30%	100.70%	*Total spillover index:*
Net spillovers	-0.70%	0.70%	*8.05%*

SPAIN	Industrial Production	Tourism Arrivals	*Contribution FROM others*
Industrial Production	95.90%	4.10%	4.10%
Tourism Arrivals	3.40%	96.60%	3.40%
Contribution TO others	3.40%	4.10%	
Contribution including own	99.30%	100.70%	*Total spillover index:*
Net spillovers	-0.70%	0.70%	*3.75%*

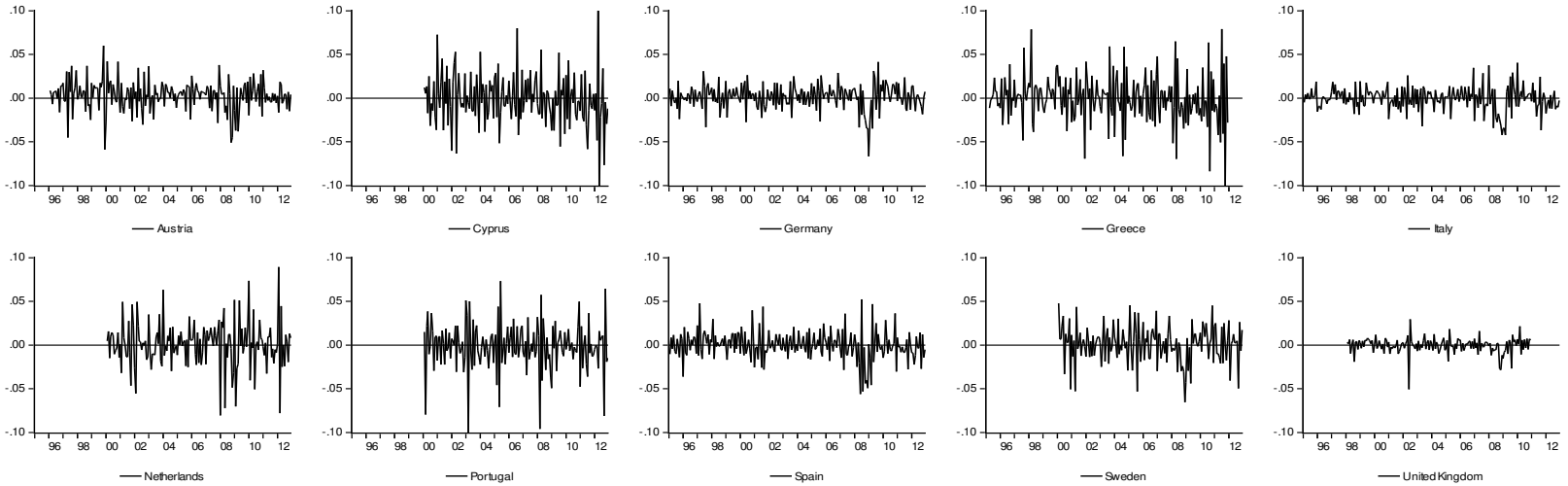
Table 5: Descriptive statistics of the 60-month rolling-sample total spillover indices for all countries. The sample period runs from January 1995 to December, 2012.

Descriptive Statistic	Austria	Cyprus	Germany	Greece	Italy	Netherlands	Portugal	Spain
Mean	12.183	7.641	10.481	9.911	13.733	6.361	15.729	8.172
Maximum	18.028	12.979	26.400	18.207	22.184	13.807	27.473	17.913
Minimum	3.323	2.809	2.247	1.419	5.501	2.087	6.937	2.124
Std. Dev.	3.092	2.387	5.301	3.454	3.971	2.550	4.488	4.118
Observations	139	94	148	139	149	94	94	153

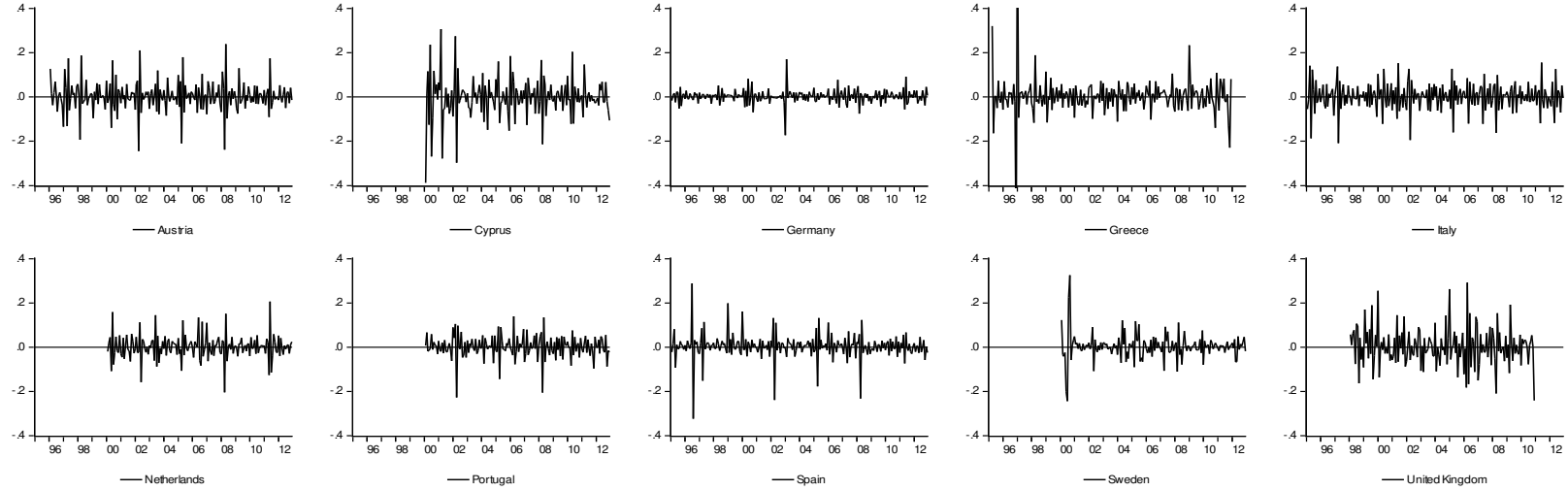
FIGURES

Figure 1: Growth rates plots for the variables under investigation.

Panel A: Industrial production growth rates

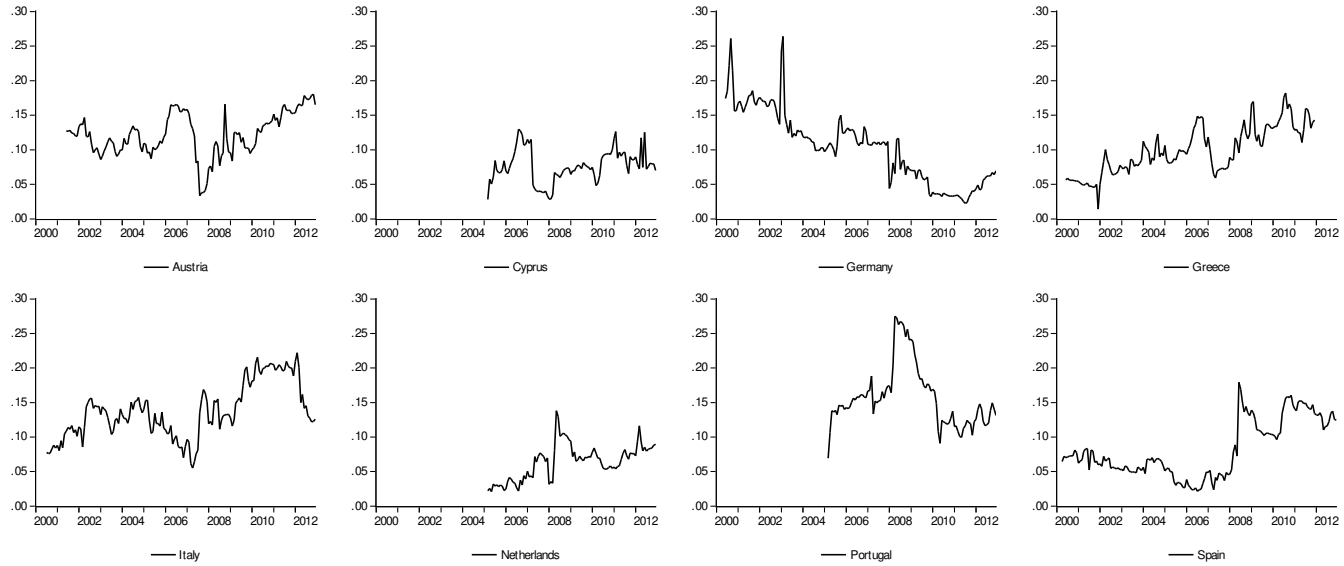


Panel B: International tourism arrivals growth rates



Note: Please refer to Section 3.2 for the country specific time span.

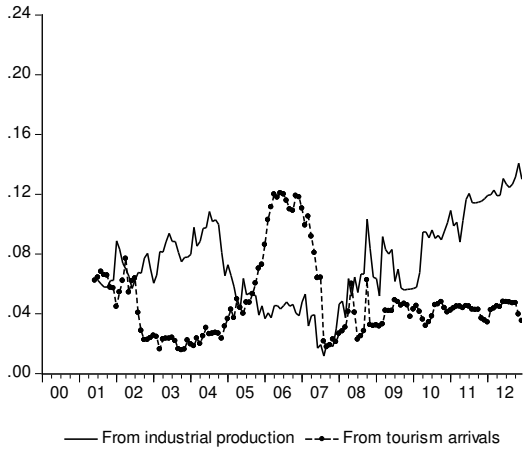
Figure 2: 60-month rolling-sample total growth rate spillover indices for all countries.



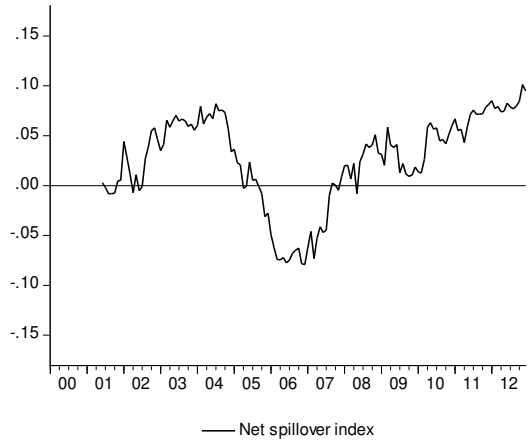
Note: Due to the fact that we use 60-month rolling windows the starting date of the total spillover indices is 60 months after the initial available date for each country.

Figure 3: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Austria.

Panel A: Directional growth rates spillover indices from tourism and economic growth



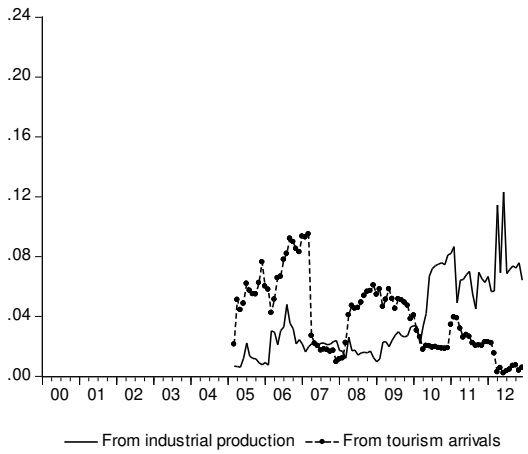
Panel B: Net growth rates spillover index



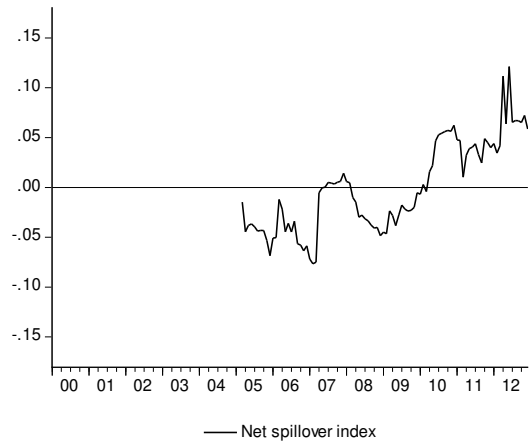
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 4: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Cyprus.

Panel A: Directional growth rates spillover indices from tourism and economic growth



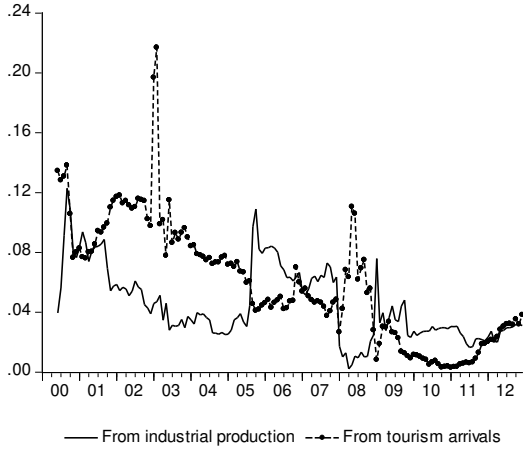
Panel B: Net growth rates spillover index



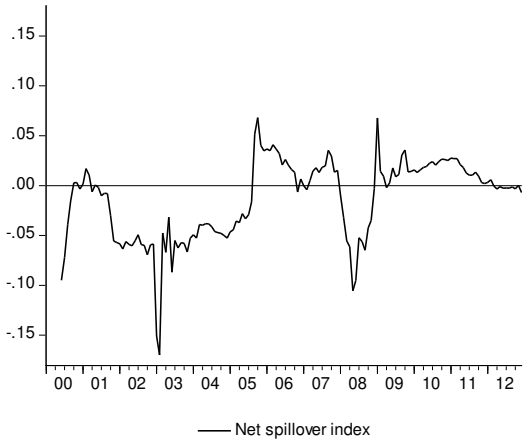
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 5: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Germany.

Panel A: Directional growth rates spillover indices from tourism and economic growth



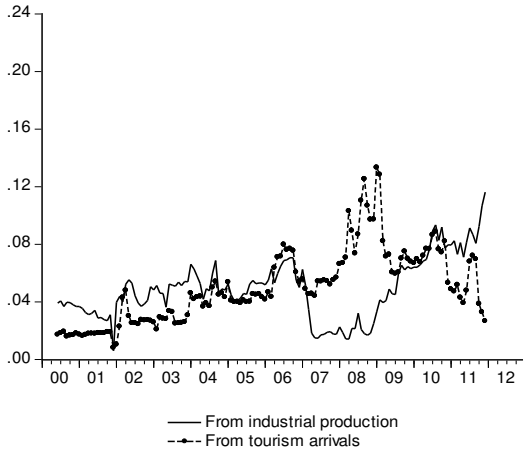
Panel B: Net growth rates spillover index



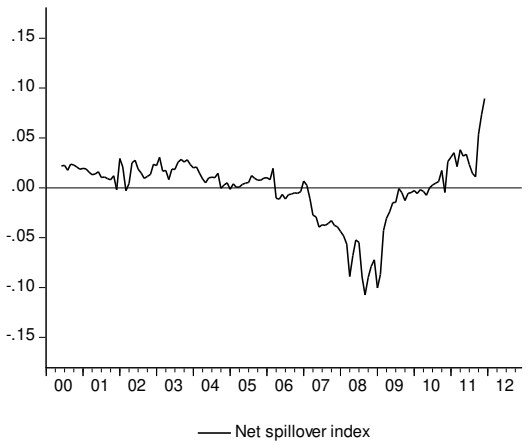
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 6: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Greece.

Panel A: Directional growth rates spillover indices from tourism and economic growth



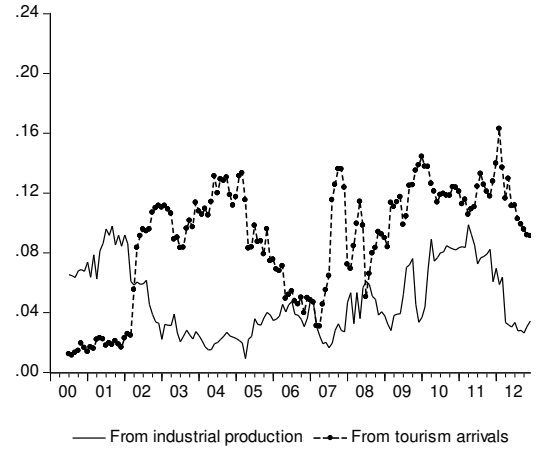
Panel B: Net growth rates spillover index



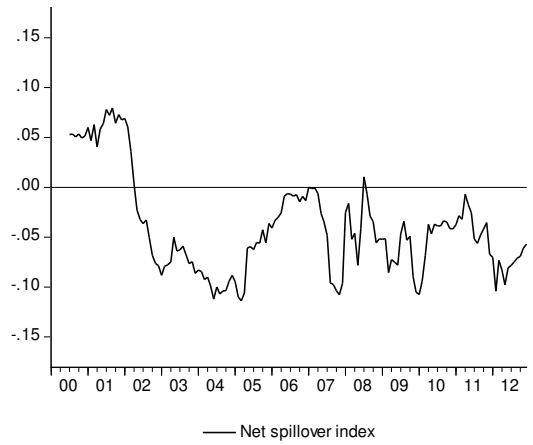
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 7: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Italy.

Panel A: Directional growth rates spillover indices from tourism and economic growth



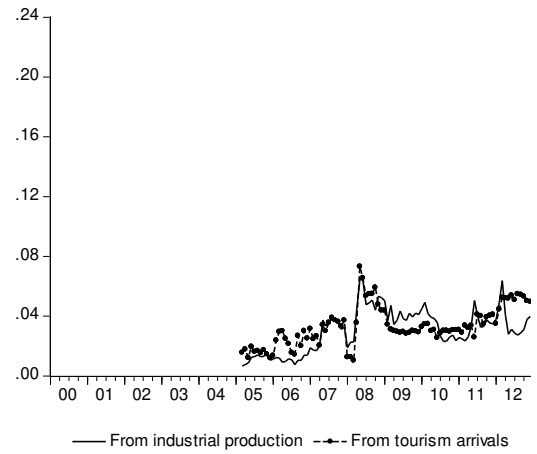
Panel B: Net growth rates spillover index



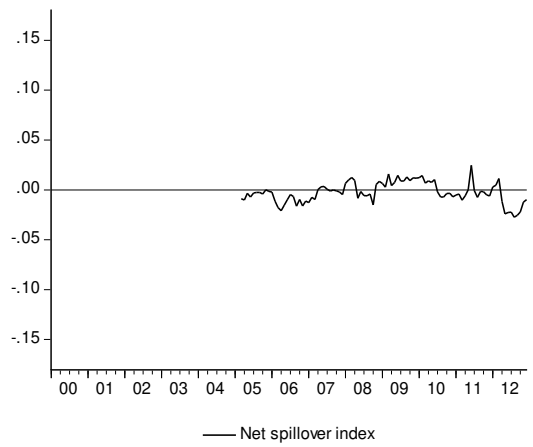
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 8: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Netherlands.

Panel A: Directional growth rates spillover indices from tourism and economic growth



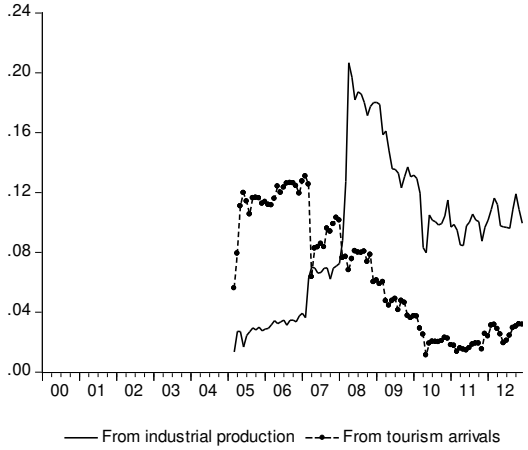
Panel B: Net growth rates spillover index



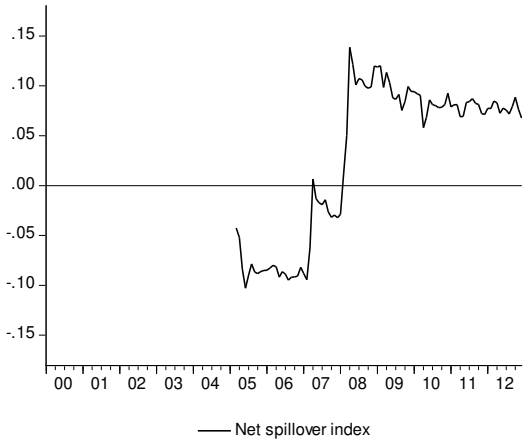
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 9: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Portugal.

Panel A: Directional growth rates spillover indices from tourism and economic growth



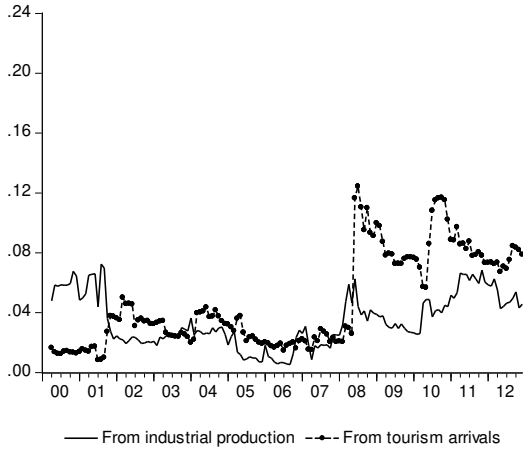
Panel B: Net growth rates spillover index



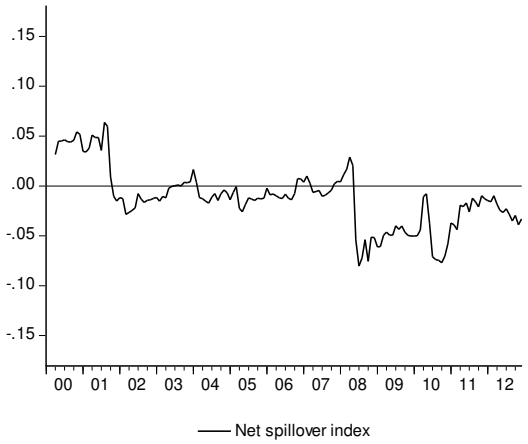
Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.

Figure 10: 60-month rolling-sample directional and net growth rate spillover indices between tourism and economic growth for Spain.

Panel A: Directional growth rates spillover indices from tourism and economic growth



Panel B: Net growth rates spillover index



Note: The positive area of the net spillover index plot denotes that the net transmitter (receiver) of shocks is the industrial production (tourism arrivals), whereas the negative area denotes that the net transmitter (receiver) of shocks is the tourism arrivals (industrial production).
For the sample period of the directional and net spillover indices please refer to the note under Figure 2.