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Methods for Measuring the Effects of the EU Presidency on International Tourism

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Abstract

This study uses time-series techniques and econometric approaches in order to quantify the effects that organising an EU presidency has on the tourism exports of a country. The approach to explain tourism revenues by a time-series intervention model filters out special effects (data discontinuations, exchange rates, events, media reports, etc.) by outlier detection methods, maps influences from trends, the business cycle and seasonal effects in an ARIMA model and depicts the effect of an EU presidency by way of an intervention variable. Using econometric indicator approaches, a country's tourism exports are controlled for seasonal and special influences, habitual effects and demand trends by way of suitable indicators, and a dummy variable is used to test whether the EU presidency made a statistically significant contribution to the revenues from tourism.

Keywords: EU presidency; econometric indicator approach; intervention models; outlier detection

Introduction

An EU presidency in a given country will generate measurable economic effects that are generally comparable to the organisation of a major temporary event (e.g. in the field of sports or culture). The economic impact is mostly due to touristic effects. The important thing is that in the six months during which a country holds the EU presidency conferences and other EU-related meetings are held in that country which generate additional demand, triggered by the expenditure by politicians, delegates, their support staff, family members, media representatives and observers from all parts of the world. They spend money on accommodation, food, culture, leisure activities, shopping and a range of services. Political events also have an intangible impact by way of

image, advertising and generally positive locational effects that is difficult to impossible to quantify. The greater media presence of a destination triggers publicity effects that contribute to its image and affect consumer behaviour.

In order to analyse the economic effects of major temporary events it is first necessary to distinguish between their overall gross impact and their additional/effective impacts.

The overall gross impact of an EU presidency includes all its effects on national GDP, employment and tax revenues resulting from the expenditure made in connection with its organisation.

As to the gross impact, it is not distinguished between what is spent by the local population, the local government and the local businesses and by sources outside the organising country.

The effective impact is the total of expenditure flows from abroad which can be related to the organisation of the EU presidency and which is not the result of spatial, temporal and monetary substitution processes (Smeral, 2003 and 2005).

The (effective) growth of demand caused by an EU presidency is thus the result mainly of spending by foreign conference participants, their attendants and staff and other foreign visitors of relevance to the EU presidency.

The cost accruing to the organising country and mostly financed from the public budget is exceeded by the additional demand caused by the conference participants' expenditures and the positive impact on the country's image. Considering that the direct and indirect public expenditures and costs of organising an EU presidency are generally financed by budgetary reallocations and cuts on other items, such expenditure would by itself produce no expansive effect. But where outlays are financed by other sources, an expansive effect will be generated from presidency-related public expenditures. As every EU member state is obliged to hold the rotating presidency in its turn and cannot escape from this obligation, it is not necessary to consider alternative uses of the resources in our analysis.

In the context of the EU presidency, some crowding-out effects in terms of non-presidency tourists must be expected, so that the net effect as manifested by tourism exports needs to be estimated: it is conceivable that tourists are occasionally crowded out due to capacity bottlenecks (e.g. in four- and five-star hotels) caused by

event-specific demand, which may reduce the altogether positive effect of the event. Furthermore, when conference facilities are booked by the EU presidency this may crowd out other events.

In a regional context, traditional holidays may be substituted by the participation in conferences. On the other hand, the EU presidency offers an incentive for travelling in the organising country prior to or after the event/conference.

When we deal with a major temporary event that lasts for six months and covers the entire territory of a state, we are faced with a wide range of factors that all have a parallel impact on demand. Yet these factors cannot be individually isolated and clearly quantified, since the motivation and decision-making process that leads to a visit of the organising country typically is not based on a single trigger but rather the result of a bundle of impulses and impressions. A key role is certainly played by the greater media presence attending to an EU presidency. In addition, a presidency-related trip may lead to a repeat trip at a later date.

The positive effects of an EU presidency have already been demonstrated for a number of organising countries (Smeral and Wüger, 2000). To this end, intervention models were used and heuristic methods applied for verification. The findings obtained by heuristic models, however, are unsatisfactory inasmuch as it is very difficult to isolate the various influencing factors which may distort results and effectively prevent any statistical inference. It is therefore not possible to state specifically whether the findings can be viewed with statistical significance. In order to be able to perform adequate comparisons to the intervention models, econometric indicator approaches were added to the tools used (Smeral and Wüger, 2005). With this, the effects of an EU presidency are estimated on the basis of a wider spectrum of methods which in turn adds weight to findings on the possible dimensions of such effects.

In assessing the touristic (monetary) benefit, a key factor is the revenues from international travelling – the tourism exports of individual EU countries. To preclude distortions from price and exchange rate variations, time series were used that were based on constant prices and exchange rates of 1995. The point was to see whether the six months of an EU presidency showed any ‘measurable’ deviations from a hypothetical ‘normal’ development to be determined by a number of econometric/statistical methods. Such deviations could then be assigned, at least to a larger part, to the special event of the presidency. In other words: do the visits and expenditure by foreign conference participants and their attendants, foreign media representatives and other observers from all

parts of the world stimulate revenues from international travelling? In terms of additional revenues during the six-month presidency it is not just the spending during conferences and events that is relevant, but also the expenditure on pre- and post-conference travelling.

Furthermore, presidency-related increased domestic travelling by the residents (e.g., politicians, officials, media representatives and family members taken along) will have economic effects, but cannot be reliably quantified and isolated, so that it is ignored in this paper.

Quantifying the effects of revenues from an EU presidency is problematic, since the data reflects not just a special event (the 'presidency effect') but also the role of specific business cycle and/or market effects, price and exchange rate influences, changes in the EU's composition and the degree to which its members are integrated, changes in the venue of meetings[1], innovations in communications technology and data distortions that are difficult to identify.

This study[2] investigates the net effect of holding an EU presidency on the organising country. The data basis for comparison is provided by tourism exports of those countries that held the EU presidency between 1994 and 2004. Below, we first present approaches to identifying the effect of the EU presidency, followed by a discussion of findings and conclusions.

Key features of the models used

As touristic consumption tends to promptly and rapidly respond to all sorts of influences, tourism exports are subject to considerable volatility which makes it difficult to identify the magnitude of each influencing factor. Accordingly, in order to cover the effect of an EU presidency, we make use of several methods, ranging from time-series intervention models to econometric indicator approaches.

Intervention models

In the 1970s, Box and Jenkins (1976) developed so-called ARIMA models[3] to analyse time series, where they attempted to explain time series based on their intrinsic dynamics (auto-regressive terms and moving averages). Since economic time series are typically influenced by economic policy decisions and other events (such as an

EU presidency, etc.), such additional information needs to be accounted for in modelling a time series. This can be done by, e.g., intervention models which are extensions of the ARIMA models.

The intervention models (Liu and Hudak, 1994; Thury, 1988; Brandner, 1986; Ledolter, 1977) developed by Box and Tiao (1975) assume that a time series consists of two components – interventions at the given points in time, and the rest.

$$[1] \quad Y_t = f\left(\frac{\omega(B)}{\delta(B)} I_t, N_t\right)$$

In [1], I_t describes a so-called binary vector (i.e. a vector that assumes either value 0 or value 1) indicating the time of an intervention. The term $\frac{\omega(B)}{\delta(B)}$ expresses the effect of the intervention, N_t describes the influence of the other factors, which can be mapped by, e.g. an ARIMA model.

Interventions (I_t) may cause singular or permanent effects. In the first case, variable I_t equals 1 only at the time of the intervention and otherwise is 0; in the second case it is 1 from the time of the intervention.

The effects of the intervention are represented by the coefficients of the rational polynom $\frac{\omega(B)}{\delta(B)}$. The operator in the numerator, $\omega(B)$, covers the time of the influence and duration[4] of the intervention. The operator in the denominator, $\delta(B)$, indicates the extent to which the effect of an intervention decays. In most cases, it will fade in line with a given damping factor δ. The residual component N_t in *(1)* is represented by an ARIMA model of type

$$[2] \quad N_t \triangleq ARIMA(p,d,q)(P,D,Q)_4$$

where (p,d,q) reflects the regular[5] and $(P,D,Q)_4$ the seasonal[6] part of the model. The regular term depicts the longer-term influences on the data generation process (trend, business cycle), and the seasonal term the influences within a given year.

Since data in economic time series is frequently impaired by changes in the recording method and faulty reporting, and since the process to generate data for tourism exports can be quite substantially affected by factors such as exchange rate fluctuations, disasters, media reports and events, it is advisable to make use of outlier detection methods when estimating the model, especially since quite often no information is available on the

timing of such events (Thury and Wüger, 1992; Chen *et al*, 1990; Darne and Diebold, 2004). Such methods use an iterative approach to test whether any of the observed values of a time series is an outlier within the data generation process. Categories of outliers are defined in advance: 'additive outliers' *AO* (i.e. events that influence a time series at a single point in time), 'level shifts' *L* (permanent changes in the data generation process), 'innovational outliers' *IO* (innovations in the data generation process) and 'temporary changes' *T* (i.e. the effect of an event decays in accordance with a damping factor). The model parameters of the data generation process and the outlier effects are estimated simultaneously and the three steps – identifying outliers, adjusting outliers and estimating parameters based on the corrected series – repeated until no outlier is found any more.

By accounting for such outliers, it is possible to quantify their effects and thereby improve the parameter estimates of the overall model, since outliers would 'distort' the model parameters through their impact. In this way it is also ensured that the effect of an EU presidency and an assessment of its significance are given a more solid foundation than when an intervention model is estimated without outlier adjustment (Liu, 2005).

Estimates were made of models of the following type:

$$[3] \quad \ln Y_t \triangleq f\left(\frac{\omega(B)}{\delta(B)} I_{it}, O_{jt}(A_j, L_j, IO_j, T_j), ARIMA(p,d,q)(P,D,Q)_4\right)$$

As is evident from [3], tourism exports (Y_t) are explained by the EU presidency (I_t), other special influences (O_{jt}), the date of which is, as a rule, not known to the analyst and which can generate different types of outliers in the data generation process (A_j, L_j, IO_j, T_j), and the other influence factors (trend, business cycle, season, etc.) which are covered by an ARIMA model with a regular and a seasonal component. In order to avoid heteroskedasticity, the estimate uses a logarithmic transformation (ln).

Econometric indicator approach

Whereas time-series models provide explanations for the development of tourism exports mainly from their intrinsic dynamism, econometric functions are used to look into the causal links between tourism exports and their key determinants. Next to purely economic influences (income, etc.), there are plenty of other factors that can affect the tourist flows (disasters, special events, media reports, etc.). As stated above, tourism consumption can and will easily and quickly respond to any relevant influences.

The complex econometric indicator approaches chosen by us use suitable indicators in order to control all the major influencing factors. These include especially calendar and seasonal effects, special effects (disasters, events, etc.) and so-called habitual effects and flexible trends in the development of touristic demand (Smeral and Wüger, 2006).

Calendar and seasonal adjustments were performed using the TRAMO/SEATS software (Maravall and Gomez, 1997) which is based on an estimate of an adequate time-series model for tourism exports with due regard to calendar and special effects, and from these derives a consistent model for a seasonally adjusted time series. This also allows determining so-called seasonal factors which indicate the importance that the 'season' has on touristic demand. Special effects were covered by special outlier identification methods in order to ensure that the model parameters would be as undistorted as possible (see above).

Habitual effects are mapped by levels once reached in the past. Satisfaction with a holiday stay may cause people to return and thus have a positive impact on future demand. Negative experience may cause them to avoid the destination in the next year; repeated stays may generate a saturation effect which may act negatively on future holiday planning. The sign of the coefficients for lagged endogenous variables indicates the (positive or negative) balance of the sum of habitual effects.

Holiday destinations are subject to trends that, for a variety of reasons, change over time. Such flexible trends in seasonally adjusted tourism exports are captured using so-called HP-filters (Hodrick and Prescott, 1997; Enders, 2004). This smoothing method is used by macroeconomists in order to obtain an estimate for the (long-term) trend of a time series.[7] It uses a two-sided linear filter to break down a time series into a trend and a stationary component. In doing so, the trend series is determined by minimising the variance of time series Y_t around the trend s_t with due regard to the second-order differences of the trend. It is thus important to choose the trend so that the following expression is minimised:

$$[4] \quad \sum_{t=1}^{T}(y_t - s_t)^2 + \lambda \sum_{t=2}^{T-1}\{(s_{t+1} - s_t) - (s_t - s_{t-1})\}^2$$

λ is an arbitrary constant that reflects the 'cost' of trend fluctuations (expressed by the second-order differences); i.e. variations are penalised. The greater the penalty parameter, the smoother will be the trend series.

The flexible trends in tourism exports thus obtained are used in our approach as indicators for influencing factors that determine demand (development of income and purchasing power, etc.).

In our first complex econometric indicator approach, the seasonally, calendar- and outlier-adjusted tourism exports (*SOY*) are explained by past values (habitual effect) and flexible trends (HP-filter) of tourism exports (*HPY*) as an indicator value for the demand-determined influence factors (income and purchase power development, etc.), where for avoiding heteroskedasticity a logarithmic transformation (ln) was used. With this, the main determinants of tourism demand are incorporated in our model. In addition, a so-called dummy variable is used to obtain the possible impact of the EU presidency on tourism exports. This dummy variable (D_t) corresponds to intervention (I_t) in the intervention approach (see above). It is 1 for the time during which the EU presidency affects tourism exports (singularly or permanently), and otherwise 0. The coefficient of the dummy variable then reflects the magnitude of the effect achieved by the EU presidency on tourism exports.

In formal terms, the econometric indicator approach can be shown as follows[8]:

[5] $\ln SOY_t \triangleq f\left(\ln SOY_{t-n}, \ln HPY_t, D_t, u_t\right)$

where $u_t \triangleq ARIMA(p,d,q)(P,D,Q)_4$ and n = number of lags.

When the error term u_t in this econometric approach still showed some 'distinctive features' (i.e. did not follow a 'white noise'[9] process), it was modelled by a suitable ARIMA approach. In this way we obtain a combination of regression model and ARIMA model which is known as REGARIMA model (Enders, 2004; Makridakis *et al*, 1998).

In a second complex econometric indicator approach, an attempt was made to explain unadjusted (actual) tourism exports (Y_t) in a directly functional manner, by habitual effects (values obtained in the past), flexible trends of demand development (HPY_t) and seasonal influences. The latter were covered by seasonal factors (SFY_t) determined by means of TRAMO/SEATS, taking into account possible special effects (such as events, etc.). Possible effects of the EU presidency were captured by a dummy variable (D_t).

In formal terms:

[6] $\ln Y_t \triangleq f\left(\ln Y_{t-m}, \ln HPY_t, \ln SFY_t, D_t, u'_t\right)$

where $u'_t = ARIMA(p',d',q')(P',D',Q')_4$ and m = number of lags.

This approach again modelled the residuals by a suitable ARIMA approach wherever necessary.

Results

By applying intervention models and econometric indicator approaches, it is possible (subject to the availability of adequate specifications, a sufficient range of observations and good data quality) to map the effects of special events free of distortions and to assess whether they make a statistically significant contribution to the data generation process of the time series under observation. In the following analysis it is assumed that a country's EU presidency constitutes a special influence (which can be isolated) on the development of its tourism exports, so that the above approaches are an adequate instrument to analyse and quantify its effect.

Within the scope of the intervention models, we attempt to explain the tourism exports of a given country by three components: intervention variables (1st component) are used to determine the effects of an EU presidency; outlier adjustments (2nd component) filter out the effects of other special influences (data discontinuations, exchange rate effects, etc.); and ARIMA approaches (3rd component) map the other factors (trend, business cycle, season, etc.) impacting on the data generation process for tourism exports.

Using the econometric indicator approach, we control for seasonal and special influences, habitual effects and trends in demand, identifying the effect of an EU presidency by way of a dummy variable.

Models were estimated for each EU state individually. Due to the shortness of the time series, we restricted ourselves to simple assumptions regarding the specification of the interventions[10] and the dummy variables.

With the relevant components considered in the models variously defined and in view of their interactions, the result is an enormous number of specifications for the overall model of tourism exports. Once several variants had been estimated, the best form was selected by objective statistical criteria: it was one where the model estimate deviates from actual values only by random, where the estimation error is low and where the parameter of the EU presidency offers the highest statistical significance.

Given the highly volatile demand, the selected models are actually quite good in mapping the development of tourism exports in the various countries during the period of observation. The standard errors in the equations are generally low (see Table 1), varying between 1.6% (Spain, Austria) and 8.2% (Finland). The residuals of the

estimating equations did not show any deterministic pattern. Neither does the *Q*-statistic show any autocorrelation in the residuals.

Even though it was possible to obtain a good mapping of tourism exports for most countries, not all cases were equally amenable to an exact isolation of the impact of the EU presidency, due to the shortness and quality of the time series available. The relatively large number of data outliers found by the outlier detection programmes i.a. points at discontinuations in the data series.

Table 1 reflects the estimated results of the intervention and econometric inicator models with regard to the effects of the EU presidency, arranged by countries. The values given are the estimated effects of the EU presidency, expressed in percent of tourism exports at constant prices and exchange rates. The estimates produced quarterly values that were aggregated to half-yearly values. The figures given in brackets are the values of the *t*-statistic, which indicates the confidence level of the estimates. A value of 2.00 means that the results given are statistically different from zero with a significance level of 95%.[11] In slightly more than half of the cases, the econometric indicator approach produced better results than did the intervention approach. One reason appears to be that the indicator approach was better in checking for demand trends.

Table 1 includes data on the statistical significance in calculating the effect of the EU presidency. Accordingly, in almost 40% of cases, the estimates of the presidency effect have a level of significance higher than 90% and are thus statiscally firm, which is remarkable considering the substantial variations in the time series for tourism exports and the simultaneous impact of the influence factors. The level of significance is highest for the results for Spain and the Netherlands (significance level higher than 95%), Germany, Austria and France (significance level higher than 90%), and lowest for Finland, Portugal and Greece.

The effect estimated by the intervention and econometric indicator models, based on the unweighed arithmetic mean of individual country effects, made up about 3.5% of tourism exports.[12] This mean value may be interpreted as the result of a so-called panel investigation where a sample of countries is observed over time in order to filter out the impact of an event (such as the EU presidency) and where each country is assigned a separate (adequate) model to explain its tourism exports. This mean may be seen as a sort of reference value.

An analysis of cases shows that two main groups can be formed: one group experienced presidency effects of 1%–2% (Germany, Spain, Austria and Italy), whereas for the other group it was 4%–6% (Finland, Portugal,

Ireland, France, Greece). An extreme value was identified for the Netherlands (8.5%). The differences in the results may be linked to country-specific structural features for which no useful information is available.

Concluding remarks

An EU presidency triggers measurable economic effects and is generally comparable to a temporary (sports or cultural) event of a larger scale. The economic impact caused by the EU presidency is mostly rooted in tourism. The relevant point is that the meetings organised within the scope of an EU presidency are held in the country holding that presidency, through which additional demand is generated.

A key parameter in assessing the touristic (monetary) benefits from an EU presidency is the revenues from international travelling – the tourism exports of EU countries. They are a highly volatile time series which makes it very difficult to identify the individual influence factors. In a time-series intervention approach developed to explain the tourism exports, we filtered out special influences (data discontinuations, exchange rates, events, media reports, etc.) by outlier detection methods, mapped influences from trends, the business cycle and seasons by an ARIMA model and indicated the effect of an EU presidency by way of an intervention variable. Using econometric indicator approaches to explain a country's tourism exports, we controlled for seasonal and special influences, habitual effects and demand trends by suitable indicators and tested, by a dummy variable, whether an EU presidency had a statistically significant effect on tourism revenues.

While the models did quite well in reflecting overall tourism exports for most countries, it was not possible in all cases to exactly isolate the impact of the EU presidency on tourism exports due to the shortness and 'quality' of the time series available. In slightly over half of the cases, the econometric indicator approach developed here achieved a higher level of significance of the results than did the intervention approach.

The net effect (additional revenues reduced by substitution) estimated by the intervention and econometric indicator models amounted to some 3.5% of tourism export, based on the unweighed arithmetic mean of all country effects. An analysis of individual cases produced two groups of six members each and one extreme value: for one group, the presidency effect amounted to 1%–2%, for the other the value was some 4%–6%. The extreme case involved an effect of 8.5%. The fact that the presidency effect differs between countries may be linked to country-specific structural features.

Altogether it should be noted that the presidency effects determined through tourism exports need to be seen as a lower limit because:

- the presidency can be expected to have a positive effect on a country's image;
- in the case the costs of the presidency are financed by loans, public deficits are increased and expansive effects can be expected;
- additional presidency-relevant demand boosts tax revenues; and
- an increase in the presidency-related domestic travelling by residents (e.g., politicians, civil servants, media representatives and attendants) generates demand effects (which, however, cannot be reliably quantified and isolated).

Endnotes

1. Up to the end of 2003, the meetings of the European Council (heads of state and government) were held in the country holding the presidency; since 2004 they have been held in Brussels.
2. The study is an abbreviated version of an expert's report funded by the Austrian Federal Ministry of Economics and Labour.
3. ARIMA: Auto-Regressive Integrated Moving Average.
4. In $\omega(B)$, B stands for the backward shift parameter.
5. Where p indicates the order of regular auto-regressive terms, d stands for the regular integration order, and q for the order of regular moving averages.
6. Where P indicates the order of seasonal auto-regressive terms, D stands for the seasonal integration order and Q for the order of seasonal moving average terms. As we used quarterly data, the seasonal factor is 4.
7. Hodrick and Prescott (1997) introduced the method to examine the US business cycle after the Second World War.
8. Unadjusted actual tourism exports can be obtained by multiplying the seasonal adjusted time series with the seasonal factors.
9. 'White noise' means that errors in the estimating equations are unrelated and have purely random variations.
10. It was assumed that the data generation process was influenced only at the actual time of the EU presidency.
11. A t-value of 1.67 means that the results are statistically different from zero at a significance level of 90%; for a t-value of 1.30 the significance level is 80%, and for a t-value of 0.68 the significance level is 50%.

12. The effect determined for the first half-year was identical to that for the second half-year.

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Table 1. Effects of the EU presidency, estimated by intervention and econometric indicator models, by countries, in percent of real tourism exports.

	Calendar Year	EU presidency in 1st half-year	EU presidency in 2nd half-year	Presidency effects	*t*-statistic	Standard error of regression	Ljung-Box *Q*-statistic [a]
Austria	1998 [b]		x	1.5	(1.891)	0.0155	8.35
Finland	1999 [c]		x	4.4	(0.975)	0.0819	14.68
France	1995 [c]	x		5.8	(1.715)	0.0491	7.05
	2000 [b]		x	5.5	(1.460)	0.0520	2.42
Germany	1994 [c]		x	1.8	(1.910)	0.0208	9.20
	1999 [b]	x		1.1	(1.171)	0.0197	5.62
Greece	1994 [b]	x		6.2	(0.835)	0.0769	4.66
Ireland	2004 [c]	x		4.1	(1.105)	0.0476	0.58
Italy	2003 [b]		x	1.6	(1.179)	0.0273	0.56
Netherlands	2004 [c]		x	8.7	(2.085)	0.0634	6.55
Portugal	2000 [c]	x		3.9	(0.915)	0.0573	8.32
Spain	1995 [b]		x	2.1	(3.229)	0.0157	5.95
	2002 [b]	x		1.0	(1.543)	0.0157	5.95
Average	1st half-year			3.7			
	2nd half-year			3.7			
	Calendar year			3.7			

Source: IMF, own calculations.
[a] Critical value at 99.9% confidence is 16.81.
[b] Indicator approach.
[c] Intervention model.

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