THE DETERMINANTS OF LENGTH OF STAY AND ARRIVALS OF TOURISTS IN THE CROATIA: A PANEL DATA APPROACH

Scientific paper

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Abstract
Purpose – The purpose of this study are (1) to explore the determinants of visitors' arrivals at a destination from various countries, and the determinants of length of stays in Croatia (2) to examine if there is interaction effect between individual characteristics of origin countries and relative prices on length of stay, and/or various variables that include environment, energy, traffic and distance diversity.
Design – The special focus is given to reviewing the theoretical issue of defining length of stays of visitors, i.e. discussing prices as a factor that impact a length of stays as an endogenous variable in tourism modeling. The paper also presents the more complex model of arrivals to the Croatia's resorts that are essential for the understanding of tourism in this country on broader scope.
Methodology – The methodology of the research includes the descriptive statistics of time series and cross-sectional units (e.g. countries of origin), analysis of the existing data that are included in panel regression modeling, rigorous statistic diagnostics performed with an intention to choose the robust estimator.
Approach – Given the importance of tourism sector for Croatia, this paper investigates the factors affecting the length of stay and arrivals of tourist visitors in Croatia using panel data from twenty-one countries, since 1996 to 2010.
Findings – The main variables as the determinants of international arrivals in Croatia as a destination are: overcrowding and congestion of destination, attraction and environmental status and spatial distance between the capital cities. From modeling of the average duration of holiday deduced is inflation as a predictor but with insignificant value.
Originality – The originality of this paper consists on the fact that it refers to empirical testing of a speculative area of research, still yet, as modeling of tourism demand often is; by this research touched is a variety of factors (state of natural attractiveness, pollution and energy intensively, prices and geographical distances) that influence tourism demand of Croatia.
Keywords length of stays**,** international demand, tourist arrivals cross-sectional model, panel data model, Croatia

INTRODUCTION

In the last few years international tourism demand attracted more economists and statisticians to estimate and forecast it, using various statistic and econometric models and different approaches of influence. Basically, the scientific tourism world identifies cause and effect relationships between tourism demand (tourist spending, tourist arrivals, tourist overnights) and variables that affect the flow of tourists. The literature is dominated by works that deal with the modelling of demand, and to a lesser extent the length of stay of tourists.

Tourism demand has traditionally been modeled using a variety of approaches, including structural equations and time series techniques. Tourism literature comprises a large number of papers regarding tourism demand, trying to model it using various techniques starting with simple or multivariate regressions[1]; using panel or pool data analysis, co-integration procedure[2]. Intense use of the VAR model and co-integration technique should be particularly emphasized in some authors[3]. Furthermore, the same authors use the TVP approach for analysis of German tourist demand.[4] The breakings points in Croatia's tourism demand are identified by using the structural change analysis of tourism demand.[5]

In this general context, the present paper constructs a cross-sectional and panel model for total tourist flows, i.e. the length of stays and arrivals to Croatia from origin countries for the period 1996-2010. The determinants of length of stays into Croatia taking into consideration a series of various price variables, on one hand, and of international arrivals: environment, pollution, traffic and distance variable, on the other hand, are analyzed. The goal that will be obtained by modeling length of stays and arrivals, rigor estimation of elasticity values, that may be valuable for helping professionals and policy-makers in the decision making process.

The paper is organized as follows. The first section discusses the theoretical background of this paper, subsequently follows description of variable of influence on length of stays and arrivals demand, construction of the variables and the data sources. The second section presents the methodological approach and model specification with the results. The last section concludes the paper results and underlines the policy implications of main findings.

1. METHODOLOGICAL APPROACH

In attempt to modeling the length of stays of tourism vacation, assumed is that the tourism demand is decomposed in its two components: arrivals and length of stay, which are both decided when planning the holidays. In particular, the tourist first decides whether or not to travel to (to arrive at) the destination, and then decides how long to stay there in terms of days (the length of stay). Following study,[6] in their

[1] More details in: Garín-Muñoz, T., Amaral, T. P. (2000); Luzzi, G.F., Fluckiger, Y., (2003); Allen, D., Yap, G., Modeling Australian domestic tourism demand: A panel data approach, *18th World IMACS/MODSIM Congress,* Cairns, 2009.
[2] Lim, Ch., McAleer, M., Cointegration analysis of quarterly tourism demand by Hong Kong and Singapore for Australia, *Applied Economics,* 33, 2001, pp. 1599-1619; Durbarry, R., Long-run structural tourism demand modeling: An application to France*, Discussion Paper,* 2002; Mervar, A., Payne, J. E., Analysis of Foreign Tourism Demand for Croatian Destinations: Long-Run Elasticity Estimates, *Tourism Economics*, 13 (3), 2007, pp. 407-420.
[3] Šergo, Z., Tomčić, Z., Poropat, A., Models Of Overnights From Tourism Demand In Croatia 1960-98*,* 6th International Conference on Enterprise in Transition, Faculty of Economics Split, 2005, pp. 1319-1340.
[4] Ibidem, 2007.
[5] Ibidem, 2010.
[6] See in: Fabbri, P., Le ferie e il mercato turistico: un problema di politica economica. In G. Candela (Ed.), Contributi all'analisi economica del turismo. Bologna: CLUEB, 1988.

theoretical contemplation[7], the overnight stays are expressed as the product of the number of arrivals and the average length of stay (the duration of the holiday d): N = Ad.

As is obvious, d is inseparably linked to N and A by simple ratio N/A. For a given number of arrivals, the number of overnight stays decreases as a consequence of a reduction in the average length of stay. What are the determinants of A and d? If it is assumed that the tourist has already chosen the destination (ex ante decision), and given the amount of tourist's income, the problem of the determination of the length of stay can be reduced to the standard price-quantity economic model of consumption. If the holiday "behaves" like an ordinary good, it can be assumed that its duration d is a decreasing function of the daily price p: *ceteris paribus*, the greater the daily price of holiday, the less the tourist stays in the destination. Accordingly, d= d(p), with $\partial d/\partial p < 0$; (the vacation, is in the opposite case perceptive as a inferior good" if, and only if, the $\partial d/\partial p > 0$), which can be simplify by assuming a linear relationship:
d = D1 – D2p with D1:D2 > 0.

The identification of the key determinants of arrival, the second argument of tourism demand, is more complex. The decision of traveling to a specific destination is the result of considering the complex set of services that characterize the tourism product in the destination as well as its average price. In addition to these two elements, according to same authors,[8] the choice is often the reflection of a so-called "accumulation effect", building on own or other tourists' preferences and how fashionable or popular the destination is. Thus, in contrast to the study of the length of stay, it can not rely on a unique and simple independent price variable for the arrival function in the tourism demand (and so lowering risk for omitted independent variable biases in econometric sense). Therefore, by expressing a generic function: A = A(.), where the symbol (.) means that several are the variables that should be listed within the parentheses. The economic literature on this topic[9] seems to agree in highlighting the following: (a) the primary resources and attractions available in the destination; (b) the presence of mobility factors to ease the access to the destination, usually consisting of transport hubs and infrastructural systems; (c) the environmental status; essentially depending on the degree of exploitation of natural resources; (d) distance, and relative price of the destination.

1.1. Model specification

Following the aforementioned literature review (and data constraint reality), considered are two models specification. First that, length of stays is determinate by vector of various price indices, and second the demand for international arrivals in Croatia is a function of overnight stays, forests endowment, protected areas endowment, carbon dioxide emission, energy intensity, road in km, rail in km and distance between the origin country and Croatia. Thus, a hypothesis are formulate

[7] More details in: Candela G., P. Figini, *The Economics of Tourism Destinations*, Springer-Verlag Berlin Heidelberg, 2012.
[8] Ibidem.
[9] See: Crouch, G. I., Ritchie, J. R. B., Tourism competitiveness and social prosperity, *Journal of Business Research,* 44, 1999, 137–152.

$$LOSit = f(RTP_{it}, INFL_{it}, REER_{it})$$

$$ARR\ it = f(NIGHT_{it}, FOREST_{it}, PROT_{it}, CO2_{it}, ROADKM_{it}, RAILKM_{it}, GASKT_{it}\ DIST_{it})$$

where i = 1, … 21 (1 = Austria, 2 = Bosnia and Herzegovina, 3 = Canada, 4 = Croatia, 5 = Czech Republic, 6 = France, 7 = Germany, 8 = Hungary, 9 = Italy, 10 = Netherlands, 11 = Poland, 12 = Slovak Republic, 13 = Slovenia, 14 = Switzerland, 15 = UK, 16 = USA, 17 = Belgium, 18 = Denmark, 19 = Norway, 20 = Russian, 21 = Sweden); and t = 1, … 15 (1 = 1996, …., and 15 = 2010).

1.2. Explanatory variables and data description

The data used to create the total tourist number series by countries, as a dependent variable, is collected annually from the Statistical Yearbook published by Statistical Department of Croatia, and that for independent variables in World Development Indicators found at website http://data.worldbank.org/country.

LOS (average length of stay) as dependent variable in the first regression specification is defined as the average number of nights that visitors spend in the Croatia as a destination. This is measured by the ratio between the number of nights and arrivals.[10] At least on staying tourists from Bosnia and Herzegovina, only 2.5 nights in 1996, and the longest resting guests from Sweden (even 9.2 nights in 2002).

Relative Price in a sense uses CPI's of countries. The index is usually adjusted for the exchange rates. The typical calculation of RTP is as follows: RTPij= (CPIj/XRATj)/(CPIi/XRATi); where RTPij is Relative Tourist Price in origin *i* for destination *j*, *CPI* is Consumer Price Index, *XRAT* is Exchange Rate, *i* is origin country and *j* is destination country e.g. Croatia. The relationship between LOS and RTP is expected to be negative because the increase of relative tourist price in destination can reduce the number of nights planned to holiday vacation.

The real exchange rate (REER), is the trade-weighted average of the price levels of trading partners relative to the general price level of the domestic economy.[11] The sign of the mutual relationship between the REER and the LOS is unknown because the real exchange rate variable REER captures two effects on the price of international tourism: first, the influence the nominal exchange rate movements; and second, the influence of the relative price between country i and the rest of the world. [12]

Higher general price levels in a country tend to be canceled out by exchange rate depreciations – but only up to a point. Inflation rate – and the prices that tourists are paying – may be rising to the same extent. In such situation, a country's exchange rate

[10] Candela G., P. Figini, *The Economics of Tourism Destinations*, Springer-Verlag Berlin Heidelberg, 2012.
[11] Wickens, M., *Macroeconomic Theory: A Dynamic General Equilibrium Approach* (Second Edition) Princeton: University Press, 2012.
[12] Song, H., Witt, F. S., *Tourism Demand Modeling and Forecasting: Modern Econometric Approaches*, 1st ed., Pergamon: Oxford, 2000.

may not move much, and it may lose price competitiveness in tourism. [13]Just opposite is happening when inflation rate in origin countries accelerate more than inflation in destination country. The price variable used for this study is ratio of inflation rate in destination country to inflation rate in origin country, meaning the inflation rate differences across countries and expresses how many general costs of living in different countries varies. According to the theory, the demand for additional overnight in tourism destination is an inverse function of relative prices. The general level of prices in destinations is taken into account by travelers when making travel decisions.[14] Expected is a negative sign for RINFL linked to LOS. On average, the tourists covered in this study are from a low-inflation rate category as the inflation of the sending countries is 3.91, with the minimum about -0.5 (CHE, 2009) and the maximum 85.74 (RUS, 1999).

The demand for tourism in second regression is proxied by number of arrivals of visitors (ARR) since many time-series studies overwhelmingly use this variable as dependent variable in the estimation of demand function. The international tourism demand is often measured either in terms of the number of tourist arrivals, tourist expenditure, and number of tourist nights in the destination country. [15] Published articles in the tourism literature have denoted that number of tourist arrivals can be an appropriate indicator of demand for tourism.[16] In the present sample of tourist generating countries to Croatia, the average annual number of tourist arrivals/overnight stays over the period 1996 to 2010 was 379 171 and 2 037 000, respectively, of which the highest number of arrivals came from within Croatia itself and the lowest from Canada. Germany realizes relatively the highest number of overnight stays (the peak was in 2010).

Our attention is zeroed in, now, on the overcrowding and congestion of the destination now, which is an essential factor to consider when deciding to travel. The number of overnight stays N (or NIGHT) can be used as a measure for the degree of overcrowding in the destination. To be able to study this needed is to specify the analytical properties of function A(N). Regarding this, two alternative specifications are introduced, (i):

[13] Forsyth, P., Dwyer, L., Exchange rate changes and the cost competitiveness of international airlines: The Aviation Trade Weighted Index, *Research in Transportation Economics*, vol. 26(1), 2010, pp. 12-17.
[14] Eilat, Y., Einav, L., The Determinants of International Tourism: A Three - Dimension Panel Data Analysis, *Applied Economics*, 36, 2004, pp. 1315-1327.
[15] Ouerfell, C., Co-integration Analysis of Quarterly European Tourism Demand in Tunisia, *Tourism Management,* 29 (1), 2008, pp. 127-137.
[16] See more in: Ibidem; Naude, A. W., Saayaman, A., Determinants of Tourist Arrivals in Africa: a Panel Data Regression Analysis, *Tourism Economics,* 11 (3), 2005, pp. 365-391; Dritsakis, N., Cointegration Analysis of German and British Tourism Demand for Greece*, Tourism Management*, 25, 2004, pp. 111-119; Li, G., Song, H., Witt, S., Recent Developments in Econometric Modeling and Forecasting*, Journal of Travel Research*, 44 (1), pp. 82-99., 2005; Song, H., Kevin, F., Chon, K., Modelling and Forecasting The Demand for Hong Kong Tourism, *Hospitality Management*, 22, pp. 435-451., 2003; Song, H., Witt, S. F., Li, G., Modeling and Forecasting The Demand for Thai Tourism, *Tourism Economics*, 9 (4), pp- 363–388., 2003; Kulendran, N., Witt, S., Cointegration Versus Least Squares Regression, *Annals of Tourism Research,* 28, pp. 291–311., 2001; Lim, Ch., McAleer, M., Cointegration analysis of quarterly tourism demand by Hong Kong and Singapore for Australia, *Applied Economics,* 33, pp. 1599-1619., 2001; Morley, C. L., A Dynamic International Demand Model*, Annals of Tourism Research*, 23 (1), pp. 70-84., 1998; Gonzalez, P., Moral, P., An Analysis of The International Tourism demand of Spain, *International Journal of Forecasting,* 22 (2), pp. 233–251, 1985; Witt, S. F. Witt, C. A., Forecasting Tourism demand in Tourism: A Review of Empirical research, *International Journal of Forecasting,* 11 (3), pp. 447-475, 1995.

tourists are driven by *snob effect* and they escape the crowd, in this case, the number of arrivals decreases as the degree of overcrowding increases, which implies that: A' = dA/dN < 0, or (ii): tourists are driven by a *bandwagon effect* and show attraction for the crowd; in this case, the number of arrivals increases with the degree of overcrowding, which implies that: A' = dA/dN > 0. The reduction in the number of the overnight stays decreases the overcrowding of the destination and, because of the snob effect caused by tourists who are getting away from the crowd, increases the number of arrivals.[17] So, the mutual relationship between the AR and the NIGHT is unknown to us. There is not clue or sound intuition which of two effects could be present and overweight first in empirical testing.

As far as the second and third predictors of arrival model, postulated is that, availability of specific areas and a generally „green" environment are the factors determining tourist arrivals. Those are captured by the variable FOREST (% of total land area), and PROT (% of total territorial area); the variable „dense forest area" and „dense protected area" are taken to reflect the attraction of the natural environment for tourists measured by they own standard. In other words, better keeping of „green" environment in tourism demand generating country, or simple higher endowment in forest and protected areas in those countries, can inhibit the tourism growth in terms of arrivals in domestic country. This interpretation of international tourism stems from the ad hoc application of a international trade model to tourism: the Hecksher-Ohlin model. In the H/O model the relative advantage stems from the allocation of productive factors, capital (and it ought to add forest and protected areas as an important stock variable in that context) and labor, among countries. Hence, the relationship between ARR and FOREST (or PROT) are expected to be negative because with tall density of those areas comes out higher number of attraction within the country and "crowding out" effect in terms of costs associated with holidays abroad[18]. However, there is a significant variation in FOREST variable (a standard deviation of 13.48), with the minimum 11.07% (DNK, 1996) and the maximum 68.73 % (SWE, 2005). Similar case, noted is with a variable PROT or density of protected areas in the country that generates tourism demand. Paradoxically, a country that dominates within the total tourist arrivals as a Germany, has the major part of the land area under protection, big 42.29% of territory (GER 2008), while the neighboring country Bosnia and Herzegovina has the smallest percentage of protected areas (only 0.54%).

The presence of mobility factors to ease the access to the destination know as well as tourism location cost minimizing problem, can be measured by infrastructural traffic systems. In our set of tourism generating country finding is various degree of different state of traffic systems. These systems can be predictors in our regression model. As a set of exogenous variables they must ensure that they are a sound representation of the entire state in the context of tourist location problem; hence included is traffic infrastructure with varying degrees of road/rail density and traffic network complexity since these factors would likely affect the quantity of international tourism arrival. Roads are conspicuous components of landscapes and play a substantial role in

[17] Candela G., P. Figini, *The Economics of Tourism Destinations*, Springer-Verlag Berlin Heidelberg, 2012.
[18] Ibidem.

defining landscape pattern,[19] which translate in utils from visualization of landscape. Our hypothesis is that variation in road density and landscape patterns created by roads and rails in various countries can be determinants of international tourism arrivals to Croatia. The relationship between ARR and ROADKM (or RAILKM) is expected to be positive because the increase of traffic infrastructure stock increases number of trips in oversea.

The starting point of the theoretical setting in the present study is that GASKT or energy consumption and CO_2 emissions might be a predictors of international tourist arrivals too, by assumption if and only if ratio among GASKT (and CO_2) to number of arrivals, has absent trend during the time span of our analysis. Thus, the following "tourism-induced" functional relationship has been put forward in the present study. International tourist arrivals are linked, in positive way to CO_2 emission and GASKT (energy use). The last functional segment will be estimating tourism flows induced by CO_2 emissions and energy consumption in demand generating countries, respectively. That increase environmental pollution in tourism origin country (due to the growth of CO_2 or growth of energy consumption) may cause an increased propensity for traveling abroad.

Distance is another relative price variable in tourism demand theory. It is an important variable in modern society since distance reflects the time costs involved in traveling. Otherwise, distance is a useful variable to measure travel demand by tourists because it can be easily converted into energy consumption which is translated into the price of transport and carbon dioxide emissions (negative externality for society). Transportation costs, for example as a result of changes in oil prices and the emergence of low-cost airlines, have changed substantially in the last decade and influenced tourist behavior.[20] More specifically, the amount of tourism flow between two countries is assumed to decrease in the case of higher cost of transport, as measured by the distance between their capitals or economic centers. If all else remains equal, travelers will choose a destination that takes less time to reach there.[21] Therefore expected is a negative sign for DISTKM and ARR. Croatia has the shortest distance, due to technical reasons; matched with 1km of spatial distance (instead of zero km, in order to avoid losing data consistency and good balance). The average distance from Zagreb and the capital cities of the countries of origin is 1476 kms (a bit smaller than the distance between Zagreb and Stockholm, 1512 kms) where Slovenia is the nearest foreign country included in the study (123 kms) and the United States is the farthest (8858 kms).

[19] Hawbaker, Todd J., Volker C. Radeloff, Roger B. Hammer, and Murray K. Clayton, *"Road Density and Landscape Pattern in Relation to Housing Density, and Ownership"* Landscape Ecology 20(5):609 –625., 2005.
[20] World Tourism Organization, 2006; Gillen, D., Lall, A., Competitive advantage of low-cost carriers: some implications for airports, *Journal of Air Transport Management,* 10, pp. 41–50., 2004.
[21] Phakdisoth, L., Kim, D., The Determinants of Inbound Tourism in Laos, ASEAN Economic Bulletin, 24 (2), pp. 225- 237. 2007.

Thus, the econometric models on estimating tourism demand, take the following forms:

logLOSit = λ + β1*logRTPit+ β2*logINFLit+ β3*logREERit+εit

logARRit = λ + β4*logNIGHTit + β5*logFORESTit + β6*logPROTit + β7*logCO2it + β8*logROADKMit + β9*logRAILKMit + β10*logGASKTit + β11*logDISTKMit + εit

Where the variables were expressed in logarithm form, *i* and *t* denote country and year, respectively; α is the constant term, β_n are the coefficients of each variable taken into consideration, ε_i is the error term.

2. PANEL DATA REGRESSION RESULTS

In this section the regression results, using random effects/fixed effects, is set out and compared to identify the determinants length of stays/tourist arrivals to Croatia.

Since the variability in the data increases when the horizontal section dimension is included to the analysis, it is accepted that the panel unit root tests with regard to the information about both time and horizontal section dimension of the data are statistically stronger than the time series unit root tests which take into regard only the information about the time dimension. [22]

Although, practically all of classical panel data econometrics assumes cross-section independence, the dependent variable(s) was submitted to the battery of panel unit root tests, in order to detect whether there would be possible cointegrations with other variables. When the level of significance obtained from the test results is smaller than 0.05, the null-hypothesis is rejected and it is decided that the series is stable. However, since all the tests rejected the hypothesis of unit root, the analysis proceeded with the estimation of the models in log levels.

[22] Im, K. S, Pesaran, M. H, Shin, Y., Testing for Unit Roots in Heterogeneous Panels, *Journal of Econometrics* 115 (revise version of 1997's work), pp. 53-74, 2003; Maddala G.S., Wu, S., A comparative study of unit root tests with panel data and new simple test, *Oxford Bulletins of Economics and Statistics,* Special issue, pp. 631-652., 1999; Taylor, Mark P. & Sarno, Lucio, The behavior of real exchange rates during the post-Bretton Woods period, *Journal of International Economics,* Elsevier, vol. 46(2), pages 281-312, 1998; Levin, A., Lin, C. F., Chu, C. J., Unit root tests in panel data: asymptotic and finite sample properties, *Journal of Econometrics,* 108 (revise version of 1992's work), pp.1-24, 2002; Hadri, K., Testing for stationarity in heterogeneous panel data, *Econometrics Journal,* Royal Economic Society, vol. 3 (2), pp. 148-161, 2000; Pesaran, M. H., A simple panel unit root test in the presence of cross section dependence, Cambridge University, *Department of Applied Economics Working Paper 0346* (September 2003, Revised January 2006), 2006; Beyaert, A., Camacho, M., TAR Panel Unit Root Tests and Real Convergence, *Review of Development Economics,* Wiley Blackwell, vol. 12 (3), pp. 668-681, 2008.

Table 1: **Results of panel unit root testing for dependent variable**

Panel unit root test				
	Maddala-Wu	Levin-Lin-Chu	Im-Pesaran-Shin	Hadri Test
log(LOS)	367.95***	-6.535***	-7.522***	10.351***
log(ARR)	242.71***	-2.83**	-3.29**	32.85***

Source: **Author's calculations**; notes: reject the null of unit root at the level of significance *** 1%, ** 5%.

Using panel data allows one not only to investigate dynamic relations, but also to control for unobserved cross-section heterogeneity. With panel data, the issue is whether to use random effects or fixed effects estimation approaches. The random effects approach to estimating □i exploits the correlation in the composite error composed by unobserved heterogeneity and the error term. The approach puts in the idiosyncratic error term assuming that unobserved heterogeneity (or specific country effect) is orthogonal to particular country input variables in time dynamics and uses a Generalised Least Squares (GLS) estimator to take into account serial correlation in the composite error.

There can however, be many instances where this assumption is violated. Specifically, unobserved heterogeneity (country individual effects) can be correlated with explanatory variables in the present model if the country individual effects influence the input variables. In such a case, the fixed-effects estimator may be more appropriate to use. The study [23] shows that a fixed effect estimator is more robust than a random effects estimator. A shortcoming of the approach is, however, that time constant factors, such as geographical factors, in our case, underlined by relative distance variables, cannot be included as an explanatory variable – otherwise there would be no way to distinguish the effects of these variables from the effects of the unobservable variable. Another shortcoming of the fixed effects estimator is that it is less efficient than the random effects estimator – it has less degree of freedom and takes into calculation only the variation "within" units, and not between units.

Accordingly, in order not to exclude intuitively hypothesized issues, the important explanatory variable in determination of the trend in tourist demand for Croatian tourism, it is natural to exclude from the game the fixed effects estimator. However, prior to opting for the random effects estimator, diagnostics test of this question is needed. Whether the effects are really random or not can be determined by F test. [24]

So first, performed is the test for data pooling (Chow F- test), by comparing the fixed effects and the benchmark pooled OLS fits by means of F test for individual effects our results indicate that there is substantial inter-country variation when it comes to emissive trends in the tourist market. Such a result indicates that the fixed effects model approach is not needed at all. It is more appropriate to choose the competitive random effects model, according to the exclusion principle. In regard to that result,

[23] Wooldridge J. M., *Econometric Analysis of Cross Section and Panel Data,* MIT Press, Cambridge, p. 266, 2001.
[24] Baltagi, B.H., *Econometric Analysis of Panel Data,* 2nd ed. Chichester, John Wiley, p. 15, 2001.

there is no wonder because the selected countries that form international tourism demand to Croatia aren't in a certain economic group, it was intuitive obvious that individual effects would be unstable for the so different bunch of the countries in the studied period.

Table 2: **FE vs. pooled OLS Estimator: Diagnostic Results of F test (Chow Test)**

Dependent variable (model)	All countries
Log (LOS)	F = 178.59*
Log (ARR)	F = 179.94*

*Null hypothesis rejected
Note: Null (unconstrained) hypothesis – distinct regressions for each individual; alternative (constrained) – individuals have same coefficients, no error components (simple error)
Source: **Author's calculations**

Accordingly, to determine which of these estimators are more appropriate to use in the present case, both a fixed effects (FE) and random effects (RE) estimator were initially used to model tourism demand and the Hausman specification test is performed to evaluate the assumption in the random effects model that unobserved variables are orthogonal to explanatory variables. Used is also the Lagrange Multiplier (LM) test proposed by [25] to see if the variance of the intercept components of the composite error term is zero.

Rejection of the null in both these cases would lead to rejection of the random effects estimator. The results of the Hausman Specification Tests and LM Tests are summarized in Table 3 below.

Table 3: **Pooled OLS Estimator: Diagnostic Results**

Dependent variable (model)	Breusch-Pagan LM Test	Hausman Specification Test
Log (LOS)	□2(1) =14.92*	□2(3) =1.33
Log (ARR)	□2(1) =79.83*	□2(7) =31.71

*Null hypothesis rejected
Source: **Author's calculations**; note: Test for Individual Effects: Breusch-Pagan LM Test, $H_0 : \sigma_\lambda^2 = \sigma_\mu^2 = 0$, distributed as □2(2), tests of individual and time effects is derived, each distributed as □2(1); the Hausman Test: test of whether the Fixed Effects or Random Effects Model is appropriate. Specifically, test $H_0 : E(\lambda_j | x_{it}) = 0$ for the one-way model. If there is no correlation between regressors and effects, then FE and RE are both consistent, but FE is inefficient. If there is correlation, FE is consistent and RE is inconsistent. Under the null hypothesis of no correlation, there should be no differences between the estimators.

[25] Honda, Y., Testing the error components model with non-normal disturbances, *Review of Economic Studies*, 52(4), 681—690, 1985.

A log regression of LOS (or total arrivals) on all belonged explanatory variables gives LM = 14.92 (or 79.83), which is greater than the critical value of 6.63 at the 1% level of significance. Here succeed is to reject the null and conclude that random effects are appropriate. This is, evidence of significant differences across countries is present, and therefore a simple OLS regression isn't appropriate.

In the estimation, unbalanced panel data have been used, and individual effects are included in the regressions. To decide between fixed or random effects running is a Hausman [26] test where the null hypothesis is that the preferred model is random effects vs. the alternative the fixed effects. [27] It basically tests whether the unique errors (*ui*) are correlated with the regressors; the null hypothesis is they are not. If the p-value is significant (for example <0.05) then used should be fixed effects.

The Hausman Specification Test reject the null hypothesis that the difference in coefficients between the FE and RE estimators is not systematic only in second regression (total arrivals), so this result implies that our demand model of arrivals has FEs (while the calculated Hausman statistic is □2(7) = 31.71 which is greater than the critical value of 12.59 at the 5% significance level). So, the result of the Breusch-Pagan LM test, which strongly indicates the existence of REs, is not supported by that from the Hausman test in the case of arrivals modeling, which finds in favor of the FE. These findings would suggest that the RE estimator can't be used without the anxiety of producing biased estimates, in the first regression. The choice of model, in such ambiguous case, however, must be guided by economic theory as well as statistical tests. Table 4 gives the estimation results for the FE and RE restricted model, both.

Table 4: **Fixed and random effects of reduced models: estimation results**

	Fixed effects		Random effects	
	Log (LOS)	Log (ARR)	Log (LOS)	Log (ARR)
Constant	-1.631*** (85.4)a	-0.601 (-1.542)	1.637*** (86.396)a	-0.423 (-1.638)
AR(1)	0.112*** (14.340)a	0.001*** (2.972)		
Log (RTP)	-		-	
RINFL	-0.018* (-0.583)a		-0.002* (-0.781)a	
Log (REER)			-	
Log (NIGHT)		0.883*** (19.27)		1.006*** (22.079)
Log (FOREST)		-0.165** (-3.108)		-0.112* (-2.286)
Log (PROT)		0.096*** (3.852)		0.044 (1.867)

[26] Hausman, J. A., Specification Tests in Econometrics, *Econometrica* 46 (6): 1251–1271, 1978.
[27] See: Greene, William H., *Econometric Analysis* (6th ed.). Pearson, 2008.

	Fixed effects		Random effects	
	Log (LOS)	Log (ARR)	Log (LOS)	Log (ARR)
Log(CO2)		-0.305*** (-9.075)		-0.177*** (-6.303)
Log(RODKM)		-		-
Log(RAILKM)		-		-
Log(GASKT)		-6.157 (-0.188)		-0.072** (-3.302)
Log(DISTKM)		-0.004*** (4.128)		-0.002*** (4.524)
Observations	315	315	315	315
R2	0.10	0.98	0.10	0.97
F	66.642 [0.000]	4338.75 [0.000]	69.703 [0.000]	3873.91 [0.000]
DW	1.912	1.802	0.76	1.06
Breusch-Pagan LM test of independence	930.67 [0.000]	662.55 [0.000]	930.93 [0.000]	744.56 [0.000]
Pasaran CD tests of independence	3.562 [0.000]	3.94 [0.000]	3.567 [0.000]	6.617 [0.000]
Breusch-Pagan LM test of heteroskedasticity b)	0.251 [0.62]	31.403 [0.000]	0.254 [0.63]	31.405 [0.000]

Source: **Author's calculations**; notes: - The t-values are shown in brackets (); Signif. codes: 0 '***' 0.001 '**', 0.01 '*' ; AR is autoregressive term of dependent variable; a) t-values are obtained from the standard errors of the □'s which are White-adjusted; b) based on the OLS estimates, tested for heteroskedasticity. The null hypothesis for the Breusch-Pagan test is homoskedasticity; [ ] p-value.

A comparison of the regression coefficients shows that fixed- and random- effects methods yield rather similar results for our data model. The general performance of the model judged by R2 is much better in the case of arrivals model, than that of holiday duration model. Approximately 94-97% of the variations in tourism demand of arrivals are explained by variations in the independent variables, according to R2 in our reduced models, even when the few of insignificant variables are left out from regression. The F test statistics clearly show that all the coefficients in the model(s) are different than zero. The estimation of the fixed effects model for both regressions provides, at first the Durbin-Watson (DW) test statistics which indicates the presence of serial correlation in the residuals. To remedy the first-order serial correlation – the Generalized Least Squares (GLS) estimator – is used to yield unbiased and efficient parameter estimates. This time Durbin – Watson (DW) statistics suggest that residuals in restricted fixed effects aren't serially correlated. Further, the Breusch-Pagan LM and Pasaran CD (cross-sectional dependence) tests are used to test whether the residuals are correlated across entities. [28] Namely, cross-sectional dependence can lead to bias in tests results (also called contemporaneous correlation). Although, according to Baltagi, cross-sectional dependence is a problem in macro panels with long time series (which our data are not), performed is that test to examine whether model is stable. Our testing shows no cross-sectional dependence in final panel regressions.

The demand for tourism in Croatia was first estimated by OLS on the international panel data set. Based on the OLS estimates, tested is for presence of heteroskedasticity. A Breusch-Pagan test was undertaken.[29] The studentized B&P test and p-values, show that the hypothesis of homoskedasticity can be rejected at all conventional significance levels for arrivals model but not for length of stays model. Since, heteroskedasticity was found to be present in that case, re-estimated are the restricted panel regressions using White's heteroskedasticity-consistent covariance estimator to provide valid inference.[30] Parameter estimates and corresponding t-values are presented in table 4.

The tests of significance using the t-distribution are used to determine the importance of our set of independent variables with regards to demand for international tourism in terms of arrivals and length of stays. So, a series of t-test at 0% and 1% significant levels have been applied on each independent variable against the dependent variable.

As is usual with regressions, some results are considered “sensible” and not surprising – such as arrival demand decreasing with the distance from the capital cities – some results might be considering surprising – arrivals demand decrease as energy consumption and carbon dioxide emission in tourism origin countries increase – and some result are disappointing – the “price variables“ not coming into the length of stays model significantly.

In relationship with the relative price (both RTP and RINFL), the dominant paradigm in contextualizing link between tourism demand and price consider a negative sign,[31] besides for controversial case of Veblen effect when the preference for holiday increases with its price[32], and our result is negative which is in according with presumption about the tourism as a normal good. For some authors,[33] the logarithm of price of tourist service presents a positive effect on tourism demand. That author [34] refers that the tourism in Portugal tends to be a high quality service instead of a more expensive destination. In the reduced model of length of stays remains only RINFL as an independent variable, and has the expected negative sign, but since this parameter is

[28] Hoechle, D., *Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence*, The Stata Journal*,* 7 (3), 2007, pp. 281-312.
[29] Breusch, T. S., Pagan, A. R., *A Simple Test for Heteroscedasticity and Random Coefficient Variation,* Econometrica*,* vol. 47 (5), 1979, pp. 1287-1294.
[30] White, H., A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity, *Econometrica,* 48, 1980, pp. 817-838.
[31] Phakdisoth, L., Kim, D., The Determinants of Inbound Tourism in Laos, *ASEAN Economic Bulletin,* 24 (2), pp. 225- 237. 2007. Naude, A. W., Saayaman, A., Determinants of Tourist Arrivals in Africa: a Panel Data Regression Analysis, *Tourism Economics,* 11 (3), pp. 365-391, 2005.
[32] Candela G., P. Figini, The Economics of Tourism Destinations, Springer-Verlag Berlin Heidelberg, 2012.
[33] Leitão, N. C., Does Trade Help to Explain Tourism Demand? The Case of Portugal*, Theoretical and Applied Economics,* vol. 17 ((3) (544)), 2010, pp. 63-74, 2010.
[34] Ibidem.

not significantly different from zero, it should be emphasized economic rather than statistical significance relative inflation has on the length of stay of tourists in Croatia. Various discrepancies in the dynamics of inflation between Croatia as the country of destination and the assumed country of origin do not affect significantly the decision on the length of travel. A substantial negative impact of relative inflation on length of stays is absent due to low coefficient of RINFL.

Reduced model of arrivals, due to the coefficient NIGHT which is positive and significant, repeats the earlier judgment about the exclusivity of developed tourism supply in Croatia. The growing number of overnight has a positive impact on international tourism demand in terms of arrivals; international arrivals in Croatia increases with the degree of overcrowding, and *bandwagon effect* prevail.

Not all of the coefficients on the independent variable have the expected signs in arrivals regression. The exception but not the rule is only the negative sign which stands before forest endowment of origin country (FOREST) and spatial distance (DISTKM) in the modeling of total arrivals.

The forest density as a function of more or less unaltered stock of forest belt inside the territory of the country that generate tourism demand is the factor that inhibits tourist arrivals in Croatia; in our theoretical considerations, the assumption was that the relative abundance of 'green national treasures' can extrude foreign tourist demand. And this is confirmed by our findings. According to the elasticity as interpreted from the log-log model, a one percent increase in the forest density in origin country (FOREST) decreases tourism demand to an average Croatia's destination by approximately 0.14% in terms of arrivals.

The variable PROT that has an unexpected positive sign, and that is a significantly different from zero, probably such result, which is controversial thanks to Germany. Otherwise, a country with about 40 percent of protected areas in the own territory (the mean in our data set is 13.6%). Germany is due to considerable deviations from the average of PROT data obviously outliner, but this is a country very, very dominant in the number of arrivals so that it can not be excluded from regression analysis.

Theoretically, international tourist arrivals are linked, in positive way to CO2 emission and GASKT (energy use). Namely, increase environmental pollution may cause an increased propensity for tourist to travel abroad. Or, at lest to destination where they expected low air pollution and pure nature. However, it is found that the input of pollutions (as measured by carbon dioxide and energy intensity) negatively and significantly affect international arrivals (at the 1 percent level).

When comes to the DISTKM variable which has a negative sign, this is expected as it is presumed tourists would choose relatively less remote destination to more far ones, and would substitute towards or away a destination as it becomes more or less travel expensive, respectively. The distance increases the transportation costs and thus the travel expenditure. The distance variable does not, actually, have the character of elasticity in an economic sense, as its inherent characteristic of constancy (geographical distance is a fixed category), and introduction of Croatia as a demand generator is most probably the reason for a high significance coefficient with a negative sign, according to the theoretical expectation.

3. CONCLUSION

In this paper, presented are data on tourism demand for Croatia resorts over time in terms of international arrivals and length of stays during the 1996-2010 periods, for twenty external countries, and Croatia too. An econometric analysis of the determinants of those trends is conducted, and shaded light on these trends in international demand based on estimation results.

The length of stays model remain unfortunately empty model due to insignificant level of price variables.

The main finding is that international tourism demand in Croatia have, in general, been unequally distributed among country of origin and that there have been substantial differences from one origin country to another, that the main determinants of the international demand for tourism arrivals in Croatia during the 1996-2010 period, deduced from panel data regressions, appear to have been the spatial distance over country which generate demand and Croatia. It is confirmed that the international demand for tourism in Croatia as a whole will remain strained with distance because of the negative impact of spatial factor and transport costs. That mean that tourism in Croatia should be for a time awhile oriented toward origin countries in the near. Namely, the relative geographical closeness of Croatia (and its warm Mediterranean sea) and the core demand generating countries scattered around Croatia (Slovenia, Germany, Italy etc.), are an important factor in maintenance and possible expansion of that demand. In this context, to attract demand from further destinations better transport policy can help, through cheap flights lines, the abolition of the visa regime for the countries of the non-EU members, etc.

The carbon dioxide emission and index of energy intensity both as environment pollution determinants, with the direction of each factor has been not expected, predicts stagnation in demand if the major tourism generating countries eventually increase the volume of pollution by their own inhabitants, in the future. These are factors that Croatia as a small country can not be much affected, but it must strive for a political dialogue to minimize energy consumption and environmental pollution. As airline travel - transportation is very dominant in this regard, it remains unclear how to reconcile the need for development of tourism and sustainability.

The forest density and protected area, as proxies for environment care in origin countries, are relevant predictors of tourism demand to Croatia. Further, the international demand for tourism in Croatia is very sensitive to indicators of overcrowding in overnight terms. And at the end, it should be underline the role of mass type tourism in determination of the international tourism demand for Croatia, because the further overcrowding by tourists is probably linked with *ear to ear* promotion of tourism in Croatia.

REFERENCES

Book:

Baltagi, B.H., *Econometric Analysis of Panel Data,* 2nd ed. Chichester, John Wiley, 2001.

Candela G., P. Figini, *The Economics of Tourism Destinations*, Springer-Verlag Berlin Heidelberg, 2012.

Fabbri, P., "Le ferie e il mercato turistico: un problema di politica economica", in G. Candela (Ed.), *Contributi all'analisi economica del turismo*. Bologna: CLUEB, 1988.

Greene, William H., *Econometric Analysis*, 6th ed. Pearson, 2008.

Song, H., Witt, F. S., *Tourism Demand Modeling and Forecasting: Modern Econometric Approaches,* 1st ed., Pergamon: Oxford, 2000.

Wickens, M., *Macroeconomic Theory: A Dynamic General Equilibrium Approach*, 2nd ed. Princeton: University Press, 2012.

Wooldridge J. M*., Econometric Analysis of Cross Section and Panel Data,* MIT Press, Cambridge, 2001.

Journal article:

Beyaert, A., Camacho, M., "TAR Panel Unit Root Tests and Real Convergence", *Review of Development Economics,* Vol. 12 (3), 2008, 668-681.

Breusch, T. S., Pagan, A. R., "A Simple Test for Heteroscedasticity and Random Coefficient Variation", *Econometrica,* Vol. 47 (5), 1979, 1287-1294.

Crouch, G. I., Ritchie, J. R. B., "Tourism competitiveness and social prosperity", *Journal of Business Research,* Vol. 44, 1999, 137–152.

Dritsakis, N., "Cointegration Analysis of German and British Tourism Demand for Greece", *Tourism Management*, Vol. 25, 2004, 111-119.

Durbarry, R., "Long-run structural tourism demand modeling: An application to France", *Discussion Paper,* 2002.

Eilat, Y., Einav, L., "The Determinants of International Tourism: A Three - Dimension Panel Data Analysis", *Applied Economics*, Vol. 36, 2004, 1315-1327.

Forsyth, P., Dwyer, L., "Exchange rate changes and the cost competitiveness of international airlines: The Aviation Trade Weighted Index", *Research in Transportation Economics,* Vol. 26(1), 2010, 12-17.

Garín-Muñoz, T., Amaral, T. P., "An econometric model for international tourism flows to Spain"*, Applied Economics Letters,* Vol. 7, 2000, 525-529.

Gillen, D., Lall, A., "Competitive advantage of low-cost carriers: some implications for airports", *Journal of Air Transport Management,* Vol. 10, 2004, 41–50.

Gonzalez, P., Moral, P., "*An Analysis of The International Tourism demand of Spain*", International Journal of Forecasting, Vol. 22 (2), 1985, pp. 233–251.

Hawbaker, Todd J., Volker C. Radeloff, Roger B. Hammer, Murray K. Clayton, "Road Density and Landscape Pattern in Relation to Housing Density, and Ownership", *Landscape Ecology,* Vol. 20(5), 2005, 609 –625..

Hausman, J. A., "Specification Tests in Econometrics", *Econometrica,* Vol. 46(6), 1978, 1251–1271.

Hadri, K., "Testing for stationarity in heterogeneous panel data", *Econometrics Journal*, Vol. 3(2), 2000, 148-161.

Hoechle, D., "Robust Standard Errors for Panel Regressions with Cross-Sectional Dependence", *The Stata Journal,* Vol. 7 (3), 2007, 281-312.

Honda, Y., "Testing the error components model with non-normal disturbances ", *Review of Economic Studies*, Vol. 52(4), 1985, 681—690.

Im, K. S, Pesaran, M. H, Shin, Y*.,* "Testing for Unit Roots in Heterogeneous Panels", *Journal of Econometrics,* Vol. 115 (revise version of 1997's work), 2003, 53-74.

Kulendran, N., Witt, S., "Cointegration Versus Least Squares Regression", *Annals of Tourism Research*, Vol. 28, 2001, 291–311.

Levin, A., Lin, C. F., Chu, C. J., "Unit root tests in panel data: asymptotic and finite sample properties", *Journal of Econometrics,* Vol. 108 (revise version of 1992's work), 2002, 1-24.

Leitão, N. C., "Does Trade Help to Explain Tourism Demand? The Case of Portugal ", *Theoretical and Applied Economics*, Vol. 17, 2010, 63-74.

Li, G., Song, H., Witt, S., "Recent Developments in Econometric Modeling and Forecasting", *Journal of Travel Research,* Vol. 44 (1), 2005, 82-99.

Lim, Ch., McAleer, M., "Cointegration analysis of quarterly tourism demand by Hong Kong and Singapore for Australia", *Applied Economics,* Vol. 33, 2001, 1599-1619.

Luzzi, G.F., Fluckiger, Y., "An econometric estimation of the demand for tourism: The Case of Switzerland", *Pacific Economic Review,* Vol. 8(3), 2003, 289-303.

Maddala G.S., Wu, S., “A comparative study of unit root tests with panel data and new simple test“, *Oxford Bulletins of Economics and Statistics,* Special issue, 1999, 631-652.

Mervar, A., Payne, J. E., “Analysis of Foreign Tourism Demand for Croatian Destinations: Long-Run Elasticity Estimates“, *Tourism Economics,* Vol. 13(3), 2007, 407-420.

Morley, C. L., “A Dynamic International Demand Model“, *Annals of Tourism Research,* Vol. 23(1), 1998, 70-84.

Naude, A. W., Saayaman, A., “Determinants of Tourist Arrivals in Africa: a Panel Data Regression Analysis“, *Tourism Economics,* Vol.11 (3), 2005, 365-391.

Ouerfell, C., “Co-integration Analysis of Quarterly European Tourism Demand in Tunisia“, *Tourism Management,* 29 (1), 2008, 127-137.

Pesaran, M. H., “A simple panel unit root test in the presence of cross section dependence“, *Cambridge University, Department of Applied Economics Working Paper 0346* (September 2003, Revised January 2006), 2006.

Phakdisoth, L., Kim, D., “The Determinants of Inbound Tourism in Laos“, *ASEAN Economic Bulletin,* Vol. 24 (2), 2007, 225- 237.

Song, H., Kevin, F., Chon, K., “Modelling and Forecasting The Demand for Hong Kong Tourism“, *Hospitality Management,* 22, 2003, 435-451.

Song, H., Witt, S. F., Li, G., “Modeling and Forecasting The Demand for Thai Tourism", *Tourism Economics,* 9(4), 2003, 363–388.

Taylor, Mark P., Sarno, L., “The behavior of real exchange rates during the post-Bretton Woods period“, *Journal of International Economics,* Vol. 46(2), 1998, 281-312.

White,H., “A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity “, *Econometrica*, Vol. 48, 1980, 817-838.

Witt, S. F. Witt, C. A., “Forecasting Tourism demand in Tourism: A Review of Empirical research“, *International Journal of Forecasting,* 11(3), 1995, 447-475.

Paper in the proceedings:

Allen, D., Yap, G., “Modeling Australian domestic tourism demand: A panel data approach“, in 18th World IMACS/MODSIM Congress, Cairns, 2009,

Šergo, Z., Gržinić, J., Poropat, A., “Links between tourism, employment, unemployment, and productivity: case of Croatia“, in 8th International Conference Challenges of Europe: Financial Crisis and Climate Change, Proceedings, Faculty of Economics Split, 2009, 533-547.

Šergo, Z., Poropat, A., Gržinić, J., “Tourism demand and GARCH models for Croatia“, in 20th Biennal International Tourism & Hospitality Industry: New Trends in Tourism and Hospitality Management, Proceedings, Faculty of Tourism and Hospitality Management Opatija, 2010, 599-615.

Šergo, Z., Poropat, A., Ružić, P., “Demand Modeling of German Tourists in Croatia: A Time-Varying Parameter Approach“, in Vliv cestovniho ruchu na mistni rozvoj, Proceedings, Ekonomicka fakulta Tabor, Katedra obchodu a cestovniho ruchu v Tabore, 2007, 268-277.

Šergo, Z., Tomčić, Z., Poropat, A., “Models Of Overnights From Tourism Demand In Croatia 1960-98“, in 6th International Conference on Enterprise in Transition, Proceedings, Faculty of Economics Split, 2005, 1319-1340.

Data Source:

The Statistical Yearbook of Croatia (various years)
http://data.worldbank.org/country.

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