THE INFLUENCE OF TOURISM INFRASTRUCTURE ON THE VOLUME OF TOURISM

Agata MESJASZ-LECH

Czestochowa University of Technology, Faculty of Management; agata.mesjasz@poczta.fm

Abstract: This article concentrates on the influence of logistic tourism infrastructure on the volume of tourism. Accordingly, the goal of the paper is to identify the elements of the logistic tourism infrastructure that significantly impact the number of arrivals at tourist accommodation establishments. The analysis was based on panel data for select European countries.

Keywords: tourism, tourism infrastructure, logistics, econometric modelling

Introduction

Tourism is a dynamically developing sector of the economy. The implementation of policies and practices aimed at increasing tourism plays an important role in the economic development of regions and countries (Dźwigoł-Barosz, 2015, p. 10). Tourism impacts the socio-economic development of regions and countries (Szpilko, 2017, p. 688) in many ways, such as the following (Hazari, and Lin, 2011, p. 30):

- increased tourism raises the relative price of non-traded goods,
- an increase in tourism necessarily immiserates the poor but improves the welfare of the rich.

Tourism is also an important factor in increasing economic competitiveness, as it stimulates the relationships between local business entities and companies who do business with those entities and other places of tourist interest (Skowron-Grabowska, and Tozser, 2016, p. 182). In this way, it also leads to increased investments in public utility facilities and transport infrastructure (Ursache, 2015, p. 131-132). Local policy and strategy are also somewhat shaped through the development of tourism (Hącia, 2014, p. 2334-2337; Kopeć, and Poniewski, 2015, p. 175). Nor should we forget about the influence of tourism on the environment, which can be either positive or negative (Stefănica, and Butnaru, 2015, p. 595-596). The subject literature increasingly draws attention to the relationship of tourism and the sustainable development of the environment (Szymańska, 2014, p. 6201-6203; Mihalic, 2014, p. 1-2; Amir, Ghapar, Jamal, and Ahmad, 2015, p. 116; Hashim, Latif, Merican, and Zamhury, 2015, p. 51), which results in the emergence of so-called green or eco-tourism (Kilipiris, and Zardava, 2012, p. 46-47; Setyaningsih, Iswati, Yuliani, Nuryanti, Prayitno, and Sarwadi, 2015, p. 109-110).

Although cultural heritage and resources are central to the concept of tourism (Stratan, Perciun, and Gribincea, 2015, p. 116-117; Bodosca, and Diaconescu, 2015, p. 231), it seems equally reasonable to factor in the infrastructural conditions of the destination and events (Higgins-Desbiolles, 2018, p. 73), which can dramatically improve the quality of stay. It is clear that tourism involves changing the place of residence to satisfy both cultural and business needs (Pabian, 2015, p. 8). Other significant factors of tourism include positive economic effects, an increased number of visitors and accommodations, and growing income from the sector, but tourism also affects the living conditions of the local people and other tourists (Bujdosó, Dávid, Tőzsér, Kovács, Major-Kathi, Uakhitova, Katona, and Vasvári, 2015, p. 313-314). This stems from the fact that the tourism industry is understood as a production of goods, typically touristic, which are connected with accommodation, catering, recreational services (Wiktorowska-Jasik, 2010, p. 161), and consumption. The industry occurs simultaneously in the place of demand and the production of services (Szajt, 2013, p. 177).

The tourism infrastructure embraces the suite of objects and facilities with which a given area is equipped to cater to the needs of tourist flows. Namely, this is the infrastructure connected with communication, accommodation, catering and related services (Wyrzykowski, 2010, p. 34). In this way, tourism infrastructure ensures the realization of tourist services such as accommodation, catering, transportation, and other related services (Grad, Sawicki, Ferensztajn-Galardos, and Krajewska, 2014, p. 2171). Considering that this infrastructure ensures the provision of well-designed tourism products and attention paid to the quality of transportation and accommodation needs, the implementation of logistics into the management of tourist movements seems all the more advisable. Logistics should ensure the efficiency of infrastructure flow and reduce related costs. The tourist-client, on the other hand, looks for a product of proper quality at a good price. In this context, we can speak of the logistics of tourist infrastructure, which when properly shaped should translate into an increase in tourist potential, including the volume of tourism. Therefore, the goal of this article is to identify the elements of tourist infrastructure that influence the scale of tourism.

1. The importance of logistics in the development of tourist infrastructure

Tourism infrastructure is an important element of logistics in the tourism space (Ngamsirijit, 2017, p. 43) because of the role of logistics with respect to (Rzeczyński, 2003, p. 12):

1. placing tourist infrastructure in the cultural space of the site,
2. consumption of tourism services governed by their economic, infrastructural and transport accessibility.

Tourists have defined requirements and expectations concerning the places they intend to visit (Nuraeni, Arru, and Novani, 2015, p. 313). These requirements and expectations are connected not only with such characteristics of their destination as culture, art, history and terrain shape but also with facilities for transportation, accommodation and catering (Stawiarska, 2017, p. 116). Logistics in tourism means using an innovative tool for managing the infrastructure and superstructure of tourism that yields tangible benefits in the production and consumption of its services (Rzeczyński, 2003, p. 9) Tourism logistics are utilized mainly in:

- customer service (Wolska, and Hawlena, 2014, p. 6778-6786), which is called customer logistics (Kadłubek, 2011, p. 159),
- reduction of negative environmental impact,
- ensuring proper transport and accommodation infrastructure.

Infrastructural aspects shape the development of tourism because they are directly connected with satisfying the needs of tourists. That is why an analysis of the influence of tourist infrastructure on the volume of tourism seems reasonable.

2. Analysis of the relationship between the volume of tourism and selected elements of logistic tourist infrastructure in chosen European countries

The analysis focused on the variables characterizing logistic tourist infrastructure in Europe. The following set of variables are defined for the analysis:

1. Response variable:
   X1 – Number of arrivals at tourist accommodation establishments,
2. Explanatory variables:
   X2 – Number of establishments, bedrooms and bed-places (Hotels; holiday and other short-stay accommodation; campgrounds, recreational vehicle parks and trailer parks),
   X3 – Full/part-time employed persons (in thousands),

X4 – Length of motorways (kilometre),

X5 – Number of airports (with more than 15,000 passenger movements per year),

X6 – Number of hospital beds.

The data come from the Eurostat, the statistical office of the European Union, pertain to the years 2008-2015 and concern the following chosen European countries: Belgium, Bulgaria, Czech Republic, Denmark, Germany (until 1990 former territory of the FRG), Estonia, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland and Sweden. A selection of variables and countries for the analysis was dictated by the availability of relevant data. An analysis of the influence of explanatory variables on individual response variables was done through panel models. The analysis presents the single equation models describing the relationship between number of arrivals at tourist accommodation establishments and other variables.

$$X1_{it} = \alpha_{i1} + \alpha_1 X2_{it} + \alpha_2 X3_{it} + \alpha_3 X4_{it} + \alpha_4 X5_{it} + \alpha_5 X6_{it}$$

In the first stage of the analysis, the parameters of the model were estimated on the basis of OLS. Table 1 shows the results of the estimation.

Table 1.
OLS estimation and verification results of the models for response variable X1

Variable*	Parameter estimate	Standard error	Student's *t* statistics	Significance level *p*
const	−2.23685e+06	746674	-2.9958	0.00309
X2	239.134	21.6762	11.0321	<0.00001
X4	5661.48	275.331	20.5625	<0.00001
X5	252882	43470.6	5.8173	<0.00001
X6	77.1726	6.32938	12.1927	<0.00001
mean of dependent variable 29225532 standard deviation of dependent variable 42776553 residual sum of squares 1.34e+16 standard error of residual 8294425 determination coefficient R^2 0.963158 adjusted R^2 0.962402 F (4, 195) 1274.470 significance level *p* for *F* test 1.6e-138 Log likelihood −3467.475 Akaike criterion 6944.950 Schwarz criterion 6961.441 Hannan-Quinn criterion 6951.623 residual autocorrelation - rho1 0.983044 *DW* statistic 0.171086				

*After the elimination of statistically insignificant variables.

Note: Own calculation in GRETL – an econometric software package.

The applicability of OLS was confirmed by Breusch-Pagan, Hausman, and total significance of group mean differences tests. The decision whether to reject or support the null hypothesis is made on the basis of the level of significance (*p* parameter). The results of the tests for the model are presented in table 2.

Table 2.
Results of statistic tests for estimated models

Explained variable of model	Breusch-Pagan test statistic		Hausman test statistic		Significance of group mean differences	
	LM	***p***	***H***	***p***	***F***	***p***
X1	243.072	8.41356e-055	179.37	1,018e-037	64.5768	5.5338e-073

Note: Own calculation in GRETL – an econometric software package.

Analyzing the results, we can conclude that the OLS estimation is not appropriate for the model with the *X1* explanatory variable. A fixed-effects model should be used for model parameters estimation. Table 3 shows the estimation of the *X1* response variable model after adding the fixed effect.

Table 3.
Estimation results of the model with fixed effects for response variable X1

Variable	Parameter estimate	Standard error	Student's *t* statistics	Significance level *p*
const	2.40752e+07	8.8564e+06	2.7184	0.00724
X2	79.758	25.3254	3.1493	0.00193
X3	5592.1	665.58	8.4019	<0.00001
X4	10095	1201.69	8.4007	<0.00001
X5	-83518.2	23344.6	-3.5776	0.00045
X6	-639.207	49.9509	-12.7967	<0.00001

mean of dependent variable 29225532 standard deviation of dependent variable 42776553
residual sum of squares 9.42e+14 standard error of residual 2353916
LSDV R^2 0.997413 Within R^2 0.713468
LSDV F(29, 170) 2260.267 significance level *p* for *F* test 1.7e-204
Log likelihood −3201.854 Akaike criterion 6463.708
Schwarz criterion 6562.658 Hannan-Quinn criterion 6503.751
residual autocorrelation - rho1 0.338001 *DW* statistic 1.192380

Joint test on named regressors
Test statistic: F (5, 170) = 84.6603
p value = P(F(5, 170) > 84.6603) = 2.64756e-044

Test for differing group intercepts
Null hypothesis: The groups have a common intercept
Test statistic: F(24, 170) = 93.0631
p value = P(F(24, 170) > 93.0631) = 6.53726e-085

Note: Own calculation in GRETL – an econometric software package.

Modelling based on panel data suffers from the non-stationary elimination problem (Szajt, 2010), which is why four tests on the order of integration of analyzed variables were carried out: Levin, Lin & Chu (LLC), Im, Pesaran and Shin (IPS), ADF and PP. The results are shown in table 4.

Table 4.
Results of unit root tests for given variables

Variable	Method	Order of integration X_t~I(0)		Order of integration X_t~I(1)	
		Statistic	*p*	Statistic	*p*
X1	Levin, Lin & Chu t*	-3.02593	0.0012	-3.02593	0.0012
	Im, Pesaran and Shin W-stat	3.28021	0.9995	3.28021	0.9995
	ADF - Fisher Chi-square	30.0590	0.9886	30.0590	0.9886
	PP - Fisher Chi-square	10.2181	1.0000	10.2181	1.0000
X2	Levin, Lin & Chu t*	-1.13386	0.1284	-10.8847	0.0000
	Im, Pesaran and Shin W-stat	2.99989	0.9986	-0.87873	0.1898
	ADF - Fisher Chi-square	19.4408	1.0000	60.7703	0.1415
	PP - Fisher Chi-square	53.2623	0.3498	99.6802	0.0000
X3	Levin, Lin & Chu t*	-11.4279	0.0000	-15.8046	0.0000
	Im, Pesaran and Shin W-stat	-1.53422	0.0625	-5.27215	0.0000
	ADF - Fisher Chi-square	79.0068	0.0055	119.045	0.0000
	PP - Fisher Chi-square	86.1032	0.0011	115.442	0.0000
X4	Levin, Lin & Chu t*	1.91312	0.9721	-18.2003	0.0000
	Im, Pesaran and Shin W-stat	1.69689	0.9551	-3.01019	0.0013
	ADF - Fisher Chi-square	29.2203	0.7810	63.4584	0.0032
	PP - Fisher Chi-square	53.0292	0.0334	155.042	0.0000
X5	Levin, Lin & Chu t*	-3.00515	0.0013	-25.3553	0.0000
	Im, Pesaran and Shin W-stat	0.86844	0.8074	-3.92422	0.0000
	ADF - Fisher Chi-square	23.1112	0.9211	44.8078	0.0061
	PP - Fisher Chi-square	37.7726	0.3009	95.7545	0.0000
X6	Levin, Lin & Chu t*	-8.05379	0.0000	-32.5547	0.0000
	Im, Pesaran and Shin W-stat	0.14582	0.5580	-8.30565	0.0000
	ADF - Fisher Chi-square	56.0321	0.2589	128.123	0.0000
	PP - Fisher Chi-square	65.8613	0.0656	127.798	0.0000

Source: Own calculation in Eviews – an econometric software package

The LLC test shows that the majority of analyzed variables are stationary, with the exception of *X2* and *X4*. However, the strongest IPS test reveals a potential existence of unit roots, so we can assume that the variables have an integration of order 1. Order 1 integration is also confirmed by majority of tests. That is why we assumed a common order of integration for all variables and tested the existence of cointegration in the given models. The results of these tests are shown in table 5.

Table 5.
Results of cointegration tests in given models

Model	Test	Statistic	p
Response variable: *X1*, explanatory variables: *X2, X3, X4, X5, X6*	Kao Residual Cointegration Test (No deterministic trend) Null Hypothesis: No cointegration	-6.676159	0.0000

Note: Own calculation in Eviews – an econometric software.

In the case of the *X1* response variable model, the hypothesis about the lack of cointegration should be rejected. It can be assumed that cointegration exists in the analyzed set of variables. Therefore, an error correction model was proposed, and the results of the estimation are listed in table 6. The OLS method was used to estimate the cointegrating equation parameters (Table 1).

Table 6.
Error correction model for X1 response variable.

Variable*	Parameter estimate	Standard error	Student's *t* statistics	Significance level *p*
const	680038	182096	3.7345	0.00026
d_*X2*	85.5913	35.7789	2.3922	0.01784
d_*X3*	6005	923.16	6.5048	<0.00001
d_*X5*	−38400.9	20034.5	-1.9167	0.05696
d_*X6*	−272.856	87.2758	-3.1264	0.00208
Ecm_1	−0.0709889	0.0220057	-3.2259	0.00151
mean of dependent variable 913584.4 standard deviation of dependent variable 2449157 residual sum of squares 7.87e+14 standard error of residual 2157300 determination coefficient R^2 0.246427 adjusted R^2 0.224132 F (4, 169) 11.05300 significance level *p* for *F* test 3.19e-09 Log likelihood −2797.526 Akaike criterion 5607.052 Schwarz criterion 5626.041 Hannan-Quinn criterion 5614.754 residual autocorrelation - rho1 0.101079 *DW* statistic 1.627829				

*After the elimination of statistically insignificant variables.

Source: Own calculation in GRETL – a n econometric software package.

It was assumed that the endogenous variable is influenced by three variables determining the level of tourist infrastructure: *X2, X3, X5, X6* (variables *X4* turned out to be statistically insignificant). Therefore, it can be concluded that the increase in arrivals at tourist accommodation establishments depends on the number of establishments, bedrooms and bed-places, number of full/part-time employed persons, number of airports and number of hospital beds. Some specific data includes:

- the growth in the number of establishments, bedrooms and bed-places by a unit results in an increase in arrivals at tourist accommodation establishments averagely by 86,
- growth in the number of full/part-time employed persons by one thousand brings an increase in arrivals at tourist accommodation establishments averagely by 6005,
- growth in the number of airports by one brings an decrease in arrivals at tourist accommodation establishments averagely by 38400,
- growth in the number of hospital beds by a unit causes a decrease in arrivals at tourist accommodation establishments averagely by 273.

In the case of the approximated error correction model, the mechanism of imbalances correction is effective and can return to the previous trajectory of dynamic equilibrium.

3. Conclusions

The main goal of logistics is to shape all types of cost effective and quality aspects in a system, including tourism. The tourism infrastructure is an important element of both tourism and logistics, as it ensures a continuous and effective flow of resources. Therefore, the development of tourism infrastructure logistics should impact the volume of tourism in a positive way. It is assumed that the tourism infrastructure consists of such elements as the number of establishments, full/part-time employed persons, length of motorways, number of airports and number of hospital beds. It has also been proven that the number of arrivals at tourist accommodation establishments is only influenced by the number of establishments, full/part-time employed persons, the number of airports and the number of hospital beds. This tells us that tourists have a greater interest in the quality of accommodation than in the quality of road transportation, which means that the journey to the destination is a matter of secondary importance. This is in line with the assumption that tourists choose their destinations for their cultural merits and, therefore, the issues of transportation seem less important. As the stay at the destination is longer than the journey there, the accommodation quality is held to a higher standard. In terms of logistics, it is longer stays that generate difficult problems to solve, especially as it creates the demands on infrastructure for long-term accommodation and catering, as well as proper emergency care and cultural facilities. In light of the above, the systematic approach of logistics should support tourism through ensuring the correct infrastructure, not only in the material sense but also in the context of effective flow of all tourism resources.

Bibliography

1. Amir, A.F., Ghapar, A.A., Jamal, S.A., and Ahmad, K.N. (2015). Sustainable tourism development: A study on community resilience for rural tourism in Malaysia. *Procedia – Social and Behavioral Sciences*, 168.
2. Bodosca, S., and Diaconescu, D.M. (2015). Tourism development after the implementation of sustainable strategies in Neamt County. *Procedia – Social and Behavioral Sciences*, 188.
3. Bujdosó, Z., Dávid, L., Tőzsér, A., Kovács, G., Major-Kathi, V., Uakhitova, G., Katona, P., and Vasvári, M. (2015). Basis of heritagization and cultural tourism development. *Procedia – Social and Behavioral Sciences*, 188.
4. Dźwigoł-Barosz, M. (2015). Metoda najlepszej praktyki w procesie przekształcania przedsiębiorstwa w organizację inteligentną. *Zeszyty Naukowe Politechniki Śląskiej, s. Organizacja i Zarządzanie*, 82.
5. Eurostat database. Available from: http://ec.europa.eu/eurostat [Accessed: 30th Oktober 2017].
6. Grad, B., Sawicki, B., Ferensztajn-Galardos, E., and Krajewska, R. (2014). Zintegrowane zarządzanie usługami turystycznymi – implikacje dla funkcjonowania i rozwoju sektora usług turystycznych w Gminie Miasta Radomia, *Logistyka*, 3.

7. Hashim, R., Latif, Z.A., Merican, F.M., and Zamhury, N. (2015). The Praxis of Langkawi's Sustainable Regeneration Strategy through Eco-Tourism. *Procedia – Social and Behavioral Sciences*, 170.
8. Hazari, B.R., and Lin, J.J. (2011). Tourism, Terms of Trade and Welfare to the Poor. *Theoretical Economics Letters*, 1.
9. Hącia, E. (2014). Kształtowanie rozwoju turystyki a strategia i polityka regionalna. *Logistyka*, 3.
10. Higgins-Desbiolles, F. (2018). Event tourism and event imposition: A critical case study from Kangaroo Island, South Australia. *Tourism Management*, 64.
11. Kadłubek, M. (2011). Istota obsługi klienta w logistyce. *Logistyka*, 5.
12. Kilipiris, F., and Zardava, S. (2012). Developing sustainable tourism in a changing environment: issues for the tourism enterprises (travel agencies and hospitality enterprises). *Procedia – Social and Behavioral Sciences*, 44.
13. Kiráòvá, A., and Pavlíčeka, A. (2015). Development of Social Media Strategies in Tourism Destination. *Procedia – Social and Behavioral Sciences*, 175.
14. Kopeć, M., and Poniewski, R. (2014). Business tendency indicators in tourism in the Małopolska Region (Poland) 2011-2014. *International Journal of Arts & Sciences*, 8, (2).
15. Liu, B., and Mwanza, F.M. (2014). Towards Sustainable Tourism Development in Zambia: Advancing Tourism Planning and Natural Resource Management in Livingstone (Mosi-oa-Tunya) Area. *Journal of Service Science and Management*, 7.
16. Mesgarian, H., and Alaei, L. (2014). An exploration on the effective factors of tourism industry on protection of the environment in the historical city Ghoumas. *Open Journal of Ecology*, 4.
17. Mihalic, T. (2014). Sustainable-responsible tourism discourse e Towards 'responsustable' tourism. *Journal of Cleaner Production*.
18. Ngamsirijit, W. (2017). The responsive tourism logistics from local public transport domain: the case of Pattaya city. Big Data and Smart Service Systems. In L. Xiwei, A. Rangachari, X. Gang, S. Xiuqin, and L. Xiaoming, *Big Data and Smart Service Systems*. Elsevier Science Publishing Co Inc., San Diego.
19. Nuraeni, S., Arru, A.P., and Novani, S. (2015). Understanding Consumer Decision-Making in Tourism Sector: Conjoint Analysis. *Procedia – Social and Behavioral Sciences*, 169.
20. Pabian, A. (2015). Zrównoważone zarządzanie zasobami ludzkimi-zarys problematyki. *Zeszyty Naukowe Politechniki Częstochowskiej, s. Zarządzanie*, 17.
21. Rzeczyński, B. (2003). Logistyka w przestrzeni turystycznej. *Logistyka*, 4.
22. Setyaningsih, W., Iswati, T.Y., Yuliani, S., Nuryanti, W., Prayitno, B., and Sarwadi, A. (2015). Low-Impact-Development as an Implementation of the Eco-Green-Tourism Concept to Develop Kampung towards Sustainable City. *Procedia – Social and Behavioral Sciences*, 179.

23. Skowron-Grabowska, B., and Tozser, J. (2016). The problems of corporate social responsibility. The issues of the economic theory and practice. In M. Nowicka-Skowron, C. Illes, and J. Tozer (Eds.), *Contemporary issues of enterprise management in Poland and Hungary*. Godollo: Szent Istvan University Publishing House.
24. Stawiarska, E. (2017). Creating a product innovation in the context of the risks involved in the supply systems in the automotive sector. *Kwartalnik Naukowy Organizacja i Zarządzanie*, 3, (31).
25. Stefănica, M., and Butnaru, G.I. (2015). Research on tourists' perception of the relationship between tourism and environment. *Procedia Economics and Finance*, 20.
26. Stratan, A., Perciun, R., and Gribincea, C. (2015). Identifying Cultural Tourism Potentials in Republic of Moldova through Cultural Consumption among Tourists. *Procedia – Social and Behavioral Sciences*, 188.
27. Szajt, M. (2010). *Działalność badawczo-rozwojowa w kształtowaniu aktywności innowacyjnej w Unii Europejskiej*. Częstochowa: Wydawnictwo Politechniki Częstochowskiej.
28. Szajt, M. (2013). Sezonowość w turystyce a ryzyko niedopasowania prognoz gospodarczych. In A. Strzelecka (Ed.), *Zarządzanie organizacją w warunkach niepewności – teoria i praktyka.* Częstochowa: Sekcja Wydawnictw Wydziału Zarządzania Politechniki Częstochowskiej.
29. Szpilko, D. (2017). Tourism Supply Chain – Overview of Selected Literature. *Procedia Engineering*, 182.
30. Szymańska, E. (2014). Zarządzanie usługami noclegowymi w świetle zasad zrównoważonej turystyki. *Logistyka*, 3.
31. Ursache, M. (2015). Tourism – significant driver shaping a destinations heritage. *Procedia – Social and Behavioral Sciences*, 188.
32. Wiktorowska-Jasik, A. (2010). Znaczenie logistyki w rozwoju gospodarki turystycznej Polski. *Folia Pomeranae Universitatis Technologiae Stetinensis, Oeconomica*, 284, 61.
33. Wolska, G., and Hawlena, J. (2014). Znaczenie programów lojalnościowych w zarządzaniu produktem turystycznym. *Logistyka*, 3.
34. Wyrzykowski, J. (2010). Potencjał turystyczny w ujęciu geograficznym. *Zeszyty Naukowe Uniwersytetu Szczecińskiego, s. Ekonomiczne Problemy Usług*, 52, 590.