Analysis of Tourism Demand Model across European Source Countries

Alexi Thompson

Koichi Yamaura

Corresponding Author:
Koichi Yamaura
Postdoctoral Fellow
Graduate School of Global Environmental Studies
Sophia University
Bldg 2, Rm1519, 7-1 Kioicho, Chiyoda-ku
Tokyo, 102-8554, Japan
koichiyamaura@hotmail.com

Thompson and Yamaura share senior authorship.

Abstract

We estimate a linear Almost Ideal Demand System (LAIDS) model for European tourism. Tourist source countries include Germany and United Kingdom (UK). German and British tourists travel to euro using and non-euro using countries. Euro using countries (euro hosts) include France, Italy, and Austria. Non-euro countries (non-euro hosts) include Switzerland, Denmark, and Poland. We derive income and price elasticities of tourism demand. We find that British tourists are less sensitive to prices among euro hosts than German tourists, which, we believe, is due to the relative strength of the pound over the euro. We also find that Germans substitute between euro hosts but non-euro hosts are compliments for German tourists. Germans are able to understand price differences in euro hosts because Germans use the euro themselves. This finding has interesting policy implications.

JEL classification: D1

1. Introduction

As world income continues to grow and countries develop, tourism demand should be expected to increase. According to the latest statistics from the World Tourism Organization (WTO), international tourism arrivals numbered 935 million in 2010, the largest annual number or tourists recorded. International tourist arrivals grew from 528 to 935 million from 1995 to 2010, an increase of 77%. The WTO predicts another 4% to 5% increase in international tourism arrivals in 2011.

The dynamics of tourism and its growing importance in many economies has increased economic studies of tourism demand. Tourism demand is most commonly modeled using single equation estimations. Sinclair (1998) noted the lack of theoretical basis of the single equation. Recent studies have employed the Almost Ideal Demand System (AIDS) model of tourism demand. The Deaton and Muellbauer (1980) AIDS model has a strong theoretical foundation (the form is derived from a cost function), and demand properties of homogeneity and symmetry can be tested and imposed.

The present study incorporates a LAIDS model to study tourism demand in Europe. We focus on two tourism source countries, Germany and UK, and two sets of tourism host countries, euro countries and non-euro countries. Figure 1 and 2 (3 and 4) show German (British) tourists in euro and non-euro host countries from 1994 to 2007. Euro countries include France, Italy, and Austria. Non-euro countries include Switzerland, Poland, and Denmark. German tourists were top tourist source country in Austria and Italy in euro area while British tourists were top source country in France. German tourists were top source country in non-euro host countries during 1994-2007 while British tourists were second ranked source country. German tourists were

stable numbers or have been slowly increased France, Italy, and Austria, Switzerland and Poland while British have been increased their tourists in all host countries during data term.

Germans and British tourists comprise the largest share of tourists to European countries. Germany uses the euro as its currency; UK the pound. Euro countries have the euro as currency while non-euro countries have their own currencies.

We estimate four models, German tourism demand to euro countries (henceforth euro hosts) and non-euro countries (henceforth non-euro hosts), and British tourists to euro hosts and non-euro hosts. By comparing Germans traveling to euro versus non-euro hosts we are interested in looking at the price transparency effect of tourism demand. Price transparency refers to differences in real prices of host countries. Price transparency has interesting policy implications for countries contemplating adoption of the euro that rely on tourism as a major source of gross domestic product (GDP).

The rest of the paper is as follows: Section 2 is a literature review; Section 3 is a model discussion; results are discussed in Section 4; and Section 5 concludes.

2. Literature Review

Most tourism demand studies include exchange rates or some relative price measure (or both) as explanatory variables (Vanegas and Croes 2000; Salman 2003; Lyssiotou 2000). Mangion et al. (2005) estimate UK tourism demand to Malta, Cyprus, and Spain using the AIDS model and a hedonic pricing model. Results from the AIDS model show Spain was the least sensitive to own prices, and Spain and Cyprus tourism are luxury goods for UK tourists.

DeMelo and Fortuna (2005) estimate a dynamic AIDS model for UK tourists to France, Spain, and Portugal from 1969-1997. Spain was found to have the lowest own price elasticity in

the short run suggesting UK tourists prefer traveling to Spain although in the long run all countries have similar negative own price elasticities. Cross price elasticties indicate the host countries are substitutes for each other in the long run (except France and Portugal).

Garín-Munoz and Amaral (1998) estimated tourism demand to Spain from 17 source countries using an unbalanced panel from 1985-1995. Gross national product (GNP), exchange rates, relative price indices, and a Gulf War dummy are included as explanatory variables. Results show that Spanish tourism demand is price inelastic and sensitive to exchange rates.

Li, Song and Witt (2004) employ an error correction AIDS model and derive short and long run demand elasticities of UK tourists to 22 western European countries. Most destinations were found to be luxuries for UK tourists and cross price elasticities varied across location.

Hanafiah and Harun (2010) estimate tourism demand to Malaysia from a number of source countries including Australia, Hong Kong, Indonesia, UK, Thailand, Taiwan, and China using a modified Gravity model. Both prices and exchange rates are statistically significant; inflation of the source currency reduces number of tourists visiting Malaysia and tourists from source countries that have higher purchasing power prefer traveling to Malaysia more than other tourists.

These results show that regardless of econometric method, country, or time period, exchange rates and prices appear to be very important determinants of tourism demand. The present paper adds to tourism literature by introducing the importance of price transparency to tourism demand. Again, price transparency can be thought of as source and host countries using the same currency.

3. Model Discussion

The AIDS Model

Time series approaches (Gil-Alana 2005; Papatheodorou and Song 2005; Coshall 2005) and panel studies (Sakai et al. 2000; Ledesma-Rodríguez et al. 2001; Roget and Gonzalez 2006) remain the most popular methods of modeling tourism demand. Recently, however, the AIDS model, developed by Deaton and Muellbauer (1980), has been used in tourism demand studies (DeMello and Fortuna 2005; Durbarry and Sinclair 2003; Mangion et al. 2005; Syriopoulos and Sinclair 1993). The AIDS model has a strong foundation in economics theory and therefore may be more useful in estimating tourism demand elasticities than single equations (Song and Li 2008).

The AIDS model takes the form

$$w_i = \alpha_i + \Sigma_{j=1}^{n}\gamma_{ij}\ln(p_j) + b_i\ln(x/P) + u_i \quad (1)$$

where w_i is the share associated with the i^{th} host country, α_i is a constant coefficient in i^{th} share equation, γ_{ij} is the slope coefficient associated with the j^{th} host country in the i^{th} tourism host share equation, p_j is the price of tourism in the j^{th} host country, x is total annual tourism expenditures in the host countries in the each model, and P is an aggregate price index specified as

$$\ln(P) = a_0 + \Sigma_i\alpha_i\ln(p_i) + .5\Sigma_i\Sigma_j\gamma_{ij}\ln(p_i)\ln(p_j) \quad (2)$$

The AIDS model is preferred to the linear expenditure system due to its strong theoretical foundation. Restrictions imposed on a demand system include homogeneity, symmetry, and negativity. The adding-up restriction requires budget shares to sum to unity in equation (1),

$$\sum_{i=1}^{n} a_i = 1,\ \sum_{i=1}^{n}\gamma_{ij} = 0,\ \sum_{i=1}^{n} b_i = 0 \quad (3)$$

The homogeneity restriction states that as long as prices and expenditures change by proportional amounts quantity demanded of the good is not affected;

$$\Sigma_j \gamma_{ij}=0 \quad (4)$$

Symmetry implies consistency among consumer's choices;

$$\gamma_{ij}= \gamma_{ji} \quad (5)$$

Negativity requires the matrix of substitution effects to be negative semidefinite implying negative own price elasticities. Homogeneity and symmetry conditions of demand theory can be tested and imposed. This paper uses the linear approximation of the aggregate price index in (2) with Stone's (1954) Price Index (P^*) specified as:

$$\ln (P^*) = \Sigma_i w_i \ln(p_i) \quad (6)$$

This linear approximation of the price index is suitable in demand studies when prices are collinear (Deaton and Muellbauer 1980), as in tourist demand studies where the host countries are all in the same region. Further, homogeneity and symmetry conditions are imposed on the demand system in line with demand theory.

We estimate four static LAIDS models using the seemingly unrelated regression (SUR) method proposed by Zellner (1962). The four models consist of German tourism demand for euro hosts and non-euro hosts as well as British tourism demand for euro and non-euro hosts. The SUR method estimates a system of equations with different dependent variables and assumed correlated error terms. To avoid singularity, an equation from each SUR model is dropped and later recovered using the adding up restriction. Any price transparency or currency effect is assumed to be realized in the long term, hence the focus on the static LAIDS model. The estimated coefficients and budget shares from the each SUR model are used to derive uncompensated elasticities. We derive income, own-price and cross-price elasticities.

Income elasticities measure the percentage change in quantity demanded given a one percentage increase in income. We expect elasticity estimates to be positive since tourism is most likely a normal good. Some host countries may be considered a luxury good and have income elasticities greater than one. To derive the income elasticities we calculate $1+(b_i/w_i)$ where b_i is the estimated coefficient on the expenditure term in equation (1) and w_i is the budget share of tourism expenditures of host country *i*.

Own-price elasticities measure the percentage decrease in quantity demanded given a percentage increase in price. Economic theory predicts this will be a negative relationship. The cross-price elasticities measure the percentage increase/decrease in quantity demanded of tourism in host country *j* given a one percentage increase in the price of tourism in host country *i*. A positive relationship indicates the two host countries are substitutes and a negative relationship indicates the host countries are compliments. The equation b_{ij}/w_i is used to derive cross price elasticities where b_{ij} represents the cross price coefficient of country *j* on country *i* and w_i is the share of tourism expenditures in country *i*.

Data

German and UK number of tourists comes from the Compendium of Tourism Statistics. Price data comes from OECD.StatExtracts (http://stats.oecd.org/Index.aspx?DataSetCode=MEI_PRICES). Data covers the years 1994-2007. Variables are converted into natural logs. German and UK were chosen as source countries because tourists from these countries comprise the largest share of European tourists. Host countries were chosen based on data availability.

4. Results

To determine statistical significance, we first derive standard errors using error propogation. Elasticity estimates and standard errors are used to determine t-statistics. All coding is performed in SHAZAM program.

Table 1 reports the estimated uncompensated price and expenditure elasticities of German tourists in euro countries and non-euro countries. The expenditure elasticity of France indicates it is a luxury good (country) whereas Austria and Switzerland are normal goods (countries). The own-price elasticities in France and Italy are negative and elastic as expected. However, the own-price elasticity in Poland is negative and inelastic. A positive cross-price elasticity coefficient indicates that countries are substitutes and have negative cross price elasticities indicate countries are complements. The results show that France and Italy are substitutes for German tourists. Thus, a 1% increase in French prices will result in a 0.902% increase in the number of German tourists going to Italy. A 1% increase in Italian prices results in a 1.54% increase in the number of German tourists going to France.

The own-price elasticity in Poland is negative and inelastic, and own price elasticities in Switzerland and Denmark are elastic but positive. The cross-price elasticities indicate that Switzerland and Denmark are complements. A 1% price decrease in Switzerland (Denmark), results in an increase of 2.23% (4.11%) of German tourists to Denmark (Switzerland).

Table 2 reports the uncompensated price and expenditure elasticities of British tourists to euro and non-euro countries. Expenditure elasticities indicate Switzerland is a luxury good and France is a normal good. The own-price elasticities in Switzerland and Poland are negative and elastic as expected. The negative cross-price elasticity between Switzerland and Poland indicates

they are substitutes. A 1% increase in Polish prices results in an increase of 11.1% in British tourists going to Switzerland. A 1% increase in Swiss prices results in an increase of British tourists to Poland by 0.69%. France is a complement to Italy and Austria. A 1% decrease in prices in Italy (Austria) results in an increase of number of British tourists to France by 0.29% (0.83%). Switzerland is a complement for Denmark; a 1% price decrease in Denmark increases tourism demand for Switzerland by 2.32%.

Euro Impacts for German tourists

With respect to statistically significant cross price elasticities, Germans substitute between euro hosts but non-euro hosts are compliments for German tourists. We believe this indicates the importance of price transparency as a determinant of tourism demand. Germans have an easier time discerning price differences between euro hosts and are therefore able to substitute between them. This transparency is a result of Germans using the same currency as the host countries. On the other hand, it is difficult for Germans to discern real price differences between non-euro countries; there is a lack of price transparency. Germans may consider currency exchange and lack of price transparency a sunk cost and induce them to travel to multiple non-euro hosts on any given trip (hence non-euro hosts are compliments). The non-euro hosts include Denmark and Switzerland, the first and third highest priced countries in Europe (Eurostat). This shows that lack of price transparency, rather than the relative strength of the euro to other currencies, is the reason these two countries are compliments to German tourists.

Tourist Currency Impacts in the Destinations

Comparing German tourists and British tourists to euro hosts, German tourists are sensitive to prices in France and Italy but British tourists are not sensitive prices in the euro host countries.

This reflects the relative strength of the pound to the euro. France is a compliment for Italy and Austria for British tourists. France and Italy are substitutes for Germans. Again, prices in euro host countries are more "transparent" for Germans than British tourists, thus Germans substitute between euro hosts.

5. Conclusion

This paper examines German and British tourism demands in euro host and non-euro hosts using the LAIDS approach. We divide host countries into euro hosts and non-euro hosts to see how German and British tourists respond to different prices in the two host country groups. In general the results show that British tourists are less sensitive to price effects than Germans, most likely due to the relative strength of the pound over the euro. Also, Germans substitute between euro host countries due to price transparency. Non-euro hosts are compliments for German tourists because it is difficult for them to compare prices among the different currencies (hence they travel to a few, rather than just one, destination).

These results have policy implications for the host countries in the study as well as countries that may be contemplating adopting the euro as a currency. Substitute host countries should be weary of competitors' prices and host countries that are compliments could theoretically work together to promote tourism. The more interesting implication of our results, however, is how price transparency will influence policy recommendations. To begin with, these policies recommendations should be based on whether a country invites more Germans or British tourists to their border. For a country whose tourist numbers are comprised mostly of Germans, price manipulation would be more likely successful if the host country has its own currency, since Germans would suffer from the lack of price transparency.

Our results can be applied to the case of Turkey. Recently Turkey has been making steps toward entry into the European Union. Turkey has a thriving tourism industry, among the top 20 tourist countries in the world. In 2007, Turkey had 22.2 million visitors, of which 4.06 million were Germans comprising 18.23% of all tourists. There were 1.76 million English tourists that traveled to Turkey that year (WTO). According to the results of our study, if Turkey enters the EU, Turkish policymakers may want to think twice before adopting the euro. Adopting the euro may hurt the Turkish tourism industry as Germans may substitute away from Turkey to other Mediterranean destinations such as Greece or Italy that use the euro. As long as Turks are on the lira, it is easier for the Turkish tourism industry to confuse Germans with prices.

Price transparency is a venue for further tourism research. Of course one area of improvement could be a larger data covering more countries and years. Budget shares play a large role in elasticity estimates, so grouping high demand tourist host countries with low demand tourist host countries affects results and should be carefully considered. Future studies may control for distance which was assumed not to play a role in our study due to the number of low cost airline from the UK and Germany to various European destinations.

References

Coshall JT. 2005. A selection strategy for modeling UK tourism flows by air to European destinations. *Tourism Economics*, 11, 141-158.

Deaton AS, Muellbauer J. 1980. An almost ideal demand system. *American Economic Review*, 70, 312-326.

DeMello MM, Fortuna N. 2005. Testing alternative dynamic systems for modeling tourism demand. *Tourism Economics*, 11, 517-537.

Durbarry R, Sinclair MT. 2003. Market shares analysis: The case of French tourism demand. *Annals of Tourism Research*, 30, 927-941.

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

Gil-Alana LA. 2005. Modeling international monthly arrivals using seasonal univariate long memory processes. *Tourism Management*, 26, 867-878.

Hanafiah M, Harun M. 2010. Tourism Demand in Malaysia: A cross sectional pool time-series analysis. *International Journal of Trade, Economics, and Finance*, 1, 200-203.

Heston A, Summers R, Aten B. 2009. Penn World Tables Version 6.3, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania, August.

Li G, Haiyan S, Witt S. 2004. Modeling Tourism Demand: A Dynamic Linear AIDS Approach. *Journal of Travel Research*, 43, 141-150.

Ledesma-Rodríguez FJ, Navarro-Ibáñez M, Pérez-Rodríguez JV. 2001. Panel data and tourism: a case study of Tenerife. *Tourism Economics*, 7, 75-88.

Lyssiotou P. 2000. Dynamic Analysis of British demand for tourism abroad, *Empirical Economics*, 25(3):421-436.

Mangion ML, Durbarry R, Sinclair MT. 2005. Tourism competitiveness: price and quality Tourism competitiveness: price and quality. *Tourism Economics*, 11, 45-68.

Papatheodorou A, Song H. 2005. International tourism forecasts: Time-series analysis of world regional data. *Tourism Economics*, 11, 11-23.

Roget FM, Gonzalez XR. 2006. Rural tourism demand in Galicia, Spain. *Tourism Economics*, 12, 21-31.

Sakai M, Brown J, Mak J. 2000. Population aging and Japanese international travel in the 21st century. *Journal of Travel Research*, 38, 212-220.

Salman AK. 2003. Estimating Tourist Demand through Cointegration Analysis: Swedish Data. *Current Issues in Tourism*, 6, 323-339.

Song H, Li G. 2008. Tourism Demand Modeling and Forecasting: A review of recent Research. *Tourism Management*, 29, 203-220.

Syriopoulos TC, Sinclar MT. 1993. An econometric study of tourism demand: the AIDS model of US and European tourism in the Mediterranean Countries, *Applied Economics*, 25:1541-1552.

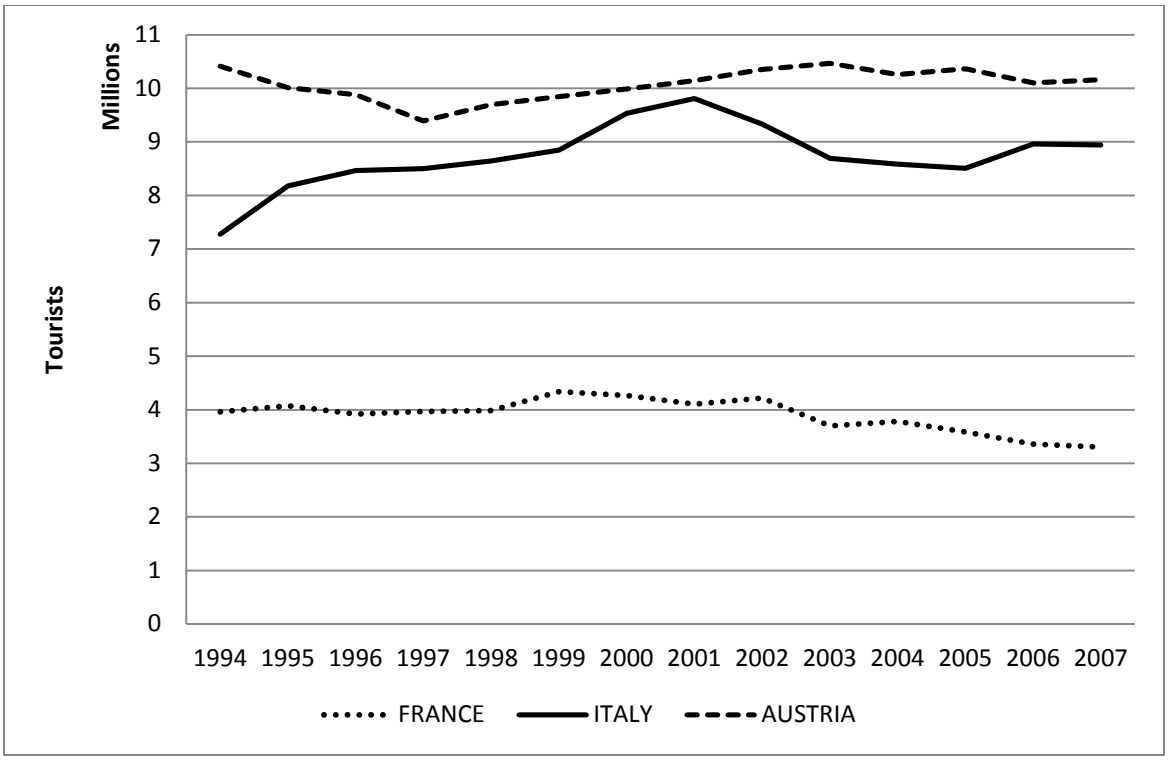
Tourism Market Trends, Europe 2004, Madrid, Spain, World Tourism Organization.

Vanegas M, Croes RR. 2000. Evaluation of demand: US tourists to Aruba. *Annals of Tourism Research*, 27, 946-963.

World Tourism Statistics. *Compendium of World Tourism*, Madrid, Spain.

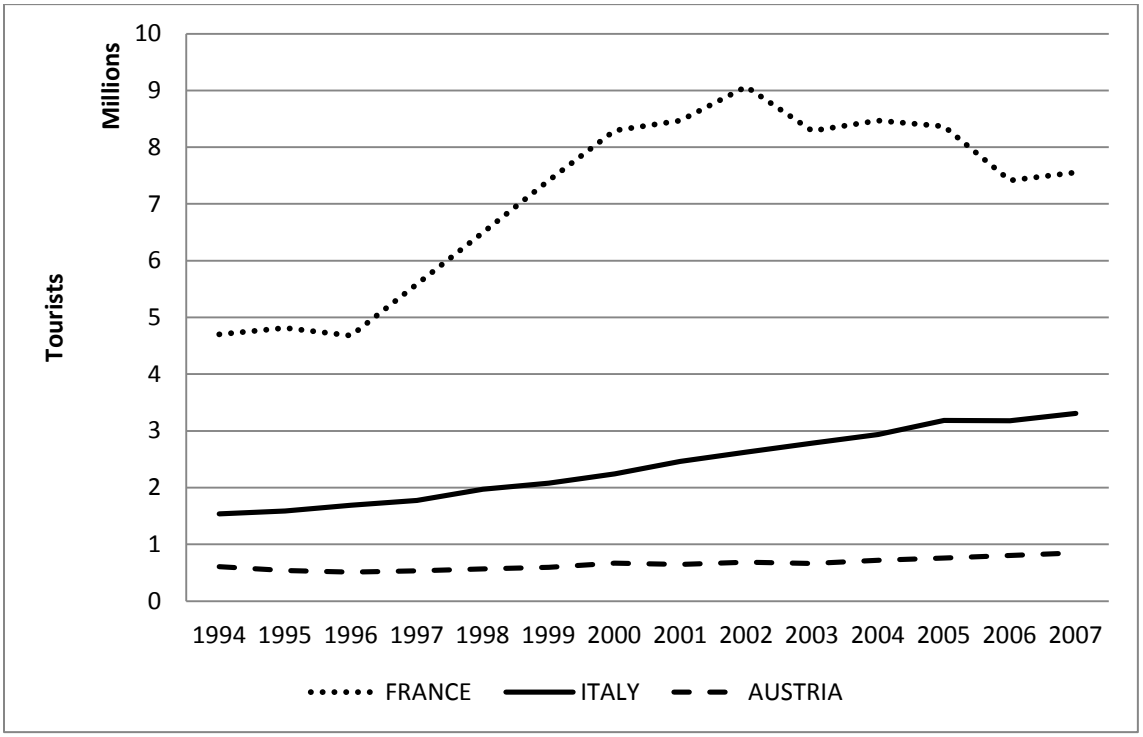
Zellner A.1962. An efficient method of estimating seeming unrelated regression equations and tests for aggregation bias. *Journal of the American Statistical Association*, 57, 348-368.

Figure 1. German Tourists in Euro Host Countries



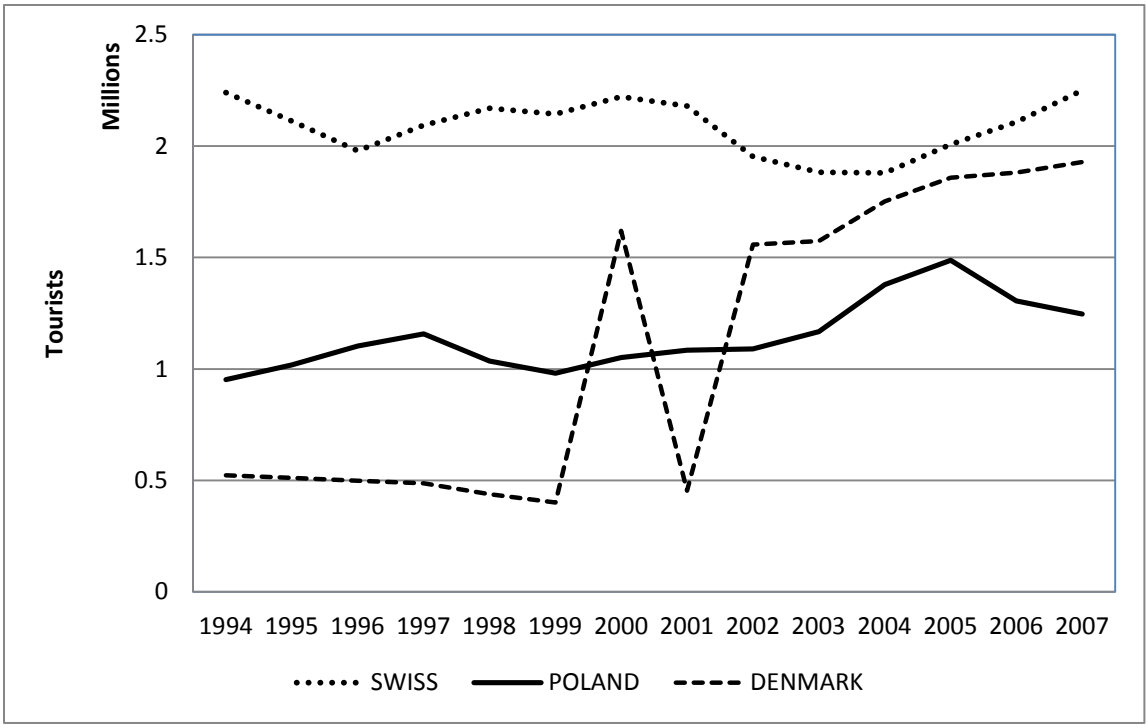
Source: World Tourism Statistics 2009

Figure 2. German Tourists in non-Euro Host Countries



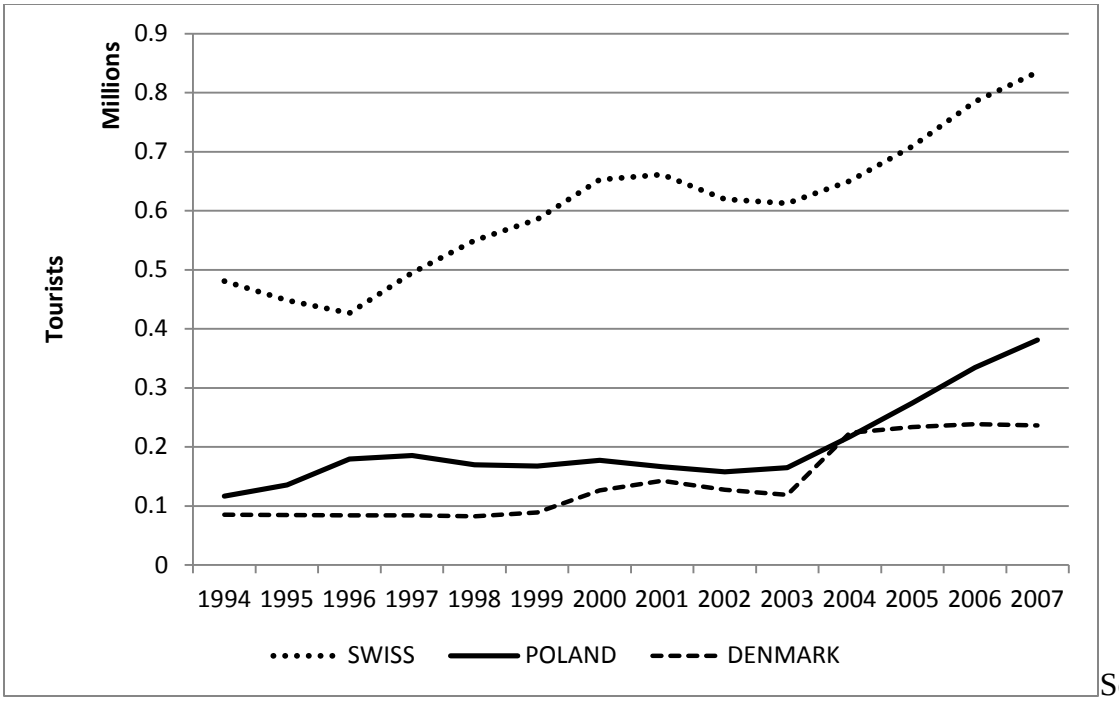
Source: World Tourism Statistics 2009

Figure 3. British Tourists in Euro Host Countries



Source: World Tourism Statistics 2009

Figure 4. British Tourists in non-Euro Host Countries



Source: World Tourism Statistics 2009

Table 1. Input Price and Expenditure Elasticities in German Tourists.

	German in Euro countries			German in non-Euro countries		
	France	Italy	Austria	Swiss	Poland	Denmark
Expenditure	1.416***	1.076	0.59***	0.59**	1.180	1.570
	(0.540)	(1.550)	(0.220)	(0.280)	(2.560)	(1.430)
France	-1.98*	1.54***	0.071			
	(1.020)	(0.540)	(0.510)			
Italy	0.902***	-3.04***	0.257			
	(0.320)	(0.740)	(0.370)			
Austria	0.081	0.500	-1.330			
	(0.430)	(0.500)	(1.640)			
Swiss				1.41***	-0.330	-4.11***
				(0.490)	(0.220)	(1.750)
Poland				-0.170	-0.42***	-0.230
				(0.110)	(0.180)	(0.260)
Denmark				-2.23***	-0.240	3.34***
				(0.850)	(0.250)	(1.470)
System of R^2	0.8075			0.9342		

Note:

*** Refers to significance at 1% level

** Refers to significance at 5% level

* Refers to significance at 10% level

Table 2. Input Price and Expenditure Elasticities for British Tourists.

	British in Euro countries			British in non-Euro countries		
	France	Italy	Austria	Swiss	Poland	Denmark
Expenditure	0.802***	1.553	1.061	1.270*	0.998	0.950
	(0.298)	(0.956)	7.675	(0.616)	(14.860)	(2.476)
France	-0.689	-0.096	-0.215			
	(0.414)	(0.203)	(0.749)			
Italy	-0.292***	-0.572	-0.136			
	(0.058)	(0.342)	(0.339)			
Austria	-0.825***	-0.172	-0.003			
	(0.207)	(0.144)	(0.003)			
Swiss				-9.816***	0.693***	-0.502
				(2.500)	(0.106)	(0.479)
Poland				11.140***	-2.217***	1.819
				(2.693)	(0.538)	(1.088)
Denmark				-2.323***	0.524	-2.317
				(0.876)	(0.524)	(1.568)
System of R^2	0.7727			0.7521		

Note:

*** Refers to significance at 1% level

** Refers to significance at 5% level

* Refers to significance at 10% level