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Title: Determinants of foreign tourism demand in Catalonia

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Abstract

Catalonia is the region of Spain with the most important tourist sector. The purpose of this thesis is to analyse the main determinants of foreign tourism demand in Catalonia. In the basic model, tourism demand depends on real income of tourists and price competitiveness. This thesis shows the results of a quarterly error correction model that try to shape the foreign tourism demand in Catalonia for the period 2000-2018. The results show that foreign tourism demand depends positively on real income of tourists in the short and long term and negatively on relative prices in the long term. Moreover, it is concluded that tourism expenditure in Catalonia is a luxury good due to the income elasticity of tourism demand is greater than one.

Keywords

Foreign tourism demand modelling – Tourist sector – Error correction model – Empirical analysis – Catalonia

Resum

Catalunya és la regió d'Espanya amb el sector turístic més important. L'objectiu d'aquest treball és analitzar els principals determinants de la demanda de turisme estrangera. En el model bàsic, la demanda de turisme depèn de la renda real dels turistes i de la competitivitat en preus. Aquest treball mostra els resultats d'un model de correcció de l'error amb dades trimestrals que intenta determinar la demanda de turisme estrangera a Catalunya durant el període 2000-2018. Els resultats mostren que la demanda de turisme estranger depèn positivament de la renda real dels turistes a curt i a llarg termini i negativament dels preus relatius a llarg termini. A més, es conclou que la despesa turística a Catalunya és un bé de luxe, ja que l'elasticitat renda de la demanda per turisme és superior a la unitat.

Keywords

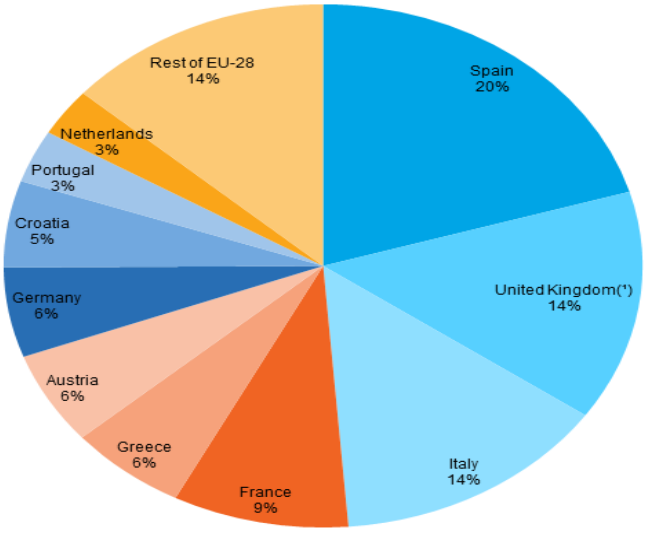
Demanda de turisme estranger – Sector turístic – Model de correcció de l'error – Anàlisi empírica – Catalunya

Index

1. Introduction

The tourism sector is an important source of wealth in our current society. This industry continues driving growth, creating jobs and fostering development and tolerance (WEF 2017). The case of Spain is internationally relevant; it attained the first place globally in the Tourism & Travel Competitiveness Index of the World Economic Forum in 2017 and 2015. In 2017, Spain was the most common outbound tourism destination in the EU for people travelling outside their country, with 306 million nights spent in tourist accommodation, 20 % of the EU total (see Figure 1). Nearly 7 out of 10 from these 306 million nights spent in Spain were concentrated in three regions: *Canarias* (Canary Islands), *Illes Balears* (Balearic Islands) and *Catalunya* (Catalonia), according to Eurostat.

Figure 1. Share of nights spent at EU-28 tourist accommodation by tourists travelling outside their own country of residence, 2017 (% of all nights spent in EU-28 tourist accommodation establishments)



Note: EU-28 estimate made for the purpose of this publication, based on available data.
(*) Number of nights spent estimated using monthly data.
Source: Eurostat (online data code: tour_occ_ninat)

Moreover, in 2018 Spain was the second country of the world with the highest number of international tourist arrivals, just below France (UNWTO 2019). The case of Catalonia is particularly interesting; it is the first region of Spain both in number of international tourist arrivals and in tourism revenues. In 2016, Catalonia was the second region of the EU with more nights spent in tourists accommodation (79.8 million), bellow Canary Islands. In 2018, tourism sector in Catalonia provided the 13 % of the total employment in the region, according to the Catalan Employment and Production Model Observatory.

In the same year, Catalonia received 19 million of foreign tourists, which represent the 23 % of the total arrivals in Spain; and it collected near 20,600 million of euros of foreign tourism revenues. At global level, Catalonia would be in the 19th position in the world ranking of countries with most international tourists, according to the UNWTO data the year 2017.

Currently, tourism sector is changing as the economy sphere does. The transformation that tourism has experienced is palpable; the raise of low cost transport companies; online travel booking services became the principal mean for tourists and the collaborative economy, all of them are examples of facts that have changed the paradigm. The main effects of this transformation are lower prices, a change in the culture of traveling by becoming almost a vital experience in life and, overall, by easing the access to travel. Indeed, the World Tourism Organization (UNWTO) foresees that world tourist flows will grow around 3 - 4 % the next years. For all of these reasons, governments and tourists operators need to be updated in order to adapt their policies and strategies to develop the sector according to the leader position that Catalonia joys. In this context, it is remarkable the importance of the capability to understand, measure and analyse the main determinants that explain the evolution of tourism demand (Álvarez, J., García, C. y Gordo, E., 2007).

The hypothesis of this thesis is whether foreign tourism demand in Catalonia is mainly determined by the real income of the foreign tourists' countries and by the relative prices of tourism in Catalonia with respect to other areas of the world, and to analyse the influence of these variables in foreign tourism demand. Under this objective, this thesis shows the results of a quarterly error correction model that try to shape the foreign tourism demand in Catalonia for the period 2000-2018. However, we may consider the Catalan competitiveness index based on tourism prices for the period available 2003q1-2015q2 in order to find out whether this index is more useful and valuable to determine foreign tourism demand than the Spanish competitiveness index based on consumer prices.

In parallel to that, this thesis also contrasts the hypothesis of whether tourism expenditure in Catalonia is a luxury good, as it was determined in literature for the case of Spain.

This thesis follows the approach of some Bank of Spain's works: Álvarez, García and Gordo (2007), Buisán (1995) and Espasa, Gómez and Jareño (1990).

This thesis is shaped in three general parts. First of all, a descriptive part about the tourism sector in Catalonia in order to highlight its relevance and its international position. Second, we provide the analytical framework concerning the determinants that explain the evolution of tourism revenues. Moreover, there is an analysis of the literature that also tries to shape tourism revenues in order to compare the variables used as determinants. This comparison allows comparing the later results knowing the differences in the construction of models.

In the third section we deal with the empirical analysis which is based on an error correction model. This section also presents data details and the discussions of our results connected with the related literature. Finally, section 4 concludes.

2. The tourist sector in Catalonia

2.1. Touristic supply

Tourism is a key sector in the Catalan economy; it represents near the 12 % of the Catalan GDP in 2017 (Vice-Presidency and Ministry of the Economy and Finance of Catalonia, 2018). In the last decades, Catalonia has consolidated its position as a leader region in international tourism in Spain. Along with the increasing demand, the tourist supply is improving and diversifying itself. Under the transformation of paradigm of the sector, the supply side gains more relevance and attention; it has to be capable to attract tourists, due to the increasing competition especially in the "sun and beach" tourism. Hence, the diversification of the tourism model by improving different brands likes wine tourism, cycling tourism, gastronomic tourism, active tourism or the accessibility to cultural heritage has been a key element for this sector. Catalonia is divided in nine touristic brands: the littoral coast, characterised mainly by the "sun and beach" tourism model is constituted by *Costa Brava, Costa Daurada, Costa de Barcelona-Maresme, Costa de Garraf, Terres de l'Ebre;* the rural tourism is highly concentrated in *Catalunya Central* and *les Terres de Lleida* while mountain tourism is found in the *Pirineus* and *Val d'Aran* brands. However, the tourism is highly concentrated in the coast (*Brava*, central and *Daurada*) and the city of Barcelona. This area concentrates the 93.4 % of the total hotel overnight stays.

From 2003 to 2017, tourist establishments have increased by 41 %[1]. The tourist supply is composed by almost 700,000 accommodation places (see Figure 2.1), which represent the 22.1 % of the total in Spain and the 2.5 % of the EU, according to Eurostat (2017 data).

Figure 2.1

Touristic supply: number of establishments and accommodation places (2017)

	Establishments	Places
Hotel establishments	3.007	312.249
Camping	351	271.419
Rural tourism	2.451	19.083
Tourist apartments	20.255	94.053
Total	**26.028**	**696.759**

Source: Vice-Presidency and Ministry of the Economy and Finance based on data from Ministry of Business and Knowledge.

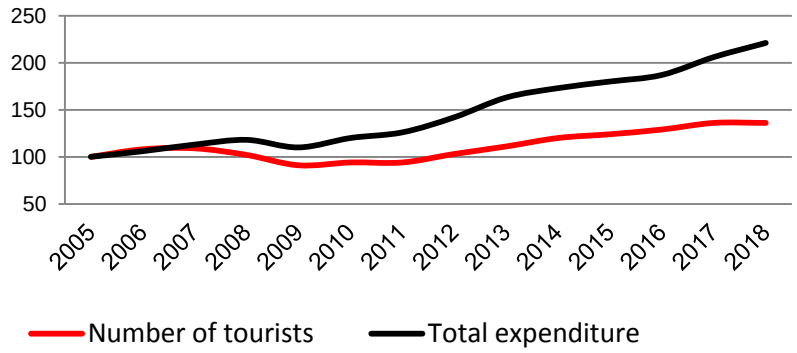
[1] Tourist apartments not included. Data source: Idescat.

2.2. Evolution of foreign tourism

The evolution of foreign tourism has been positively strong during the last decades, showing an increasing trend, it just slowed down during the recession period in 2008 and 2009. In 2018, the data of foreign tourism shows a record level again; both in the number of visitors and in their declared expenditure (see Figure 2.2). The number of foreign tourists has been similar to the year 2017 (19.1 millions), while the expenditure has increased by 7.2 %.In the last decade the growth has been continuous; the number of tourists has increased by 50.5 % in the period from 2009 to 2018 and the total expenditure, experimenting an even greater evolution, increased by 115 % in current values.

Figure 2.2

Foreign tourism trends
(2005=100)



Source: own elaboration based on INE data.

The dynamism of the tourists' origin is heterogeneous; the more traditional origin countries are Germany, Belgium, France, Italy, Netherlands, Scandinavian countries and the United Kingdom. Nevertheless, in 2018 they have decreased their inflows in Catalonia down by 7.0 %, whereas the tourism of the rest of the world has increased by 10.6 %. In the last decade, the traditional countries have decreased their weight in the total tourists of Catalonia by 16.6 %: they represented the 72.3 % of the tourists in 2009 in contrast with the 55.7 % in 2018. This tendency is backed by the increase of the supply of international flights and the improvement of the average income of Asian countries. Then, in 2018 the main markets of origin in foreign tourists are France (21.5 %), United Kingdom (10.9 %), Germany (7.4 %) and United States (7.1 %), although the increase of tourists from the United States (21.8 %), Japan (26.1 %) and China (17.4 %) was higher. The declared expenditure also diverges according to the origin country. Whereas tourists from traditional countries spend 763.7 euros on average in Catalonia, tourists from the rest of the world almost duplicate this expenditure spending 1,469 euros on average (see Table 2.3).

However, this is a comprehensive result because the transport cost is included, which represent the 27 % of the expenditure. In addition, it is cheaper for the traditional countries due to the shorter distance and the higher supply of transport companies.

Table 2.3

Tourism data. 2018

		Foreign tourists total	More traditional countries total	Rest of the world
Tourists	Thousands	19.125,1	10.653,9	8.471,2
	% var. y-o-y	0,0	-7,0	10,6
Average expenditure	Thousands of euros	1.077,1	763,7	1.468,9
	% var. y-o-y	7,1	7,7	12,5

Source: Catalan Employment and Production Model Observatory based on INE.

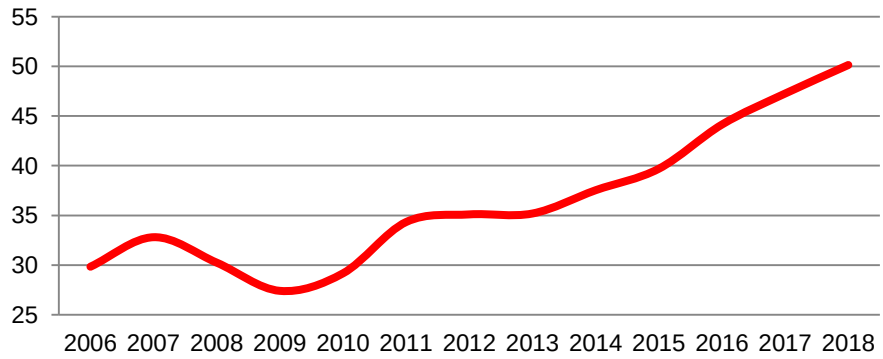
"More traditional countries" is referred to Germany, Belgium, France, Italy, Netherlands, Scandinavian countries and the United Kingdom.

2.3. Infrastructures

According to INE, currently the main access way of foreign tourism is the airport (70.6 %), in contrast to the road (23.9 %) and the other ways, train and ship (5.5 %). In the last decade, tourists who arrived through the airport have almost duplicated, being 7 million in 2009 and 13.5 million in 2018. The number of passengers was pretty reduced when the recession took place in 2008, but the increasing tendency was restored showing a high growth, especially since 2013 (see Figure 2.4). In fact, the number of total passengers at the airport of Barcelona in 2018 reached a new record of 50 million of passengers, growing by 6.1 % year-over-year. The whole set of Catalan airports reached a new record too, surpassing the 53.2 million of passengers.

Figure 2.4

Passengers at Barcelona-El Prat airport (milions)



Source: Own elaboration based on AENA data.

Internationally, the Barcelona airport is the 7th European airport in number of passengers in 2017.

In parallel to that, the number of cruise passengers at the port of Barcelona also reached its record surpassing for the first time the 3 million of passengers, which represent a growth of 12.4 % with respect to 2017. According to Suriñach, Vayá and García (2017), the economic effects of the cruise activity are 1,000 million of euros and 9,000 employments in Barcelona and Catalonia.

2.4. The city of Barcelona

Barcelona is a touristic city recognised worldwide since the Olympic Games took place in 1992. The city was transformed, modernized and it adapted an openness strategy towards the world, and finally appeared in the world map (Duro and Rodríguez, 2015). Receiving almost 8.7 million of international visitors, Barcelona is in the top 20 ranking of most visited cities in the world, occupying the 17th position, according to the Mastercard's 2018 Global Destination Cities Index. In Europe, Barcelona is the 8th most visited city ranked by number of international arrivals (see Figure 2.6), although it has lost two positions in the ranking with respect to 2017.

Figure 2.5

List of the most visited European cities in 2018

Rank	European City	Number of International Arrivals in 2018 (millions)
1	London	20,72
2	Paris	16,84
3	Istanbul	12,12
4	Antalya	10,73
5	Rome	9,53
6	Prague	9,04
7	Amsterdam	8,48
8	**Barcelona**	**6,73**
9	Milan	6,51
10	Vienna	6,3

Source: own elaboration based on Statista data.

In terms of international visitor spending (in U.S dollars), Barcelona is in the 20th position of the world ranking of the year 2017 (6.55 billion U.S dollars), bellow cities like Istanbul (6.75), Seoul (7.21), Miami (7.91), Sydney (7.99) or Los Angeles (8.36)[2].

[2] Data from Statista https://www.statista.com/statistics/310405/leading-cities-in-international-visitor-spending-worldwide/

Urban tourism is one of the main drivers of European and world tourism, as it can be appreciated looking at the list of the most visited European cities (Figure 6). For this reason, the management of tourism in Barcelona needs to include territorial planning, specific legislation and specific tourist planning (Casanovas, 2017). The Strategic Tourism Plan of Barcelona for 2020 establishes 10 programmes, 30 actuation lines and around 100 measures based on the principles of urban equilibrium, tourist accommodations planning, sustainability, more agents implied and benefits for the citizens. The executive director of Tourism of Catalonia, Patrick Torrent, emphasises the importance of the planning in tourist destinations in order to avoid the phenomena of "tourism phobia" (citizens' rejection of tourists). He also proposes some means to take into account when governing a territory: tourism table, acquisition, employment politics, creation of an indicators system and a tourist tax are examples of it (Casanovas, 2017).

Business tourism is also a relevant part of tourism in cities and in Barcelona. In 2017, the 21 % of tourists visited Barcelona because of professional reasons and the 20.8 % of meetings were congresses[3]. In the area of meeting tourism, Barcelona is the leader city in the world (see Figure 2.6).

Figure 2.6

ICCA Ranking – Meeting tourism (2017)
ICCA (International Congress & Convention Association)

Rank		Number of meetings
1	**Barcelona**	**195**
2	Paris	190
3	Vienna	190
4	Berlin	185
5	London	177
6	Singapore	160
7	Madrid	153
8	Prague	151
9	Lisbon	149
10	Seoul	142

Source: Barcelona tourism activity report (2017) based on ICCA.

In 2017, 195 congresses with 150,000 delegates were celebrated in Barcelona, according to ICCA. According to the data from the Barcelona Convention Bureau of Barcelona Tourism, the economic impact of meeting tourism in Barcelona the year 2017 is estimated around 1,850 million of euros, which represent an increase of the 21 % with respect to the previous year and an increase of the 30 % with respect to the average of the last five years.

[3] Data from the Barcelona tourism activity report, 2017
https://ajuntament.barcelona.cat/turisme/sites/default/files/informe_act_tu_2017_complet_0.pdf

3. Analytical framework: the determinants of foreign tourism in Catalonia

In the demand analysis, it is usual to try to explain the demand of a good or service based on the prices and the income, according to the demand theory. Then, in the basic model tourism demand is positively related with the income of foreign tourists and negatively related with the relative prices of the tourist destination (1):

$$TUR^d = F(Y^*, P/P^*) \quad (1)$$

Where TUR^d is the tourism demand, Y* is the real income of foreign tourists and P/P^* is the relative prices of the destination (P) with respect to the foreign tourist's countries (P*). (Source: Álvarez, García and Gordo, 2007).

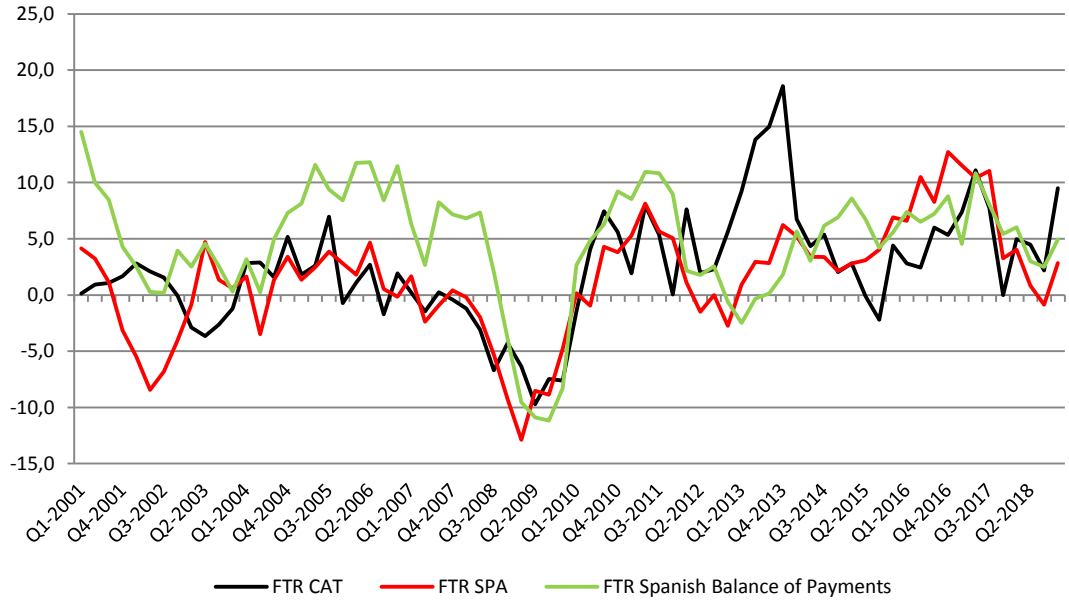
3.1. Tourism demand

Under the objective of analyse the determinants of foreign tourism demand, in this thesis the latter is used as the dependent variable. It is approximated through the foreign consumption from the Quarterly Economic Accounts for Catalonia. Due to the importance and the high volume of tourism in Catalonia, this variable may work as a good proxy although it does not specify tourism consumption, so it also includes the visitors' consumption. This approach follows the strategy of authors like Buisán (1995), who extracted tourism revenues from the Economic Accounts for Spain and Álvarez, García and Gordo (2007) as well as Espasa, Gómex and Jareño (1990), who extracted them from the Balance of Payments instead. The Balance of Payments does specify the tourism revenues, but it is only calculated at national level, so there is no data for Catalonia. To analyse the similarity of foreign tourism revenues extracted from the Quarterly Economic Accounts and those extracted from the Balance of Payments, Figure 3 shows the evolution of the three variables seasonally adjusted for the period 2000-2018: Spanish tourism revenues from the Balance of Payments and Catalan and Spanish tourism revenues from the Quarterly Economic Accounts. It is noted the coincidence on their trend during the whole period, except in 2013, when the series from the Economic Accounts for Catalonia experienced a one year sharp increase. Thus, the Economic Accounts for Catalonia may be a good source to approximate foreign demand.

Several authors use other alternatives to approximate tourism demand, mostly the number of tourists arrivals (Goh, Law and Mok, 2008) or, less frequently, the number of tourists nights spent (González, Álvarez and Otero, 2011). However, tourism revenues may be a better approximation because it includes tourists' expenditure as well as, implicitly, the inflows of foreign tourists and duration of stay.

Figure 3

Evolution of foreign tourism revenues (FTR) in Spain and Catalonia (y-o-y % variation, quarterly data)



Source: own elaboration based on Bank of Spain, INE and Idescat data.
FTR CAT: Foreign tourism revenues in Catalonia, from the Quarterly Economic Accounts.
FTR SPA: Foreign tourism revenues in Spain, from the Quarterly Economic Accounts.

3.2. Real Income

Theoretical and empirical literature mostly states that real income of tourists is one of the main determinants of tourism demand. Following the methodology of Bank of Spain's authors Buisán (1995) and Álvarez, García and Gordo (2007), to measure the effects of real income in tourism demand it has been built an income index based on the GDP growth of the main origin markets of tourists that visit Catalonia. The construction of this index is detailed in section 4.1. There is a wide range of literature that approximates the effects of real income through the GDP, mainly the GDP per capita. However, since the market of origin of tourists in Catalonia is quite heterogeneous, an income index including the main markets is a more accurate option. In contrast, some authors use different approximations, for example Goh, Law and Mok (2008) use the Industry Production Index.

3.3. Price competitiveness

Price competitiveness of Catalonia with respect to other world areas is the second determinant of foreign tourism demand. Buisán (1995) and Álvarez, García and Gordo (2007) built a price competitiveness index for Spain with respect to client and competitor markets. Nevertheless, the construction of this kind of index is out of the order of this thesis, so price competitiveness is approximated through the Spain competitiveness index based on the CPI and through the Catalan competitiveness index based on tourism prices.

Then, taking into account de results of the estimation, both indices are compared in order to determine which one fits better as a determinant of tourism demand. Literature also proposes the real exchange rate, the CPI in purchasing power parity or the cost of tourism in the destination area divided by the cost of tourism in the origin market.

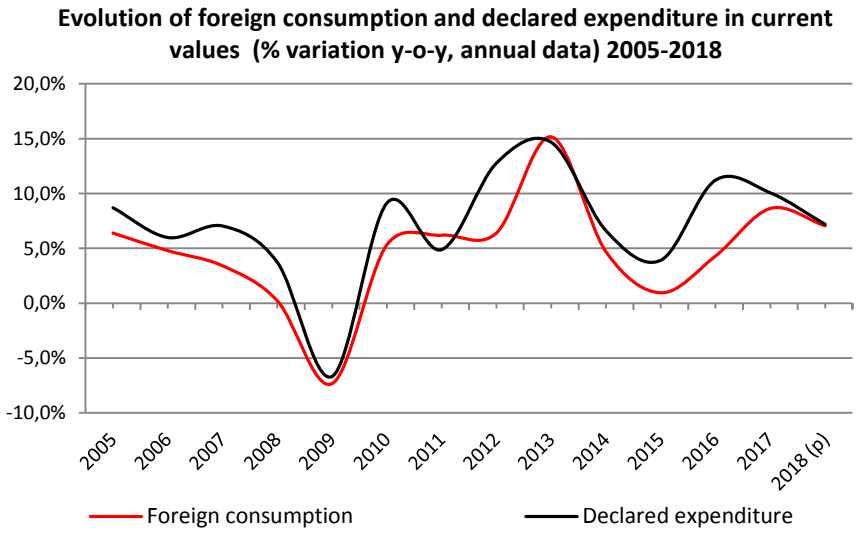
4. Empirical approximation

4.1. Data

As stated above, the variables used in the econometric model are the foreign tourism demand as the dependent variable; while the explicative variables are the index of real income of the main visitors' countries, the tourism competitiveness index of Catalonia with respect to countries of the world and the competitiveness index of Spain with respect to industrialized countries. In order to better understand these variables and to explain how they are used in this model, in this section they are analysed in a descriptive way.

The dependent variable is extracted from the Annual Economic Accounts for Catalonia, from *Idescat.* The evolution of GDP is broken down by components of demand, so the component called "Foreign consumption in the territory" is interpreted as foreign tourism demand and it is used as the dependent variable of the estimation. Then, the evolution of these revenues is supposed to be similar to the evolution of the total declared expenditure of tourists whose main destination is Catalonia, obtained through INE's Tourist Movement on Borders Survey and Tourist Expenditure Survey. In order to verify this relationship, both variables are analysed at the level of variation year-on-year in current prices.

Figure 4.1



Source: own elaboration based on Idescat data.

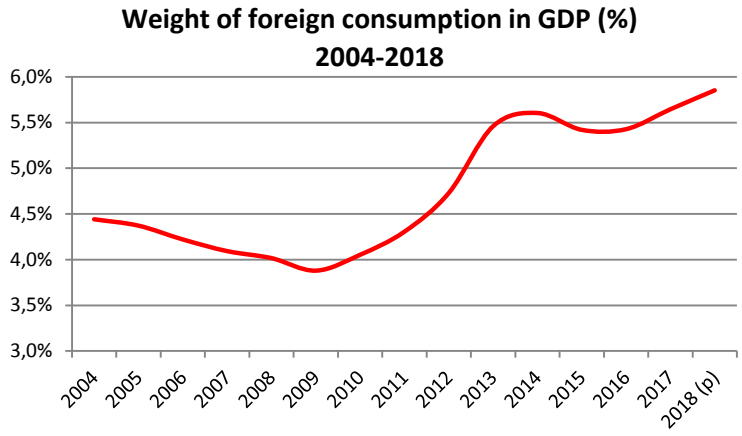
First, the coefficient of correlation between both variables is 0,888 in first differences; which indicates that foreign consumption and the declared tourism expenditure are highly correlated. Second, by comparing both variables between 2005 and 2018 (see Figure 4.1) it is noted that both variables follow the same trend along time.

Their pace of growth was moderated at the beginning of the period and, in 2009, foreign tourism revenues were negatively affected by the economic recession so they experienced a sharp decline.

Between 2010 and 2013 there is a high increase, especially in 2012 and 2013, when the declared expenditure increased by 12.8 % and 14.7 % respectively and foreign consumption increased by 6.4 % and 15.2 % in the same period. At this point, it must be noted a structural break in declared expenditure data since 2015. The reason is that up until the third quarter of 2015, the Spanish Institute of Tourism was in charge of producing the Survey of Tourist Movement on Borders (Frontur) and the Survey of Tourist Expenditure (Egatur). Starting in the last quarter of 2015, the body in charge of these operations is the INE. This fact also entailed a change in the design and methodology of the surveys; as a result there will be a break in the series. Fortunately, *Idescat* offers a comparable time series. In 2018, it seems that both series fit together better, by growing almost at the same rate: foreign consumption grew by 7.0 % providing in current values 14,183.06 millions of euros, whereas declared expenditure grew by 7.2 %, settling down in 20,606 millions of euros.

Regarding the importance of foreign tourism revenues along time in the economy, it has increased notably since 2004. In Figure 4.2 is plotted the evolution of the weight of foreign consumption in GDP. It has experienced an appreciable increase of its weight: in 2004 foreign consumption represented the 4.4 % of the GDP, while in 2018 it represented almost the 6 %. At the beginning of the period its weight decreased in favour of the weight of domestic demand, which was growing fast in that period, even though foreign consumption was increasing too. Due to the economic recession it slowed down, but in 2010 went up and its weight in GDP started to grow at a good pace.

Figure 4.2



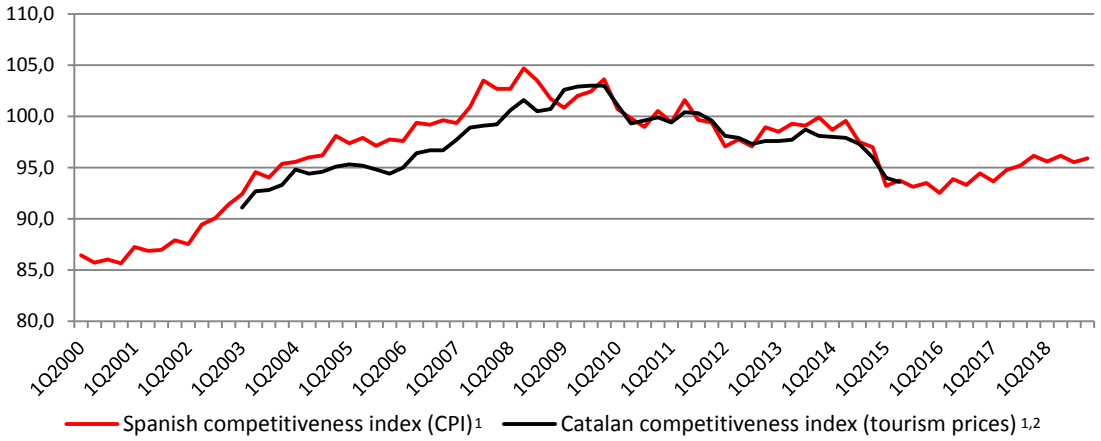
Source: own elaboration based on Idescat data.

To explain the effect of relative prices in foreign tourism demand, it is used the variable of the competitiveness index of Spain based on consumer prices index (CPI) compared to industrialized countries, elaborated by the Bank of Spain. Although this variable is not specific of relative tourism prices, it is a good approximation.

For the case of Catalonia, *Idescat* provides the tourism competitiveness index (Costa, Gomà and López, 2006). However, it only covers the 2003-2Q2015 period. Then, it seems preferable to use the competitiveness index with consumer prices of Spain in order to enlarge the estimation from 2000 to 2018 to make the results more robust. In Figure 4.3 it is plotted the evolution of both variables for the period used in the estimation, from 2000 to 2018. In this figure it is demonstrated that both variables follow a very similar path, so the competitiveness index of Spain may work as a proxy of the tourism competitiveness index of Catalonia.

An increase in both variables reflects a loss of competitiveness in relation to the rest of the countries. Then, if the euro is globally appreciated and/or relative prices increase more (or decrease less) in Catalonia than in the selected countries used as a benchmark for competitiveness, both variables increase. The tendency showed in Figure X3 presents a strong correlation with the economic cycle: both variables increased fast until 2008-2009, and after that they slowed down as the economic recession was taking place. The competitiveness index with consumer prices went up again in 2016. Analysing the whole period, it is noted a progressive loss of competitiveness excluding the economic recession period.

Figure 4.3. Indicators for measuring competitiveness in tourism



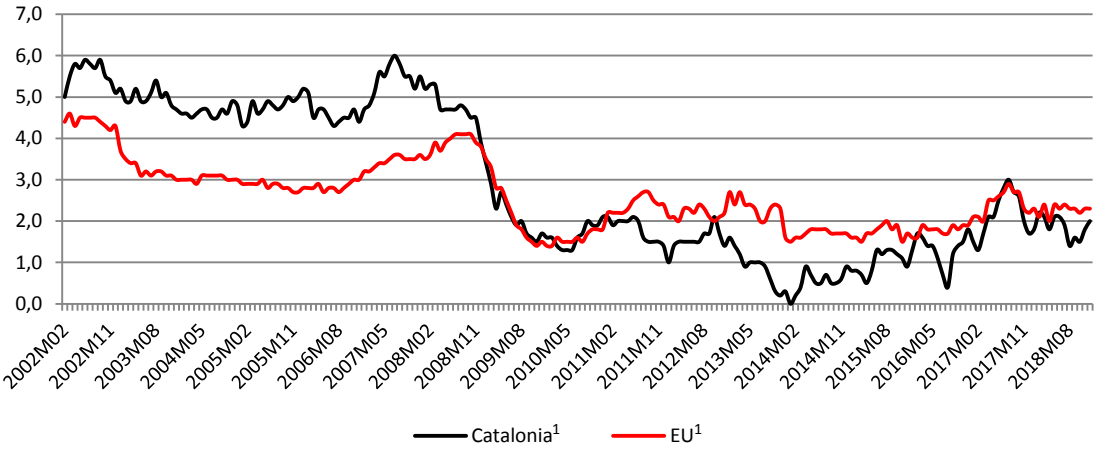
[1] Base: 2010 = 100

[2] Raw data. Serie of the indicator compared to the group "Countries of the world".

Source: own elaboration based on Idescat and Bank os Spain data.

Figure 4.4

Evolution of tourism prices. (y-o-y variation, monthly data) 2002-2018



[1] Tourist prices are equal to the COICOP group "Restaurants and Hotels" from the HICP (2015=100).
Source: own elaboration based on INE and Eurostat data.

Comparing the evolution of tourist prices[4] (see Figure 4.4) between Catalonia and the EU (the largest tourist market for Catalonia), it can be checked the plausibility of the competitiveness index used, despite its coverage is wider in the latter index. At the beginning of the period tourist prices in Catalonia grew above tourist prices in the EU, and at the same time both the indicator of tourism prices and the competitiveness index increased fast until 2009.

[4] COICOP group “Restaurants and Hotels”.

In this year, the path of growth of tourist prices in Catalonia and the EU declined sharply, so both competitiveness indices decreased too, which means that Catalonia gained price competitiveness. In 2011 the recovery of tourist prices in Catalonia was halted, growing below those of the EU until 2017. This latter trend may have driven in the same period both competitiveness indices down.

On another note, to explain the income effect on foreign tourism demand, it has been built an income index (W_t) that captures the income growth of the principal countries of origin of the tourists in Catalonia. The quarterly growth of GDP of these countries is weighted by their share in the total foreign expenditure of the selected group of countries. The results are added in the following way (2):

$$W_t = \sum_1^n \alpha_{i,t-1} G_{i,t} \qquad (2)$$

$G_{i,t}$: is the quarterly growth of GDP seasonally adjusted of country "i" (Source: Quarterly National Accounts, OECD and Eurostat).

$\alpha_{i,t-1}$: Previous year weight of country "i" in tourism expenditure in Catalonia of the selected countries (Source: *Idescat*, Catalan Employment and Production Model Observatory and INE).

The countries used in this index are the traditional visitors of Catalonia. These countries represented the 80.2 % of the total declared expenditure in 2004 and the 55.8 % in 2018. The available dataset disaggregates the tourism expenditure into the countries of Table 4.5, so the index has been built with only these countries.

Nevertheless, it is noted that these traditional countries have been losing weight on tourism expenditure. Specially countries with the highest weight in 2004, such as United Kingdom (-9.1 pp), Germany (-6.4 pp), France (-6.6 pp) or Italy (-5.8 pp). Instead, there are countries that increased their tourism expenditure in Catalonia, like the United States, which increased its weight by 6.5 pp between 2004 and 2018. Russia also appears on the data; but it is not used in the estimation because available data starts in 2010. However, Russia would have a weight of 5.8 % of the total in 2018. Therefore, a further task on the study of tourism expenditure would be including countries that have gained importance in the distribution of tourism expenditure, like China or Japan, in order to better analyse tourism revenues. Another issue is to estimate the lack of data of Russia, because it has a high weight on tourism expenditure and it would expand the analysis.

Table 4.5

Tourism demand by country of origin (share of total tourism revenues)	2004	2018	Absolute variation 2004-2018
Germany	12.2%	5.9%	-6,4 pp
Belgium	4.6%	2.1%	-2,5 pp
France	18.3%	11.7%	-6,6 pp
Ireland	2.4%	2.7%	0,3 pp
Italy	9.6%	3.7%	-5,8 pp
Netherlands	6.1%	3.5%	-2,6 pp
Scandinavian Countries	3.0%	3.5%	0,5 pp
Portugal	1.5%	0.9%	-0,6 pp
United Kingdom	18.2%	9.2%	-9,1 pp
Switzerland	3.0%	1.0%	-2,0 pp
United States	5.1%	11.7%	6,5 pp
TOTAL	**80.2%**	**55.8%**	**-24.4 pp**

Source: own elaboration based on *Idescat* data.

Since the expenditure series started in 2004, for the period 2000-2003 the index uses the weight of 2004 for all the countries ($\alpha_{i,\ t-1}$ in expression 1). Moreover, the data of Portugal and Ireland the years 2004 and 2015 is not available, so it has been estimated based on the rate of variation of their tourism expenditure in Spain, following the next formula (3):

$$Exp_{i,t}^{CAT} = \left(\frac{Exp_{i,t}^{SPA}}{Exp_{i,t+1}^{SPA}}\right) * Exp_{i,t+1}^{CAT} \qquad (3)$$

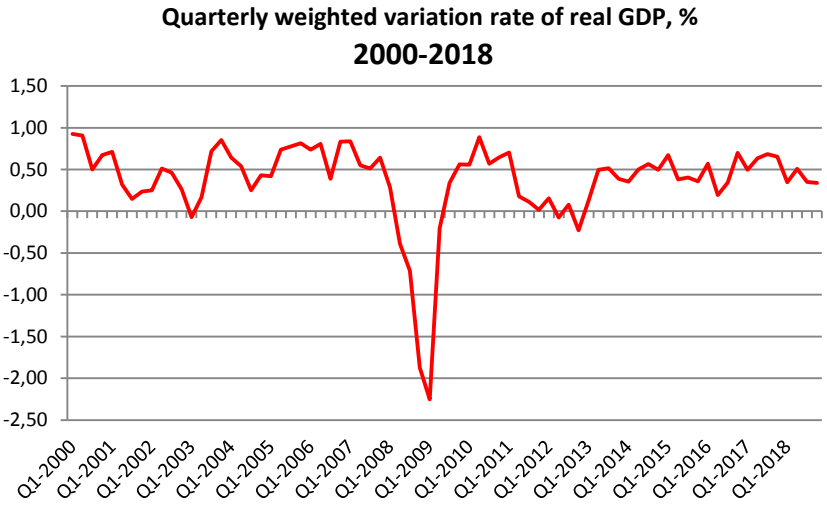
$Exp_{i,t}^{CAT}$: Tourism expenditure of country "i" in Catalonia the year *t.* (Source: Catalan Employment and Production Model Observatory).

$Exp_{i,t+1}^{CAT}$: Tourism expenditure of country "i" in Catalonia the next year (*t+1*). (Source: Catalan Employment and Production Model Observatory).

$\frac{Exp_{i,t}^{SPA}}{Exp_{i,t+1}^{SPA}}$**:** Variation ratio of tourism expenditure of country "i" in Spain the year *t+1* compared to the previous year (year *t*). (Source: EGATUR, from TURESPAÑA).

In Figure 4.6 the evolution of the income index in the period 2000-2018 is plotted. At the beginning of the period, there is a decreasing tendency that even became negative in the first quarter of 2003. After that, it began an increasing tendency until 2008, when the economic recession period decreased sharply the income index. In the middle of 2009 it went up, even taking back the level before the recession. However, it slowed down again immediately until 2013, when it started a more moderated increasing tendency.

Figure 4.6. **Income dynamics of the principal countries of origin of Catalan foreign tourism demand**

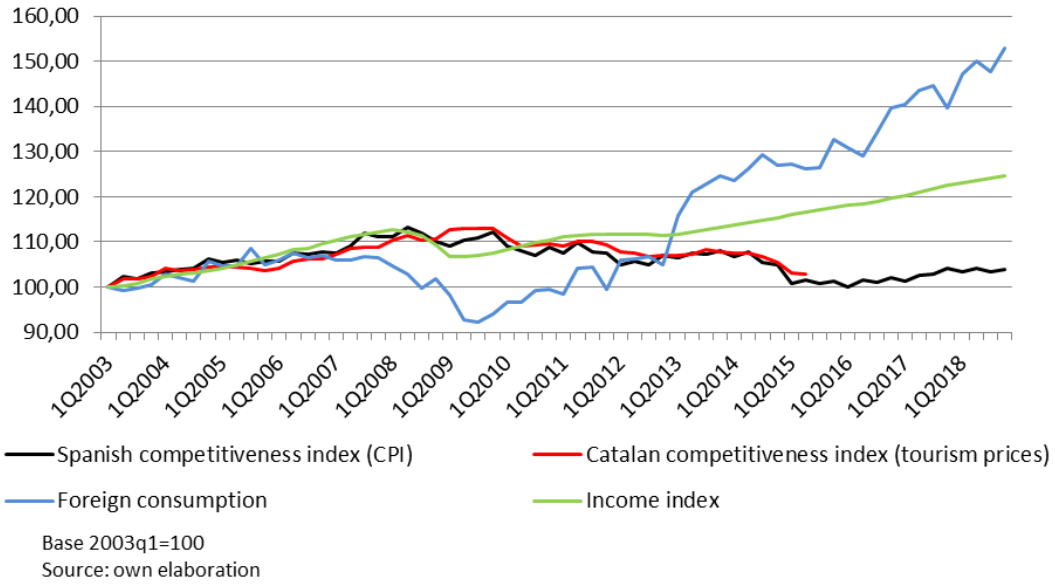


Source: own elaboration.
Note: see expression (2) in page 16.

Other variables have been introduced in the equations to try to improve the explicative power of the regression. On the one hand, it is introduced the price of the oil in US dollars per barrel in quarterly terms. On the other hand, some dummy variables have been introduced in the equations to correct the atopic effects caused by terrorist attacks: the terrorist attack of the 11th of September of 2001 (2001q4-2002q3 = 1, the rest of the period = 0) named D2001, the terrorist attack of the 11th of March of 2004 (2004q2-2005q1 = 1, the rest of the period = 0) named D2004 and the terrorist attack of the 17th of August of 2017 (2017q4-2018q3 = 1, the rest of the period = 0) named D2017.

In order to summarize the evolution of all variables, Figure 4.7 shows the accumulated growth of each one. On the one hand, both competitiveness indices show a relative stable trend. As stated above, they increased in the economic recession period, which implies a loss of price competitiveness. For the rest of the period, this trend slowed down. On the other hand, the accumulated growth of the income index follows a positive evolution within the period 2003-2018, despite the moderation of its growth in the economic recession period. Furthermore, it is remarkable the behaviour of foreign consumption. This variable decreases during the economic recession period, but after that it starts a sharp increasing path of growth that remains for the rest of the period.

Figure 4.7. **Catalan foreign consumption and its main determinants (2003q1=100)**



Base 2003q1=100
Source: own elaboration

4.2. Econometric specification

Once the variables considered relevant determinants for the tourism demand are descripted, it is estimated a quarterly error correction model based on the cointegration theory.[5] All the variables are seasonally adjusted. The steps followed to build the estimations with this model are captures by the following baseline specification:

$$ln(F\_TR_t) = \gamma_0 + \gamma_1 \ln(F\_INCOME_t) + \gamma_2 \ln(PRICES_t) + \varepsilon_t \quad (3)$$

$$\Delta(lnF\_TR_t) = \alpha_0 + \alpha_1 \Delta(\ln F\_INCOME_t) + \alpha_2 \Delta(\ln PRICES_t) + \lambda \varepsilon_{t-1} + \upsilon_t (4)$$

Coefficients $\gamma_1$and $\gamma_2$denotes the long-run elasticities, whereas $\alpha_1$and $\alpha_2$denotes the short-run elasticities. λ captures the speed of adjustment, namely how fast foreign consumption revenue converges to its long-run equilibrium.

F_TR is the foreign tourism revenues, F_Income is the real income of foreign tourists and PRICES is the variable related with price competitiveness.

[5] We provide in the Appendix (section 9) integration tests for all variables included in the ECM model. As expected, all variables in the long term equation are I(1).We also provide integration test for the same variables differentiated. In this case, all variables are I(0), as expected. These results suggest that an ECM model may be a valid representation of our data. In fact, we have also checked that the residual term in the short-term equation is an I(0) variable, which suggest this choice (that of modelling these equations as an ECM model).

In other words, our empirical strategy consists on:

- First, to estimate the dependent and the explicative variables in logarithm levels. Then, keep the residual series. This is the long term equation.

- Second, to estimate the dependent and the explicative variables in first differences of their logarithm level and add the lagged residual series. This is the short term equation. The statistical significance of the error correction mechanism suggests that this cointegration approach may be a plausible representation of our data.

In order to better analyse the principal hypothesis, we provide several robustness checks. Then, different estimations are modelled:

- Model 1 (baseline specification, short sample): The dependent variable is the foreign consumption in the territory. The explicative variables are the income index, the Catalan competitiveness index based on tourism prices, the price of oil and the dummy variables. The estimation period is from 2003q1 to 2015q2.

- Model 2 (baseline specification, Spanish prices, short sample): The dependent variable is the foreign consumption in the territory. The explicative variables are the income index, the Spanish competitiveness index based on the CPI, the price of oil and the dummy variables. The estimation period is from 2003q1 to 2015q2.

- Model 3 (baseline specification, Spanish prices, long sample): The dependent variable is the foreign consumption in the territory. The explicative variables are the income index, the Spanish competitiveness index based on the CPI, the price of oil and the dummy variables. The estimation period is from 2000q1 to 2018q4.

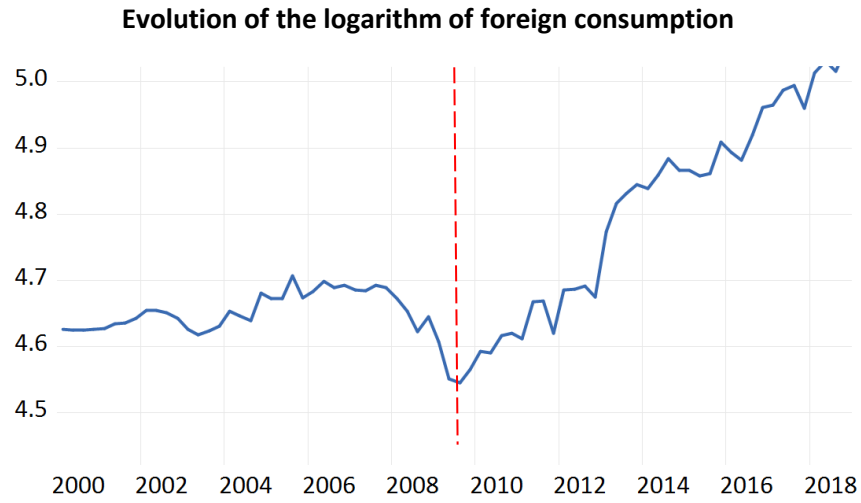
At this point, looking at the evolution of the foreign consumption and the income index (see Figure 4.8 and Figure 4.9), it is noted a possible structural change in 2009q3. This hypothesis is contrasted through the Chow test in Model 3. Since the null hypothesis is rejected, our data provides evidence on a structural breakpoint in 2009q3.

Chow Breakpoint Test: 2009Q3
Null Hypothesis: No breaks at specified breakpoints

Equation Sample: 2000Q1 2018Q4

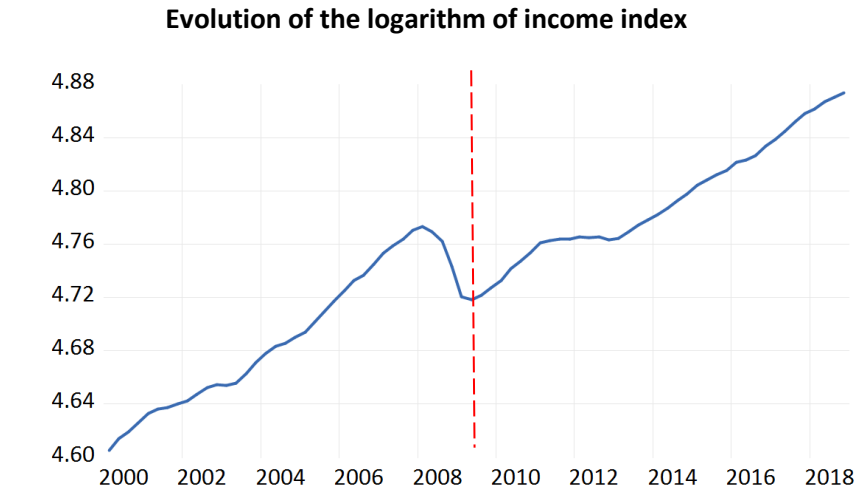
F-statistic	12.60367	Prob. F(3,70)	0.0000
Log likelihood ratio	32.82322	Prob. Chi-Square(3)	0.0000

Figure 4.8



Source: own elaboration based on Idescat data.

Figure 4.9



Source: own elaboration

- Model 4 (baseline specification, Spanish price, long sample, structural break): This model tries to capture the effect of the structural breakpoint in foreign consumption and in real income in 2009q3, so it is introduced a dummy variable to capture a different response of our determinants across the sample. According to the empirical literature, we consider both a multiplicative and an additive effect of our dummy variable The dependent variable is the foreign consumption in the territory. The explicative variables are the income index, the Spanish competitiveness index based on the CPI, these explicative variables multiplied by the dummy variable and the dummy variable itself. The estimation period is from 2000q1 to 2018q4.

5. Results and discussion

Once the econometric specification and the different models are defined, in this section the results are presented and analysed. The logarithm of tourism demand or tourism revenues is LF_TUR; the logarithm of Catalan price competitiveness index is LPRICE_CAT, the logarithm of Spanish price competitiveness index is LPRICE_SPA; the logarithm of the income index is LF_INCOME (or LF_INC) and finally the dummy variable specified in Model 4 is D09.

Model 1: (2003q1-2015q3)

Long term equation: $LF\ TR = \underset{(4.12)}{4.32} - \underset{(-8.70)}{2.02} LPRICE\ CAT + \underset{(7.32)}{2.03} LF\ INCOME$

$$Adjusted\ R^2 = 0.74 \quad Durbin - Watson\ stat = 0.58$$

Short term equation: $\Delta\ LF\_TR = \underset{(0.37)}{0.00} - \underset{(-0.07)}{0.02}\ \Delta\ LPRICE\ CAT + \underset{(3.31)}{1.13}\ \Delta\ LF\ INC - \underset{(-1.76)}{0.18}\ \varepsilon_{-1}$

$$Adjusted\ R^2 = 0.07\ \ Durbin - Watson\ stat = 1.96$$

Model 2: (2003q1-2015q3)

Long term equation: $LF\_TR = \underset{(3.86)}{4.54} - \underset{(-6.66)}{1.79} LPRICE\_SPA + \underset{(5.84)}{1.80} LF\_INCOME$

$$Adjusted\ R^2 = 0.63 \quad Durbin - Watson\ stat = 0.40$$

Short term equation: $\Delta\ LF\_TR = \underset{(0.32)}{0.00} - \underset{(-0.15)}{0.04}\ \Delta\ LPRICE\_SPA + \underset{(3.25)}{1.15}\ \Delta\ LF\_INC - \underset{(-2.09)}{0.13}\ \varepsilon_{-1}$

$$Adjusted\ R^2 = 0.04\ \ Durbin - Watson\ stat = 2.06$$

Model 3: (2000q1-2018q4)

Long term equation: $LF\_TR = \underset{(3.20)}{1.95} - \underset{(-9.19)}{1.46} LPRICE\_SPA + \underset{(17.83)}{2.03} LF\_INCOME$

$$Adjusted\ R^2 = 0.88 \quad Durbin - Watson\ stat = 0.37$$

Short term equation: $\Delta\ LF\_TR = \underset{(0.40)}{0.00} - \underset{(-0.50)}{0.11}\ \Delta\ LPRICE\_SPA + \underset{(3.56)}{1.27}\ \Delta\ LF\_INC - \underset{(-2.95)}{0.15}\ \varepsilon_{-1}$

$$Adjusted\ R^2 = 0.07\ \ Durbin - Watson\ stat = 2.07$$

Model 4: (2000q1-2018q4)

Long term equation: $$LF\_TR = \underset{(9.04)}{2.70} - \underset{(-2.13)}{0.61} LPRICE\ SPA - \underset{(1.07)}{0.44} LPRICE\_SPA * D09 + \underset{(3.24)}{1.02} LY^* + \underset{(6.00)}{2.24} LF\ INCOME * D09 - \underset{(-5.70)}{12.80} D09$$

$$Adjusted\ R^2 = 0.92 \quad Durbin - Watson\ stat = 0.48$$

Short term equation: $$\Delta\ LF\_TR = \underset{(0.33)}{0.00} - \underset{(-0.53)}{0.14}\ \Delta\ LPRICE\_SPA + \underset{(2.35)}{1.30}\ \Delta\ LF\_INC - \underset{(-1.70)}{0.16}\ \varepsilon_{-1}$$

$$Adjusted\ R^2 = 0.05 \quad Durbin - Watson\ stat = 2.03$$

Table 5.1 summarizes the results of the four models and compares them with the results obtained by Álvarez, García and Gordo (2007).

On the one hand, it is appreciable that, in the long term, tourism demand depends positively on the real income of the countries of origin of main tourists in Catalonia, and negatively on the relative prices. On the other hand, neither the dummy variables that tried to correct the idiosyncratic effects of terrorist attacks nor the price of oil have proven to be significant, so none of them have been included in the equations. Furthermore, in the short term only real income keeps its influence on tourism demand, because relative prices are not significant in the short term. A possible explanation may be the importance of residential tourism; there are an important number of residences in Catalonia which are property of tourists that use the residences during their stay instead of staying in tourist accommodations, so the importance of relative prices for these tourists will be probably lower. The perception of Catalonia as a luxury tourist destination might be another reason why the relative prices are not significant in the short term, since this type of tourism is less sensitive in response to changes in prices.

Table 5.1

Summary of results. Empirical determinants of Catalan foreign tourism demand

Dependent Variable: foreign consumption in the territory

	Model 1		Model 2		Model 3		Model 4		Benchmark BDE	
	Short term	Long term	Short term	Long term	Short term	Long term	Short term	Long term	Short term	Long term
Income elasticity	1.13***	2***	1.15***	1.80***	1.27**	2***	1.30**	1.02***	no sign.	1.9***
Price elasticity	-0.02	-2***	-0.04	-1.79***	-0.11	-1.46***	-0.14	-0.61**	-0.81***	-1.65***
Error correction mechanism	-0.18*		-0.13**		-0.15***		-0.16*			-0.55***
Income elasticity*dummy 2009-2018								2.25 ***		
Price elasticity*dummy 2009-2018								0.44		
Dummy variable 2009-2018								-12.8***		
Adjusted R-squared	0.068	0.74	0.045	0.63	0.066	0.875	0.05	0.92		0.993
Number of observations	49	50	49	50	75	76	75	76		
Period From:	2003q1	2003q1	2003q1	2003q1	2000q1	2000q1	2000q1	2000q1		
Period To:	2015q2	2015q2	2015q2	2015q2	2018q4	2018q4	2018q4	2018q4		
Predictive capability (2000-2018)										
- Mean Absolute Error		0.034		0.045		0.039		0.027		
- Theil Index Coeff.	0.663		0.682		0.667		0.687			

Model 1: 2003-2015, Catalan competitiveness index.

Model 2: 2003-2015, Spanish competitiveness index.

Model 3: 2000-2018, Spanish competitiveness index.

Model 4: 2000-2018, Spanish competitiveness index structural breakpoint.

*** ***, ** and * statistically significant at 99%, 95% and 90%.

Analysing the estimates coefficients, the elasticities are interpreted. The long term income elasticity is high and similar in all models, remaining around 2. Then, the estimation suggests that tourism in Catalonia is a luxury good, since an increase of the income of tourists would cause an increase in tourism demand more than proportional.

Although the estimations among the literature are not completely comparable, this result is so close with the result of Álvarez, García and Gordo (2007) and Izquierdo and Pereira (2006), who estimated an income elasticity of 1.9 for the Spanish economy.

Going back to older literature, Buisán and Gordo (1997) estimated a value of 2.7 in the period 1967-1995, also for the Spanish economy, and Witt and Witt (1995) estimated an average of 2.4 through their research in international literature.

It seems that, although the income elasticity is quite high, it would have been decreasing during the last two decades according to the literature analysed.

The income elasticity in the short term is lower than in the long term, but it is still high and greater than 1, which means tourism in Catalonia is a luxury good in the short term too. Buisán and Gordo (1997) estimated a value of 2.31, while Álvarez, García and Gordo (2007) conclude that this variable is not significant in the short term.

Concerning the price elasticity of tourism demand in the long term, it is quite high; it oscillates between -1.46 and -2. Then, foreign tourism demand has an elevated sensitivity to changes in relative inflation as well as to changes in exchange rates. An increase in relative prices would cause a decrease in foreign tourism demand in the long term in Catalonia more than proportional, since the elasticity is greater than 1 in all models. It is noted that the model that use the relative tourism prices of Catalonia (Model 1) shows higher price elasticity. This result is similar to the results obtained by Álvarez, García and Gordo (2007), which estimated a value of –1.65 and Buisán (1995), who estimated a value oscillating between –1.69 and –1.80; but lower than –2.67, the result obtained by Buisán and Gordo (1997).

Moreover, Models 1 and 2 are supposed to be compared between them. Both models are identical except for the variable used as relative prices; notice that Model 1 uses the Catalan index while Model 2 uses the Spanish one. First, analysing the goodness of fit, Model 1 shows a higher adjusted R-squared in both long- and short-term equations, so its estimation fits better than the Model 2. Second, both models can be compared through the information criterion test, which allows comparing the relative quality of both models (see Table 5.2). Model 1 has lower values in the three tests, so it is qualitatively better than Model 2.

Table 5.2

	Model 1	Model 2	Model 1	Model 2
Info criteria	Short term	Short term	Long term	Long term
Akaike info criterion	-4.34	-4.31	-3.30	-2.96
Schwarz criterion	-4.18	-4.16	-3.19	-2.85
Hannan-Quinn criter.	-4.28	-4.25	-3.26	-2.92

Source: own elaboration

Model 4 introduces the structural change detected in 2009q3. Note that the structural change is affecting both the constant and the slope. In terms of the constant, the dummy variable D09 has a negative coefficient, so the constant decreases with the structural change, probably due to the effect of the latest global crisis, which may be seen as a negative shock of demand. Nonetheless, the slope of the dependent variable increases, as stated in Figure 4.8. In the long term equation, income and price elasticities are quite lower in the period before 2009q3.

First, price elasticity is even lower than one; in contrast with the results obtained in the rest of models (all of them obtained price elasticity greater than one). A possible theory to explain this effect may be that after the collapse of the housing bubble in 2007, housing prices in Catalonia suffered a sharp decrease. Under this context, it makes sense that low prices attracted foreign investors to buy residences for touristic uses, among others. Then, a theoretical increase of residential tourism caused by the great fall of housing prices would decreases the price elasticity of foreign tourism demand, since this type of tourism is more loyal and less sensitive to changes in prices. There is no data about residential tourism so it is not possible to contrast this theory.

Second, income elasticity in the long term is 1.02, quite bellow the results obtained in the rests of the models. After the structural change takes place in 2009q3, it increases very sharply after the structural change until 2.25 points, more than the double. The diversification of the origin of foreign tourism demand might have been the cause of the increase of income elasticity; the high increase of tourist expenditure from the United States, Russia and Scandinavian countries may have change the behaviour of foreign tourism demand.

Regarding the goodness of fit of the models, measured with the adjusted R-squared, on the one hand Model 4 has the higher value in the long term and Model 1 has the higher value in the short term. On the other hand, all short term equations show a low R-squared. Then, the short term estimation does have a low explanatory power. This result makes sense considering that relative prices are not significant in the short term, so the only explanatory variable remaining in the short term equations is the real income. Then, adding more explanatory variables would probably increase the explanatory power of the model; for example, the index of political instability in the competitors' countries of Catalonia. Moreover, the dependent variable is so erratic (see Figure 5.3); its behaviour is difficult to predict so the estimation only captures its trend. The foreign consumption is one of the components of the GDP, on the demand side, with more variability (see Table 5.4). After calculating the typical deviation of the quarterly data of each demand component with respect to GDP, it is noted that the variability of foreign consumption in Catalonia is among the highest. Furthermore, the relative variability of the foreign consumption with respect to the variability of the GDP is approximately three times higher. However, the problem is not the variability but of working with erratic data, despite being seasonally adjusted.

Figure 5.3

Model 3, short term. Residual, actual and fitted graph

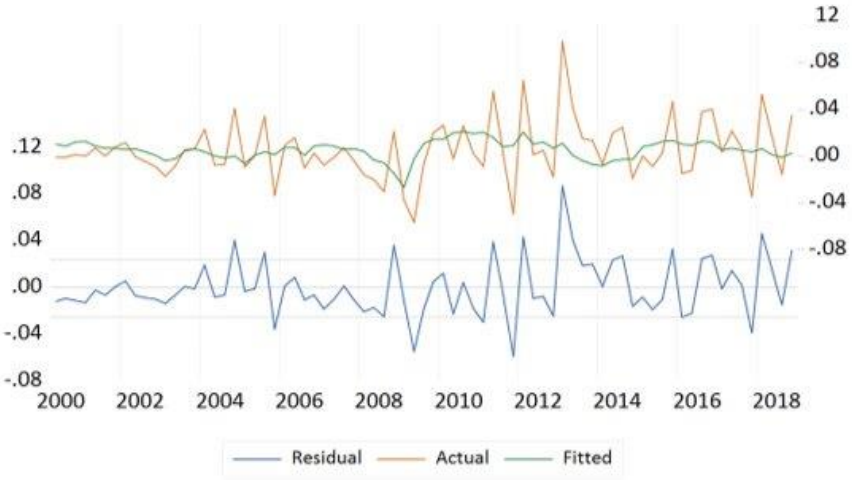


Table 5.4

GDP in volume. Seasonally adjusted data from 2000-2018

	Typical desviation	Relative typical desviation (w.r.t GDP typical desv.)
GDP	0,86	
Domestic demand	1,09	1,26
Household consumer expenditure	0,98	1,13
P.A consumer exp.	1	1,16
Gross capital formation (GFCF)	2,42	2,8
(Equipment goods and others)	3,21	3,73
(GFCF) Construction	2,53	2,93
Total exports	2,28	2,64
Exports of goods and services	2,59	3,01
Foreign cons. in the territory	**2,58**	**2,99**
Total imports	3,11	3,61
Imports of goods and services	3,19	3,71
National residents' consumption abroad	4,85	5,63

Source: own elaboration based on Idescat data.

Finally, it would be interesting to evaluate the predictive capability of the models. To compare the models between them, it is used the Mean Absolute Error (MAE) in the long term equations and the Theil Inequality Coefficient in the short term equations. In order to have that a set of predictions values is good, the MAE has to be as smaller as possible.

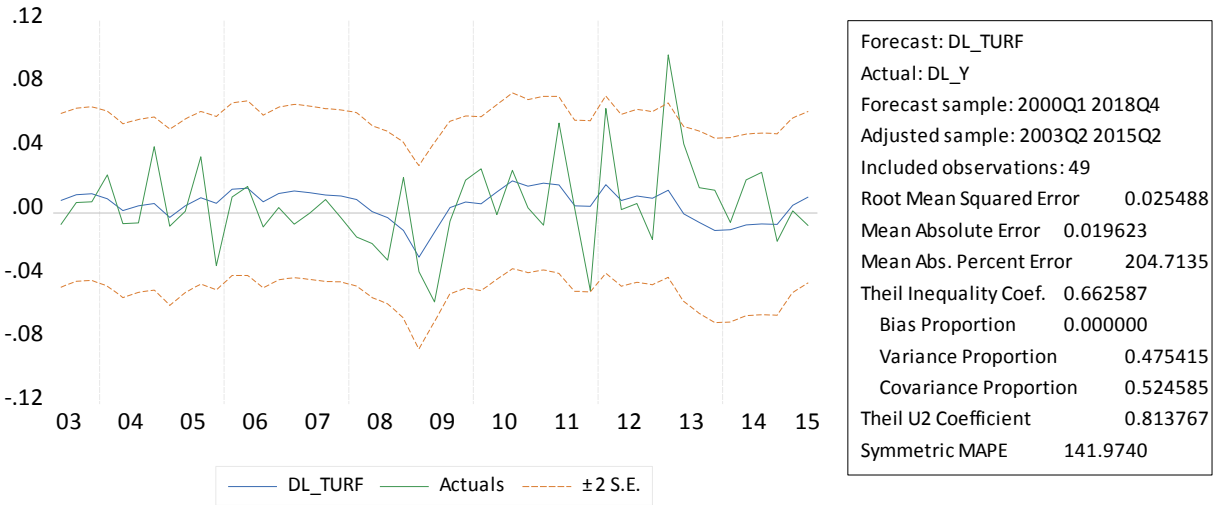
In Table 5.1 are showed all these coefficients. It is noted that in long term equations, all the MAE are quite low, although the utility of these measures is confined to make comparisons; Model 2 has the highest MAE' value and Model 4 has the lowest. Then, Model 4 is the best predictive model in the long term and Model 2 is the worst.

This is also useful to compare Model 1 and 2 and, once again, it is demonstrated that Model 1 is better than Model 2 due to Model 1 is a better predictive model.

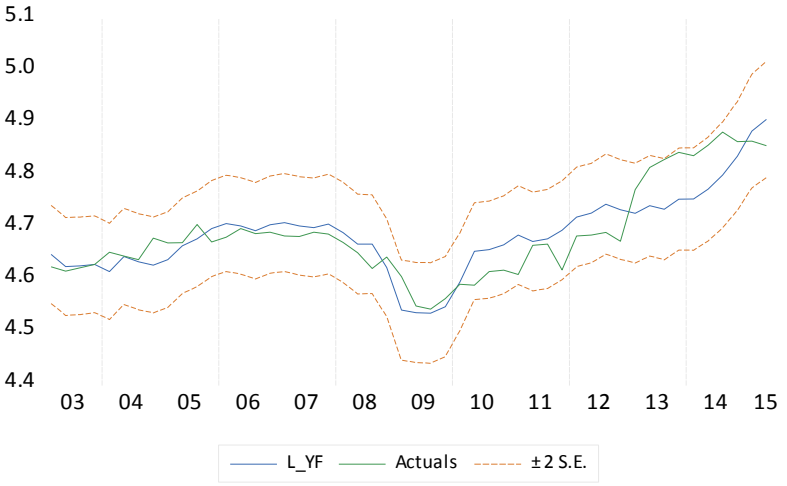
In the short term equations, the Theil Inequality Coefficient allows to compare the models as well as to evaluate the predictive accuracy of a forecasting model. The Theil index can assume values between 0 and 1, with the best values close to 0. This index is similar in all the models; it is more close to 1 than to 0. Then, all models have a low predictive capability in the short term. However, it is still possible to compare the models: in the short term equations, Model 1 is the best predictive model and Model 4 is the worst.

Figures 5.5. Predictive accuracy of all models

Model 1 – Short term.



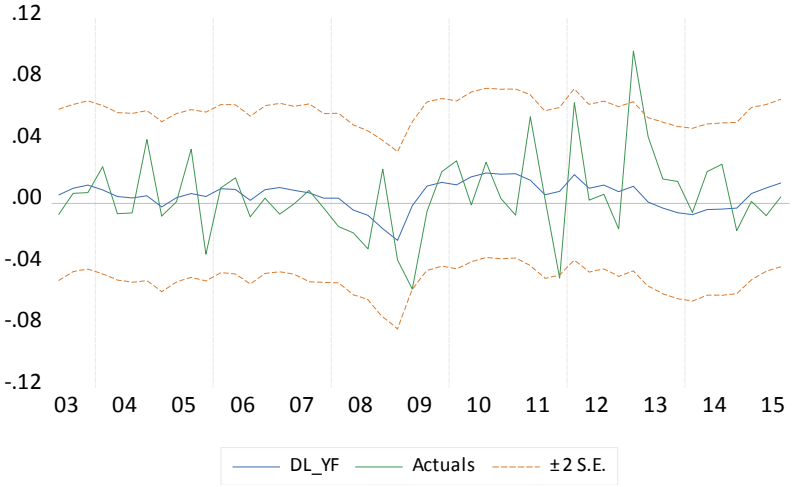
Model 1 – Long term.



Forecast: L_YF
Actual: L_Y
Forecast sample: 2000Q1 2018Q4
Adjusted sample: 2003Q1 2015Q2
Included observations: 50

Root Mean Squared Error	0.043765
Mean Absolute Error	0.034341
Mean Abs. Percent Error	0.727751
Theil Inequality Coef.	0.004667
Bias Proportion	0.000000
Variance Proportion	0.071993
Covariance Proportion	0.928007
Theil U2 Coefficient	1.567460
Symmetric MAPE	0.728443

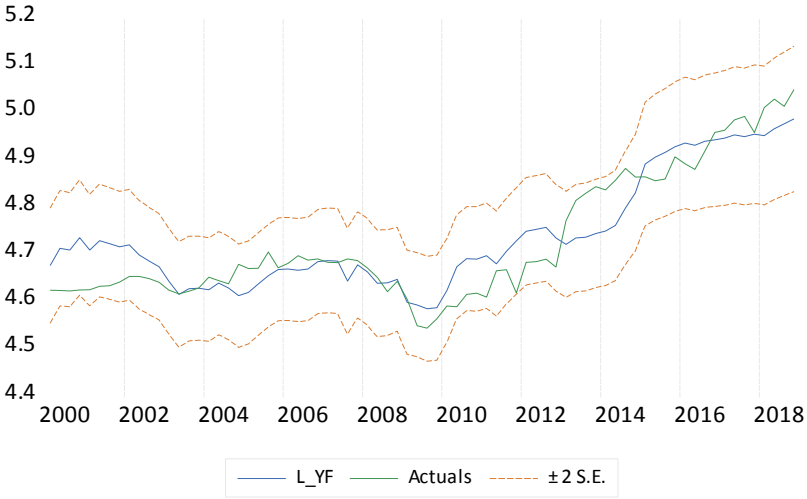
Model 2 – Short term.



Forecast: DL_YF
Actual: DL_Y
Forecast sample: 2000Q1 2018Q4
Adjusted sample: 2003Q2 2015Q3
Included observations: 50

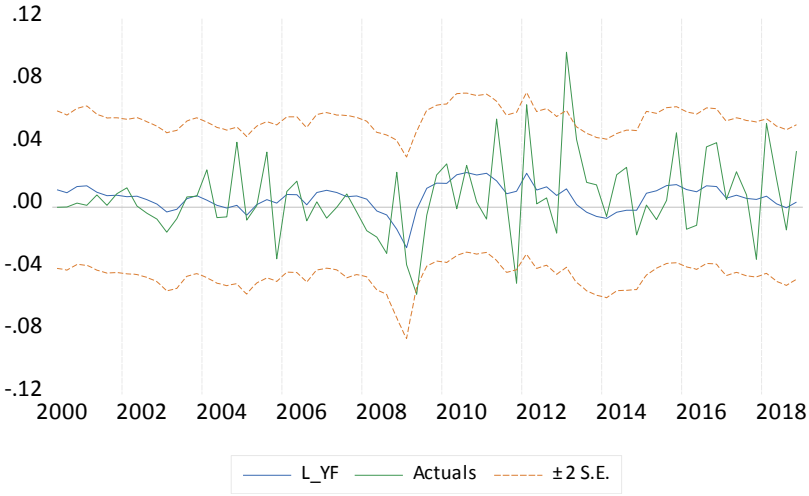
Root Mean Squared Error	0.025576
Mean Absolute Error	0.019070
Mean Abs. Percent Error	193.7494
Theil Inequality Coef.	0.682459
Bias Proportion	0.000049
Variance Proportion	0.505985
Covariance Proportion	0.493965
Theil U2 Coefficient	0.886257
Symmetric MAPE	140.1867

Model 2 – Long term.



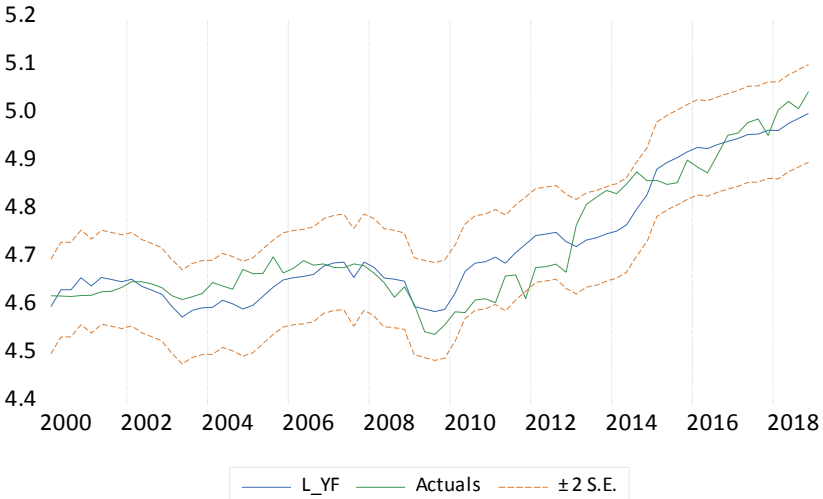
Forecast: L_YF	
Actual: L_Y	
Forecast sample: 2000Q1 2018Q4	
Included observations: 76	
Root Mean Squared Error	0.054806
Mean Absolute Error	0.045201
Mean Abs. Percent Error	0.955994
Theil Inequality Coef.	0.005786
Bias Proportion	0.030546
Variance Proportion	0.106024
Covariance Proportion	0.863430
Theil U2 Coefficient	2.124853
Symmetric MAPE	0.954005

Model 3 – Short term.



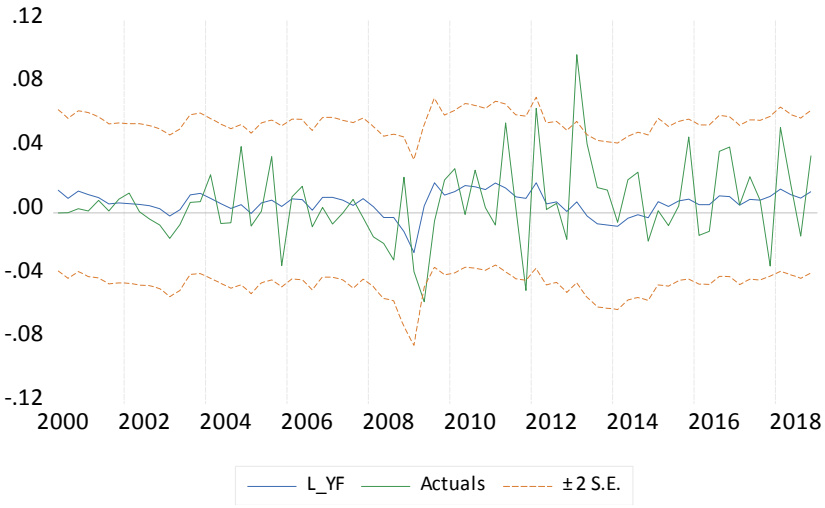
Forecast: L_YF	
Actual: D(L_Y)	
Forecast sample: 2000Q1 2018Q4	
Adjusted sample: 2000Q2 2018Q4	
Included observations: 75	
Root Mean Squared Error	0.023878
Mean Absolute Error	0.017913
Mean Abs. Percent Error	326.0424
Theil Inequality Coef.	0.667208
Bias Proportion	0.000000
Variance Proportion	0.511686
Covariance Proportion	0.488314
Theil U2 Coefficient	1.192657
Symmetric MAPE	137.3914

Model 3 – Long term.



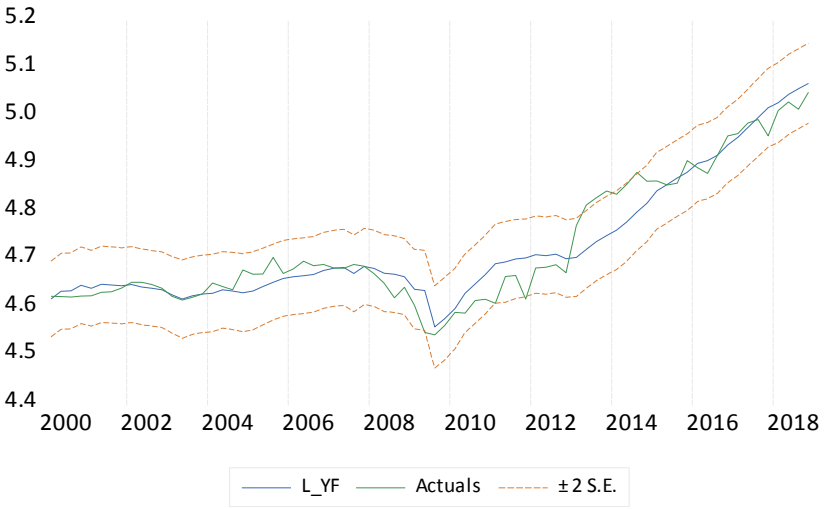
Forecast: L_YF	
Actual: L_Y	
Forecast sample: 2000Q1 2018Q4	
Included observations: 76	
Root Mean Squared Error	0.046675
Mean Absolute Error	0.038667
Mean Abs. Percent Error	0.817802
Theil Inequality Coef.	0.004932
Bias Proportion	0.000000
Variance Proportion	0.032321
Covariance Proportion	0.967679
Theil U2 Coefficient	1.816687
Symmetric MAPE	0.817566

Model 4 – Short term.



Forecast: L_YF	
Actual: D(L_Y)	
Forecast sample: 2000Q1 2018Q4	
Adjusted sample: 2000Q2 2018Q4	
Included observations: 75	
Root Mean Squared Error	0.024142
Mean Absolute Error	0.017942
Mean Abs. Percent Error	300.5893
Theil Inequality Coef.	0.687246
Bias Proportion	0.000000
Variance Proportion	0.549659
Covariance Proportion	0.450341
Theil U2 Coefficient	1.117987
Symmetric MAPE	139.4969

Model 4 – Long term.



Forecast: L_YF	
Actual: L_Y	
Forecast sample: 2000Q1 2018Q4	
Included observations: 76	
Root Mean Squared Error	0.037610
Mean Absolute Error	0.027255
Mean Abs. Percent Error	0.575066
Theil Inequality Coef.	0.003974
Bias Proportion	0.000000
Variance Proportion	0.020508
Covariance Proportion	0.979492
Theil U2 Coefficient	1.457312
Symmetric MAPE	0.575458

Figures 5.5 are the graphics of the forecasts of all equations and their actuals. Analysing these figures it is noted the low predictive capability of the short term equations in all models. As stated above, the dependent variable is pretty erratic in the short term and, again, this fact is a real challenge for a parsimonious model that tries to capture the main determinants of Catalan tourism demand. However, the long term equations' graphs show a much better predictive capability, especially in the period before 2009q3. Here, the structural change analysed in the section 4.2 and introduced in Model 4 takes place and it negatively affects the predictive capability of the models, since the new behaviour is not so well captured by the estimations. In the graphs of Figures 5.5 it is noted that the forecasting long term equation of Model 4 approximates better the real observations.

6. Conclusions

This thesis analyse the influence of real income and relative prices as determinants of foreign tourism demand. Under this propose, there have been used four uniequational models through an error correction mechanism model, each one compounded by its short and long term equation. The data used is quarterly data for the period 2000-2018 (Model 3 & 4). However, Model 1 and 2 uses a restricted sample for the period 2003q1-2015q2 in order to compare both models. The aim of this comparison is to analyse which variable approximates better the relative prices in Catalonia: whether the Catalan competitiveness index based on tourism prices (Model 1) or the Spanish competitiveness index based on consumer price (Model 2). The main conclusions of this thesis are the following:

- The long term equations provide a plausible estimation of the main determinants of the foreign tourism demand, confirming the main hypothesis of the thesis: real income of main countries of origin of tourists in Catalonia and relative prices are the main determinants of foreign tourism demand in the long term. The predictive capability of the models in the long term is reasonable.
- In the short term, the equations do not estimate the foreign tourism demand accurately and they have a low predictive capability. Relative prices are not statistically significant in the short term, so probably there are more explicative variables influencing foreign tourism demand that have not been included in the models. The number of residences property of foreign tourists may be determinant, since residential tourism is less sensitive to changes in prices. Then, economic policies aimed to increase tourist prices (i.e. an increase of tourist tax) would not disturb tourism demand in the short term.
- In the comparison between Model 1 & 2, it is proved that the Catalan competitiveness index is a better approximation of relative tourism prices in Catalonia than the Spanish one, so it has more influence on tourism demand. Therefore, it would be valuable that *Idescat* restart the elaboration of this index that was left in 2015q2 (it is no longer updated).
- The short and long term elasticity of tourism demand with respect to real income of tourists is significant, positive and greater than one. This result confirms the initial hypothesis that tourism expenditure in Catalonia is a luxury good. This fact may be the reason why relative prices are not significant in the short term, since luxury goods are less sensitive to changes in prices.
- The long term elasticity of tourism demand with respect to price competitiveness is significant, negative and greater than one, except in Model 4 that it is lower. This result shows the sensitivity of tourism demand to variations of relative inflation and to real exchange rate in the long term.

- There is a structural change in the data since 2009q3 which increases the response to the dynamic of foreign income, included in Model 4. The results in the long term are that income elasticity increases sharply, and as well, price elasticity is reduced. The increasingly heterogeneous origin of tourism demand may be the reason of this change, due to countries like United States have increased their tourism expenditure in Catalonia during the period and it may have caused a change in the behaviour of tourism demand.
- A possible extension of this thesis would be to calculate the elasticities of each country individually and analyse which one has increased its income elasticity or decreased its price elasticity of tourism demand in order to analyse the cause of the structural change in 2009q3. However, there are countries that have increased their tourism expenditure in Catalonia during the period, like China, but they are not included in the disaggregation of tourism expenditure data of Idescat or INE.Another potential explanation may be the one related to political instability of competitor countries of Catalonia. It may be interesting to check the robustness of our results including this variable.
- In fact, the countries used in the elaboration of real income index represented the 80 % of the total tourism expenditure of Catalonia in 2004 but just the 56 % in 2018; the tendency of diversification in the origin of foreign tourism in Catalonia is clear. Therefore, it would be valuable if the official Statistical Institutes included the new countries in the foreign tourism expenditure data.
- A possible theory of the lower price elasticity in Model 4 would be an increase of residential tourism due to the fall of housing prices in Catalonia when the economic recession started. Data of this type of tourism would be useful, because it seems an important part of tourism and it would help to contrast important theories on literature of this area.
- In the comparison of the elasticities obtained in this thesis with the results obtained in older literature, it is noted that the income elasticities estimated are similar to the ones obtained by Álvarez, García and Gordo (2007) for the Spanish economy, but lower than those obtained by Buisán and Gordo (1997), although this latter work covers a very different period.
- In the following years we expect a decrease in this income elasticity as a result of the boom of low cost transport companies, tourist-use housing with companies like Airbnb or the digitalization of the sector make more accessible and cheaper to travel with respect to a decade ago. Therefore, the tendency of income elasticity seems to be decreasing as the ICT is changing the tourism sector.

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9. Appendix

In this section there are showed all the regressions obtained.

Model 1

Long term:

Dependent Variable: L_F_TR
Method: Least Squares
Date: 05/28/19 Time: 14:08
Sample (adjusted): 2003Q1 2015Q2
Included observations: 50 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.317607	1.046814	4.124522	0.0002
L_PRICES_CAT_D11	-2.024488	0.232619	-8.703020	0.0000
L_I_RENDA	2.034045	0.277947	7.318104	0.0000

R-squared	0.749408	Mean dependent var	4.687757
Adjusted R-squared	0.738744	S.D. dependent var	0.088315
S.E. of regression	0.045141	Akaike info criterion	-3.299944
Sum squared resid	0.095771	Schwarz criterion	-3.185223
Log likelihood	85.49861	Hannan-Quinn criter.	-3.256258
F-statistic	70.27780	Durbin-Watson stat	0.577142
Prob(F-statistic)	0.000000	Wald F-statistic	40.72310
Prob(Wald F-statistic)	0.000000		

Short term:

Dependent Variable: DL_F_TR
Method: Least Squares
Date: 05/28/19 Time: 14:10
Sample (adjusted): 2003Q2 2015Q2
Included observations: 49 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001395	0.003755	0.371395	0.7121
D(L_PRICES_CAT_D11)	-0.022192	0.317458	-0.069906	0.9446
DL_F_INCOME	1.126538	0.340419	3.309271	0.0018
RESID01(-1)	-0.182919	0.104104	-1.757075	0.0857

R-squared	0.126416	Mean dependent var	0.004734
Adjusted R-squared	0.068177	S.D. dependent var	0.027552
S.E. of regression	0.026597	Akaike info criterion	-4.337960
Sum squared resid	0.031832	Schwarz criterion	-4.183526
Log likelihood	110.2800	Hannan-Quinn criter.	-4.279368
F-statistic	2.170646	Durbin-Watson stat	1.955255
Prob(F-statistic)	0.104628	Wald F-statistic	4.172471
Prob(Wald F-statistic)	0.010875		

Model 2

Long term:

Dependent Variable: L_F_TR
Method: Least Squares
Date: 06/03/19 Time: 14:09
Sample: 2003Q1 2015Q2
Included observations: 50
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.537376	1.176069	3.858086	0.0003
L_PRICES_SPA_D11	-1.786567	0.268055	-6.664920	0.0000
L_F_INCOME	1.806752	0.309243	5.842496	0.0000

R-squared	0.649459	Mean dependent var	4.687757
Adjusted R-squared	0.634542	S.D. dependent var	0.088315
S.E. of regression	0.053389	Akaike info criterion	-2.964295
Sum squared resid	0.133969	Schwarz criterion	-2.849573
Log likelihood	77.10736	Hannan-Quinn criter.	-2.920608
F-statistic	43.53926	Durbin-Watson stat	0.401866
Prob(F-statistic)	0.000000	Wald F-statistic	24.40314
Prob(Wald F-statistic)	0.000000		

Short term:

Dependent Variable: D L_F_TR
Method: Least Squares
Date: 06/03/19 Time: 14:12
Sample (adjusted): 2003Q2 2015Q2
Included observations: 49 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001250	0.003855	0.324218	0.7473
D(L_PRICES_SPA_D11)	-0.044328	0.300316	-0.147605	0.8833
D(L_F_INCOME)	1.154929	0.355837	3.245664	0.0022
RESID04(-1)	-0.133631	0.063817	-2.093954	0.0419

R-squared	0.104629	Mean dependent var	0.004734
Adjusted R-squared	0.044937	S.D. dependent var	0.027552
S.E. of regression	0.026926	Akaike info criterion	-4.313326
Sum squared resid	0.032626	Schwarz criterion	-4.158892
Log likelihood	109.6765	Hannan-Quinn criter.	-4.254734
F-statistic	1.752827	Durbin-Watson stat	2.066641
Prob(F-statistic)	0.169794	Wald F-statistic	4.117016
Prob(Wald F-statistic)	0.011557		

Model 3

Long term:

Dependent Variable: L_F_TR
Method: Least Squares
Date: 05/28/19 Time: 14:12
Sample: 2000Q1 2018Q4
Included observations: 76
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.952555	0.610159	3.200075	0.0020
L_PRICES_SPA_D11	-1.460985	0.158980	-9.189729	0.0000
L_F_INCOME	2.028205	0.113720	17.83509	0.0000

R-squared	0.878685	Mean dependent var	4.729996
Adjusted R-squared	0.875362	S.D. dependent var	0.134898
S.E. of regression	0.047625	Akaike info criterion	-3.212264
Sum squared resid	0.165571	Schwarz criterion	-3.120261
Log likelihood	125.0660	Hannan-Quinn criter.	-3.175495
F-statistic	264.3702	Durbin-Watson stat	0.372051
Prob(F-statistic)	0.000000	Wald F-statistic	160.0696
Prob(Wald F-statistic)	0.000000		

Short term:

Dependent Variable: D(L_F_TR)
Method: Least Squares
Date: 06/14/19 Time: 12:14
Sample (adjusted): 2000Q2 2018Q4
Included observations: 75 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001185	0.002986	0.396946	0.6926
D(L_PRICES_SPA_D11)	-0.113678	0.229575	-0.495167	0.6220
DL_ F_INCOME	1.268881	0.356629	3.557985	0.0007
RESID02(-1)	-0.148219	0.050316	-2.945785	0.0044

R-squared	0.104346	Mean dependent var	0.005669
Adjusted R-squared	0.066502	S.D. dependent var	0.025400
S.E. of regression	0.024541	Akaike info criterion	-4.525062
Sum squared resid	0.042761	Schwarz criterion	-4.401462
Log likelihood	173.6898	Hannan-Quinn criter.	-4.475710
F-statistic	2.757231	Durbin-Watson stat	2.072482
Prob(F-statistic)	0.048589	Wald F-statistic	5.098493
Prob(Wald F-statistic)	0.002978		

Model 4

Long term:

Dependent Variable: L_F_TR
Method: Least Squares
Date: 06/11/19 Time: 12:59
Sample: 2000Q1 2018Q4
Included observations: 76
Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.697874	0.298278	9.044830	0.0000
L_PRICES_SPA_D11	-0.606011	0.284022	-2.133680	0.0364
L_PRICES_SPA_D11*D09	0.443772	0.413142	1.074141	0.2864
L_F_INCOME	1.019937	0.314473	3.243325	0.0018
L_F_INCOME *D09	2.245717	0.373929	6.005733	0.0000
D09	-12.78508	2.242701	-5.700750	0.0000

R-squared	0.921232	Mean dependent var	4.729996
Adjusted R-squared	0.915606	S.D. dependent var	0.134898
S.E. of regression	0.039189	Akaike info criterion	-3.565201
Sum squared resid	0.107503	Schwarz criterion	-3.381196
Log likelihood	141.4776	Hannan-Quinn criter.	-3.491664
F-statistic	163.7376	Durbin-Watson stat	0.476149
Prob(F-statistic)	0.000000	Wald F-statistic	433.4771
Prob(Wald F-statistic)	0.000000		

Short term:

Dependent Variable: D(L_F_TR)
Method: Least Squares
Date: 06/11/19 Time: 13:00
Sample (adjusted): 2000Q2 2018Q4
Included observations: 75 after adjustments
Huber-White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001243	0.003823	0.325059	0.7461
D(L_PRICES_SPA_D11)	-0.140453	0.263726	-0.532574	0.5960
D(L_F_INCOME)	1.298632	0.552116	2.352102	0.0214
RESID05(-1)	-0.158777	0.093176	-1.704059	0.0927

R-squared	0.084452	Mean dependent var	0.005669
Adjusted R-squared	0.045767	S.D. dependent var	0.025400
S.E. of regression	0.024812	Akaike info criterion	-4.503093
Sum squared resid	0.043711	Schwarz criterion	-4.379494
Log likelihood	172.8660	Hannan-Quinn criter.	-4.453742
F-statistic	2.183071	Durbin-Watson stat	2.025953
Prob(F-statistic)	0.097547	Wald F-statistic	2.640888
Prob(Wald F-statistic)	0.055959		

To test the existence of unit roots, there has been applied the Augmented Dicky Fuller test to all the variables.

Augmented Dickey-Fuller test statistic

Levels	F_TR	F_INCOME	PRICES_CAT	PRICES_SPA
-tstatistc	-0.93	-2.99	-0.48	-1.38
pvalue	0.95	0.14	0.98	0.86
note: we assume that the deterministic specification follows a constant linear trend.				

1st diff	F_TR	F_INCOME	PRICES_CAT	PRICES_SPA
Augmented Dickey-Fuller test statistic				
-tstatistc	-8.94	-4.07	-4.64	-6.89
pvalue	0.00	0.00	0.00	0.00
note: we assume that the deterministic specification follows a constant.				