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Low Cost Carriers and Foreign Tourism Inflows: a Cointegrated VAR Analysis for Italy[1]

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ABSTRACT

This paper seeks to quantify the impact of the expansion of LCC on foreign tourism trends in Italy. We rely on a novel data set on the seats on flights by low cost carriers between foreign destinations and each Italian airport.

Cointegrated vector autoregressive models are estimated for both Italy and its main geographical areas. A single equilibrium relation is uncovered, relating the level of LCC travel supply to the dynamics of the global business cycle, of relative consumer prices and of foreign tourist expenditure.

According to our structural impulse response analysis, a positive shock to LCC travel supply determines an increase in Italy both for foreign tourist expenditure and for arrivals. The estimated response for per capita expenditure is positive at national level, but negative for two of the four macro regions. These findings suggest that focusing on arrival statistics may provide a partial view of the impact of LCC supply policies.

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Keywords: Tourism Demand, Low Cost Carriers, Cointegration Analysis, Airports, Regional Economics.

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Introduction

This paper provides an empirical analysis of the joint evolution of the foreign tourism and low fare air transport industries in Italy over the last decade.

The expansion of the operations of low cost carriers (LCCs), opening new routes and market segments and connecting a large number of regional destinations, has changed foreign tourism demand. Before the introduction of LCC travel facilities many cities had no direct air access to foreign destinations and could be reached via a hub airport. This made journeys longer and more expensive, discouraging potential foreign tourists from travelling to locations not served by direct flights. As a consequence tourism seasonality was more pronounced and prices variation sharper.

Overall, the descriptive evidence shows that in the years from 1999 to 2009 period, as LCC business soared in, the number of foreign travellers flying to Italy increased substantially. However, the rise in inbound passenger traffic was not matched by a parallel increase in foreign tourism receipts, which fell slightly over the same period as real expenditure per visitor diminished. Both the shortening of the average stay and the fall in daily expenditure per person contributed to this outcome.

The success of the low fare travel industry can be considered an important factor of the rapid growth in the number of tourists arriving but it may also help explain the trend of per capita expenditure. From a theoretical point of view, the reduction in fares or travel time made possible by an increased supply of LCC flights can have both positive and negative effects on the per capita tourist expenditure.

A reduction in air transport prices, by inducing a positive income effect, should result in increased tourist expenditure, as travellers have more money to spend on alternative items of the tourism consumption bundle.

A time effect can supplement the income effect when new air routes are opened by LCCs. By exploiting the new travel opportunities, foreign tourists facing a tight constraint on the length of their vacation may be able to reduce the overall time spent travelling and have more time to spend at their final destination.

Negative effects on average individual expenditure levels can be envisaged when reduced transport costs trigger an unfavourable change in the composition of the pool of foreign travellers. By making long journeys affordable to less wealthy foreign consumers, an expansion of the LCC flight supply can generate an adverse selection effect, as low-spending tourists partially crowd out higher-spending travellers.

As both the positive income/time effect and negative selection effects coexist, it is not possible to identify a priori the sign of the influence of LCC supply expansion on per capita tourist expenditure, which will have to be assessed on empirical grounds.

By fitting a series of cointegrated VAR models, we seek to shed light on the complex network of influences exerted by the expansion of the supply of low fare flights on the short- and long-run dynamics of foreign tourism in Italy. We subsequently dealt with the issue of differential effects across tourist districts by estimating the model separately for Italy's four macro regions.

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The endogenous response of LCC travel supply to global and local shocks affecting travel demand is fully taken into account within the proposed structural VAR model, allowing some interesting dynamics to be disclosed in this regard as well.

The paper is organized as follows. Section 2 provides a concise review of the relevant literature and highlights the role of local public policy in stimulating LCC flight operations at specific airports. Some preliminary descriptive evidence is presented in Section 3. Section 4 is devoted to the specification, identification and estimation of the baseline structural VAR model. Section 5 deals with an extended model, separately addressing tourist arrivals and individual expenditure. Regional dynamics are documented in Section 6. Section 7 summarizes and concludes.

1. Review of the literature

In 1991 Ryanair transformed itself from a conventional regional airline into an LCC, following the path blazed by Southwest Airlines in the early 1970s in the United States (see De Neufville, 2007). In Italy low fare airlines began to operate at the end of the 1990s and expanded their activity at a fast pace. According to ENAC, Italy's civil aviation authority, in the period 2004-09 the number of passengers travelling with LCCs rose by nearly 60 per cent, well above the average growth rate in Europe and faster than in the other main EU countries (Germany, France, the UK and Spain; see Cepolina-Parola, 2008).

Wong et al. (2007) reviewed the main empirical studies encompassing the use of panel data and VAR technique, and Song and Li (2008) compiled a list of articles published in tourism scientific journals. The most important determinants of tourism demand underlined by the literature are tourists' income, tourism prices in the destination relative to those in the home country, tourism prices in competing destination countries (substitute prices) and exchange rates.

We show the results of a selected list of papers: De Mello and Nell (2001) specify a VAR model for British tourism demand towards France, Spain and Portugal. They estimate the long-run relationships between destinations' shares of tourism expenditure, UK real per capita tourism budget, cross and own prices. The reactions have the expected signs (positive for an increase in per capita tourism budget and negative for an increase in prices).

Song and Witt (2006) perform an impulse response analysis to examine the impacts of shocks to each of the explanatory variables on the demand for tourism. They study inbound tourism to Macau and consider, as explanatory variables, GDP in foreign countries, own prices and substitute prices. In their evidence, tourism demand generally responds with correct signs to different shocks, but the magnitudes of the responses are small. The effects tend to last for 3–4 years.

According to the empirical results on demand for Hong Kong tourism (Wong et al., 2006), the forecasting performance of VAR models can be improved when they are estimated using the Bayesian approach (BVAR model).

Various aspects of the effects of LCC on air travel markets have been pointed up. Piga and Bachis (2006) provide information about the impact on prices. Graham (2013) and Lin et al. (2013) provide some relevant insights on the relationships between LCCs and airports. Among the papers finding a positive impact of LCCs on regional development, we mention Hahn (2006) for the creation of jobs in the region for some German airports, Percoco (2009) for local growth in Italy at NUTS3 level, and Bieger and Wittmer (2006) for the influence on tourism in Switzerland. Williams and Balaz (2009) find links between LCC entry and regional development via four main flows: the labour market; business travel and tacit knowledge; inward investment and business connectivity; and mobility for consumers and markets. The latter flows include tourism demand, which is quite price elastic.

On the other hand, there is the increasingly important issue of fair competition between airlines; this was examined by the European Commission for the Ryanair-Charleroi airport case at the beginning of 2004. In general, financial and commercial advantages to LCCs are not negligible: estimates based on press releases put the French airports' subsidies in favour of LCCs at € 35 million per year; for the whole of Europe, subsidies may come to as much as € 660 million. Alderighi and Baccelli (2006) provide some examples from the Italian market: cumulative budgets of € 13.5 million and € 25 million respectively in the regions of Piedmont and Apulia and a specific measure by Aeroporti di Roma (ADR) in Rome (see also Cour des Comptes, 2008; Vera Rebollo and Ivars Baidal, 2009).

2. Some descriptive evidence

Our empirical analysis of foreign tourism demand in Italy is carried out on a novel data set pooling information on inbound tourism flows from the Bank of Italy survey and data on the supply of LCC travel services to foreign destinations operated within each Italian airport.

The Bank of Italy's international tourism (IIT) survey is a sample survey involving some 150,000 interviews per year conducted at the country's border. The survey-based statistics encompass information compiled at different intervals (monthly, quarterly, annual) and with different territorial disaggregation (up to the NUTS3 level). The specific characteristics of the survey and downloadable data are available at http://www.bancaditalia.it/statistiche/rapp_estero/altre_stat/turismo-int.

In the period 1999-2009 foreign tourism expenditure in Italy declined slightly in real terms (Figure 1.a). In real terms, receipts decreased in the Centre and the North-East, while they remained stable in the North-West. In the South foreign tourism expenditure showed an upward trend until 2006, followed by a sharp reversal. The decline of tourism expenditure has been shown to depend on different factors, such as the rise of new destinations in emerging countries and the crowding out of some traditional catchment areas (e.g., Germany, United States and Japan). In this context, the LCC expansion should attenuate the underlying reduction in tourism demand by bringing down travel airfares.

In order to get some insights of the determinants of the decline in total foreign receipts, the latter can be decomposed as follows:

$$TE_{ij} = A_{ij} * L_{ij} * PCE_{ij}$$

where TE_{ij} is the total expenditure in region i from country j, A is the arrivals of international tourists, L the average length of stay and PCE is the per capita daily expenditure.

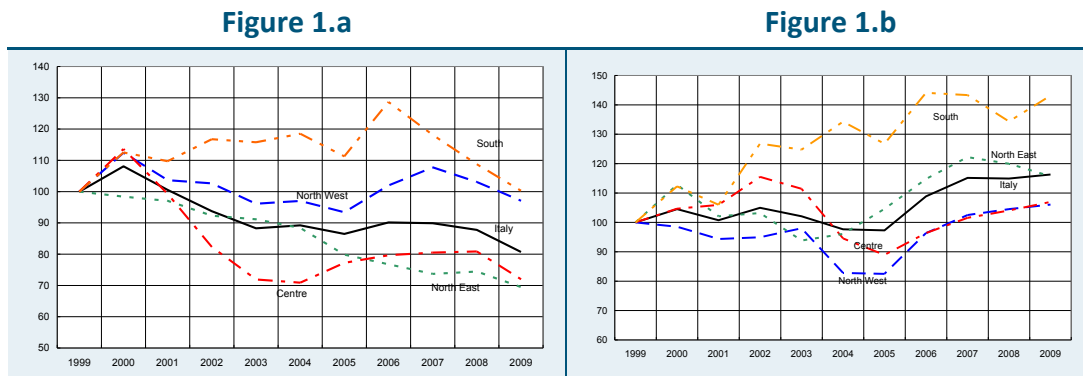| Figure 1.a	Figure 1.b

Figure 1a: International tourism expenditure in Italy (real terms, index 1999=100).
Figure 1b: International tourism arrivals to Italy (index 1999=100).
Source: Bank of Italy, based on IIT Survey.

Contrary to the dynamics of total receipts, foreign tourist arrivals (A_{ij}) recorded a cumulative 16.3 per cent increase in the period 1999-2009 (Figure 1.b). The average length of the stay of international travellers (L_{ij}) trended downwards starting in 2005 (Figure 2.a). The cumulative decline, amounting to less than 20 per cent, explains a substantial part of the reduction in total foreign tourism receipts. All the macro regions except the North–West show a decline similar to the one observed at the national level. To better understand the heterogeneous behaviour of this variable, it is useful to refer directly to the duration of trip depicted in Figure 2.a: on average, the length of tourist stays fell from 4.3 to 3.5 days in Italy. In the South, where the decline came to a cumulative 25.9 per cent, the initial length of the stay far exceeded the average for the country. The performance recorded in the North-West reflected the very short length of stays in the initial year (2.3 days in 1999); the North-West is the main target areas in Italy for business trips, which involve shorter stays.

Like travel duration, average daily expenditure (PCE_{ij}) shows a decrease over the period in question (15 per cent; Figure 2.b). This may have been due to the replacement of wealthier tourists (such as Japanese, Americans and Germans) by travellers from emerging countries, with smaller budgets. The global tendency to exploit low cost holiday opportunities may have had an impact. The decline was uniform across Italy except for the South, where a milder reduction was recorded (5.5 per cent), due to an initial level 28.5 per cent below the national standard.

The statistics compiled by the International Center for Competitiveness Studies in the Aviation Industry (ICCSAI) based on raw data from OAG Aviation allow us to evaluate the dynamics of the LCC supply of travel services to foreign destinations over the last

decade. As shown by Figures 3.a and 3.b, LCC business grew rapidly in all four macro regions in terms both of total available seats and of market shares.

During the period 1999-2009, the LCC market share on routes to and from Italy grew continuously, increasing more than 16-fold. In terms of available seats, LCC supply showed the steepest increase in the North West. The South and Centre also outperformed the average.

According to Assaeroporti, in the period 2000-09 passenger traffic on international flights to/from Italian airports increased overall by 5.3 per cent per year. LCC market share increased as a result of the slackening of growth for the traditional carriers. Figure 3.b shows that the rise in LCC market share was especially pronounced in the South, with a sharp increase until 2005 and a subsequently flattening at a very high level (about 70 per cent). At the end of the period LCC market share in the North-West and the North-East was close to the national average, slightly below 40 per cent. In the Centre market share remained below the national average despite a ten fold increase (from 3.8 to 31.2 per cent).
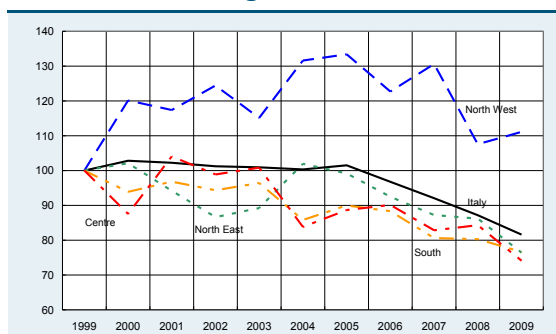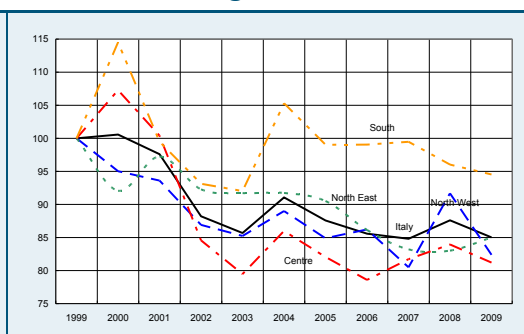
Figure 2.a **Figure 2.b**

Figure 2a: International tourism in Italy – Duration of trip (index 1999=100).
Figure 2b: International tourism in Italy – Per capita expenditure (index 1999=100).
Source: Bank of Italy, based on IIT Survey.
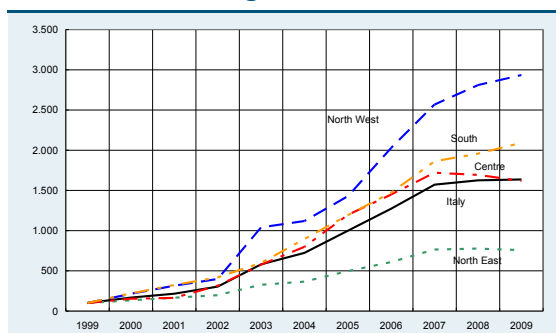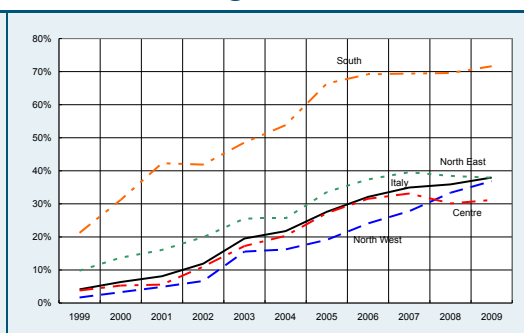
Figure 3.a **Figure 3.b**

Figure 3a: LCC: Available seats. International flights to/from Italy (index 1999=100).
Figure 3b: LCC market share in Italy in terms of available seats (1) (percentages).
Source: ICCSAI calculations based on OAG data.
(1) LCC share of total available seats at Italian airports.

The rise in inbound passenger traffic was not matched by a corresponding increase in foreign tourism receipts, which, on the contrary, recorded a slight reduction in real terms. A decline in average expenditure per foreign visitor accounts for this divergence. The decline was triggered by a shortening of the average length of stays in Italy and a simultaneous decrease in average daily average expenditure.

3. Empirical findings: the baseline model

A recent strand of the literature has advocated the use of identified vector autoregressive (VAR) models in the evaluation of the macroeconomic effects of public infrastructure investment (Pereira, 2001, Kamps, 2005, Di Giacinto et al., 2010). On this respect, the introduction of LCC travel services may be deemed to present points in common with a shock to public infrastructure endowments, as it influences the productivity of the existing stock of airport facilities. Building on this similitude, we choose to rely on the VAR methodology in order to derive our estimates of the impact of the expansion of LCCs on foreign tourism inflows in Italy.

In the VAR approach (Sims, 1980) the system of dynamic equations governing the joint evolution of the endogenous variables is not formally derived from an underlying structural model. In this way greater model flexibility is achieved and, while no empirical estimates of "deep" structural parameters (e.g. the price elasticity of consumer demand for transport services) are obtained, important policy issues may be addressed by analyzing the pattern of dynamic responses of the endogenous variables to unforeseen exogenous shocks affecting any of the system variables.

The baseline VAR specification considered in the empirical analysis was estimated at the national level and includes four endogenous variables. The first two variables account for foreign tourism demand fluctuations due to income and price factors.

Income dynamics in countries of origin are measured by the GDP series for the aggregate OECD area (referred to as INCOME in what follows). The great bulk of foreign tourism flows to Italy originates from this area. Since OECD GDP data are available only on a quarterly basis, monthly figures were obtained by interpolation. The Chow and Lin (1971) method was adopted to this end, using the OECD Composite Leading Indicator (CLI; source: OECD, Main economic indicators).

The OECD relative Consumer Price Index (RCPI) was then introduced in order to account of exchange rate and comparative price level dynamics in Italy and in foreign countries. The RCPI is a measure of the real effective exchange rate that takes into account not only changes in market exchange rates but also variations in relative consumer price levels.

A positive shock to foreign income is expected to boost tourism demand by foreign residents, possibly with a few months' lag, as households usually plan foreign trips well ahead of the actual date of departure.

A positive shock to the relative price level, on the contrary, is expected to discourage foreign tourism demand by lowering the competitiveness of Italian suppliers relative to those located abroad.

The remaining two variables considered in the baseline VAR specifications are the total flight seats on foreign routes supplied by low-cost carriers (LOWCOST) in Italy and the total foreign tourism expenditure series described in the previous section (TOTEXP). While we can rely on a detailed database that provides information on the flight seats operated by LCCs in each Italian airport, only yearly average figures are available. To match the frequency of the model's remaining variables, annual data were interpolated at monthly frequency using data on passenger traffic at individual airports (source: Assaeroporti).

Log-levels, seasonally adjusted figures for the four endogenous variables were considered in the empirical analysis. The order of integration of the individual series was first assessed by running a series of augmented Dickey-Fuller tests. All variables were found out to be I(1), as the null hypothesis could not be rejected at standard significance thresholds for the log-levels while it was always rejected for the first-differenced series.

In order to test for the existence of a long-run equilibrium relation between the VAR system variables, a cointegration analysis was subsequently performed according to the Johansen procedure. The results of the trace tests, reported in Table 1, provide evidence of the presence of only one significant cointegrating relationship, whose expression, normalized with respect to the supply of low cost flights, reads as follows (t-values in brackets):

$$\log LOWCOST_t = 6.79 * \log INCOME_t + 8.98 * \log RCPI_t + 2.74 * \log TOTEXP_t + 0.008 * t$$
$$\quad\quad (4.06) \quad\quad\quad (6.05) \quad\quad\quad (4.45) \quad\quad\quad (2.23)$$

where t denotes a linear deterministic trend, restricted to the cointegrating space.

Table 1: Unrestricted cointegration rank Test (Trace test).

No. of CE(s)	Eigenvalue	Statistic		5% Crit. Value	P.value**
None *	0.240322	53.26026	47.85613	0.0143	
At most 1	0.107654	21.37642	29.79707	0.3346	
At most 2	0.041030	8.163892	15.49471	0.4480	
At most 3	0.028081	3.304000	3.841466	0.0691	

Trend assumption: Linear deterministic trend. Lags interval (in first differences): 1 to 3.

* denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values.

The normalized cointegrating relation can be interpreted as providing the long-run equilibrium level between supply and demand of low cost travel services. Increased income levels in countries of origin and higher foreign tourism expenditure flows are

expected to boost demand for international travel services and both are positively correlated with the supply of low cost flights in the long-run equilibrium.

The sign of the equilibrium relationship between the low cost flight supply and national price competitiveness cannot be univocally determined a priori. On the demand side, higher relative prices should discourage inbound tourism but, at the same time, they should also stimulate outbound flows. The overall impact on the level of low cost travel flows will thus depend on which of these opposing forces prevails. On the supply side, LCCs may be better equipped than standard carriers to compete in markets with an overall higher price level. In this case a positive relation between the supply of low cost flight seats and the relative CPI should be expected.

On the whole, our empirical estimates point to the existence of a positive and significant long-run association between the LOWCOST and RCPI indicators.

Once the system variables have been found to be jointly cointegrated, the VAR model can be better expressed in the corresponding vector error correction (VEC) form, which (again omitting deterministic components) reads as

$$\Delta X_t = \Pi X_{t-1} + \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + ... + \Gamma_{p-1} \Delta X_{t-p+1} + \varepsilon_t$$

where

$$X_t = \begin{bmatrix} \log INCOME_t \\ \log RCPI_t \\ \log LOWCOST_t \\ \log TOTEXP_t \end{bmatrix}$$

and where the where the Π matrix has rank $\rho=1$.

Once the VEC model parameters have been estimated, the short and long-run dynamic feedbacks across the endogenous variables can be uncovered by analyzing the impulse response functions.

As is well known, in order to permit a structural interpretation of dynamic impulse-response coefficients, a proper identification scheme has to be introduced. By referring to the large empirical VAR literature initiated by Sims (1980), we achieve identification by assuming that structural shocks are linked to the VEC model reduced-form errors by the following recursive system of linear relations

$$\begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 \\ a_{41} & a_{42} & a_{43} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix}$$

where $E(\varepsilon_t \varepsilon_t') = \Sigma$, Σ denoting a generic positive definite matrix, and where $E(e_t e_t') = \Omega = diag\{[\omega_1,...,\omega_4]\}$.

Identification is hence based on a specific causal ordering of the endogenous variables in the model. We choose to order the INCOME indicator first, as it is clearly the most exogenous variable in the system, followed by the RCPI indicator. The latter, being a measure of the overall exchange rate and consumer price dynamics, should be influenced only to a limited extent by shocks affecting the foreign tourism market, although such feedback effects are eventually allowed for in the model as only a simultaneous transmission is actually ruled out.

At the core of the proposed set of identifying restrictions lies the relative ordering of the LOWCOST and TOTEXP variables. By assuming that low cost supply is ordered first, we are imposing the restriction that current shocks to foreign tourist expenditure are transmitted to the supply schedule of LCCs at least with a one-month delay.

At the same time, current shocks to the supply of low cost flights are allowed to affect foreign tourism expenditure flows immediately (within the same month).

The motivation for imposing this type of restriction on short-term system dynamics is related to the hypothesis that low cost carriers face fixed sunk costs when they modify the seasonal flight schedule, which is usually set a few months in advance.

Assuming the existence of sunk costs, the scheduled supply of flight seats may be expected to be sticky in the short run, unexpected demand fluctuations being accommodated by adjusting prices charged on individual flights rather than quantities.

At the same time, the documented existence of arrangements between local authorities and LCCs, whereby the latter must provide a given amount of seats to specific destinations over an extended period of time, may provide an alternative channel contributing to the short-run sluggishness of low fare supply.

Although the above arguments provide some strong support for our identifying hypothesis, major macroeconomic shocks are likely to be transmitted very quickly to low cost flight schedules. Nonetheless, the macro shocks should be properly accounted for in the model by the inclusion of the INCOME and RCPI variables. As these are ordered prior to LOWCOST in the recursive sequence, a simultaneous impact on low cost supply decisions should be properly allowed for in the model.

The dynamic response of foreign tourists' expenditure in Italy to a one standard deviation shock respectively affecting one of the four structural disturbance terms identified in the baseline VEC model is depicted in Figure 4. The impulse-response evidence shows that an unexpected income shock induces a transitory increase in foreign tourist expenditure, peaking about 9 months after the shock. As expected, the response of foreign tourist expenditure to an increase in relative consumer prices in Italy is negative and highly persistent over time.

An exogenous increase in LCC flight seat supply is found out to exert a positive long-run influence on spending by foreign travellers. As expected, the impact is negligible in the first few months following the low cost supply shock, as some time is required before foreign consumers fully revise their tourism spending choices. The response becomes positive and significant four months after the shock and stabilizes after about one year. Dynamic elasticity estimates, which allow for a more straightforward interpretation compared to impulse responses, can be obtained by normalizing the individual response coefficients (see, King and Watson, 1997, Kamps, 2005).

The VAR-based estimates of the elasticity of foreign tourism expenditure with respect to LCC supply are equal to about 0.15 after 6 months and to 0.18 in the long run, when all dynamic feedbacks (possibly involving an adjustment of national tourism industry supply) have produced their effects.

Finally, the response of TOTEXP to the own shock shows that these disturbances have mainly short-run effects on the dynamics of the series and should thus be expected to capture the influence of mostly transitory factors that impact on the demand and supply of tourism services.

While analysis of the behaviour of foreign tourist flows lies at the core of the present study, the VEC model evidence can also be used to outline some interesting features of the supply of low cost air transport services. To this end, in Figure 5 we plot the response functions of the LOWCOST variable to the individual VEC model shocks.

A positive income shift in countries of origin is found to result in a substantial increase in LCC supply in the long run, confirming the evidence conveyed by the cointegrating relationship. However, there is also evidence of stickiness in the short-term response of LCC supply to global business cycle fluctuations, as it takes about half a year for the supply of low cost seats to adjust to the new long-run level. Since no a priori restrictions are placed on the LCC response to macro shocks, the above evidence of sluggishness in the response provides empirical support for the assumption that LCC face non-negligible adjustment costs when they modify the seasonal flight schedule.
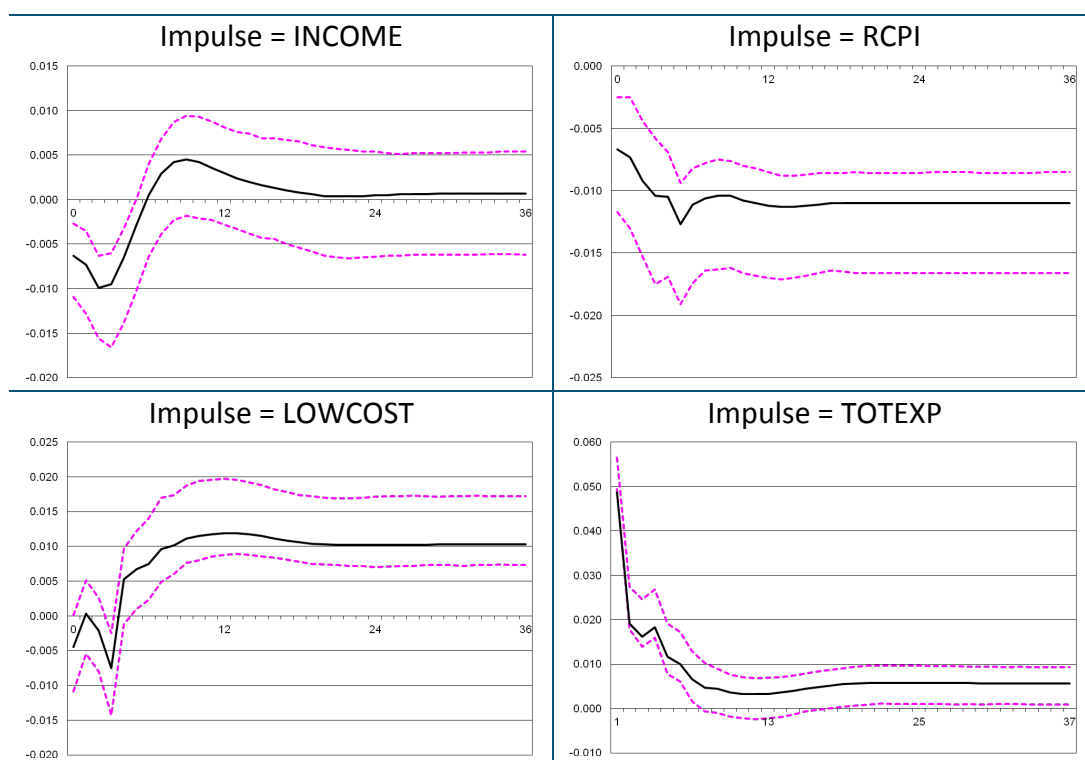

Figure 4: Foreign tourist expenditure in Italy: Impulse-response functions from the baseline VEC model.

A similar pattern of adjustment is observed in the case of shocks to relative consumer prices. In line with the evidence provided by the cointegrating relationship, a positive shock to the RCPI leads to a higher level of LCCs supply in the long run.

The sign of the response of LOWCOST to an identified shock affecting foreign tourist expenditure is negative in the long-run, although it is only barely significant in statistical terms.

Total tourist expenditure is the product of the number of arrivals and per capita expenditure. A positive shock to arrivals can be expected to always induce a response of the same sign of LCC supply, as it signals an increase in demand for travel services. On the other hand, a negative response is conceivable when unforeseen shocks affect per capita expenditure. Under the assumption that tourists on a low budget tend to prefer low cost travel suppliers, a persistent decline in per capita expenditure may be interpreted by LCCs as providing evidence of a favourable composition effect influencing travel demand, thus triggering an expansion of LCC supply. Some empirical evidence on this hypothesis is presented in the next section.

The response of LCC supply to the own structural shock displays a strong persistence of effects over time. This pattern can be interpreted as evidence that strategic choices regarding low cost flight supply, for instance, the decision to start operating from a given airport, tend to be maintained over rather long periods of time (which appears to be consistent with the narrative evidence).
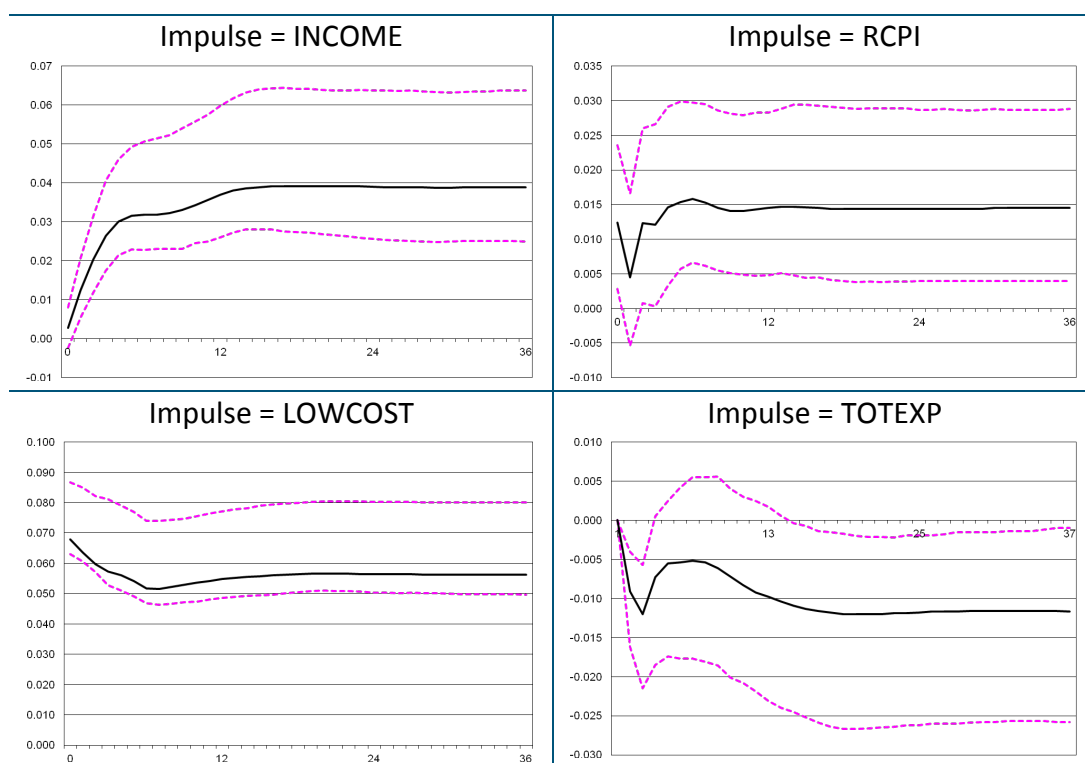

Figure 5: LCC seats supply from Italy to foreign destinations: Impulse-response functions from the baseline VEC model.

4. Empirical findings: the baseline model

While total foreign tourist expenditure rpresents the key variable for macroeconomic analysis and may arguably qualify as the relevant target for policy decisions regarding the possible subsidization of local LCC supply, tourist arrival flows are more directly related to the supply of travel services by LCCs.

In order to gain insights into the impact of the surge in low fare travel on the Italian tourism market we proceeded to estimate an extended VEC model where the logs of total foreign arrivals (ARRIVALS) and per capita real expenditure (PCEXP) replace total foreign tourist expenditure (TOTEXP).

The Johansen trace test again provides evidence of the existence of a single cointegrating vector. A VEC model was accordingly selected.

The two new variables are ordered last in the VEC model. However, to identify separate structural shocks for arrivals and individual expenditures some a priori ordering of the two variables must be introduced. As we have no strong a priori motivations in favour of one of the hypotheses, we report empirical findings obtained under both recursive orderings in order to outline common patterns (see Figure 7).

The impulse responses of foreign arrivals and average individual expenditure for the three main structural shocks in the extended VEC model are shown in Figure 6. A positive shock to GDP in foreign countries is found to induce a positive response of arrivals. A different pattern is observed for the PCEXP response, which is always negative, although it is only significant in the first few months.

The different findings for the two response functions can be reconciled under the assumption that foreign customers who adjust more quickly their prior choices after an income shock are characterized by below average per capita expenditure. In this case, as all potential customers adjust their tourism demand to the new income level, individual tourist expenditure will tend to revert to the population mean, causing a progressive fading of the negative short term impact.

The impact of an increase in relative consumer prices is negative for both arrivals and individual expenditure and is highly persistent over time.

While a positive shock to LOWCOST can be expected to exert a positive influence on foreign arrivals, as it reduces transport costs, the sign of the impact on per capita expenditure cannot be univocally set a priori. A reduction in air fares entails a positive income effect that should result, ceteris paribus, in higher per capita expenditure. At the same time, lower air fares may make a foreign journey affordable for less wealthy consumers, thus potentially introducing an adverse selection effect, which could lower per capita expenditure levels after the shock.

The empirical evidence conveyed by IR functions confirms a positive effect of the LOWCOST shock on arrivals, although it takes a few months for the shock to be fully passed through. The dynamic elasticity of ARRIVALS to a LOWCOST structural shock is sizeable, amounting to 0.10 at a six-months horizon and to 0.12 in the long-run.
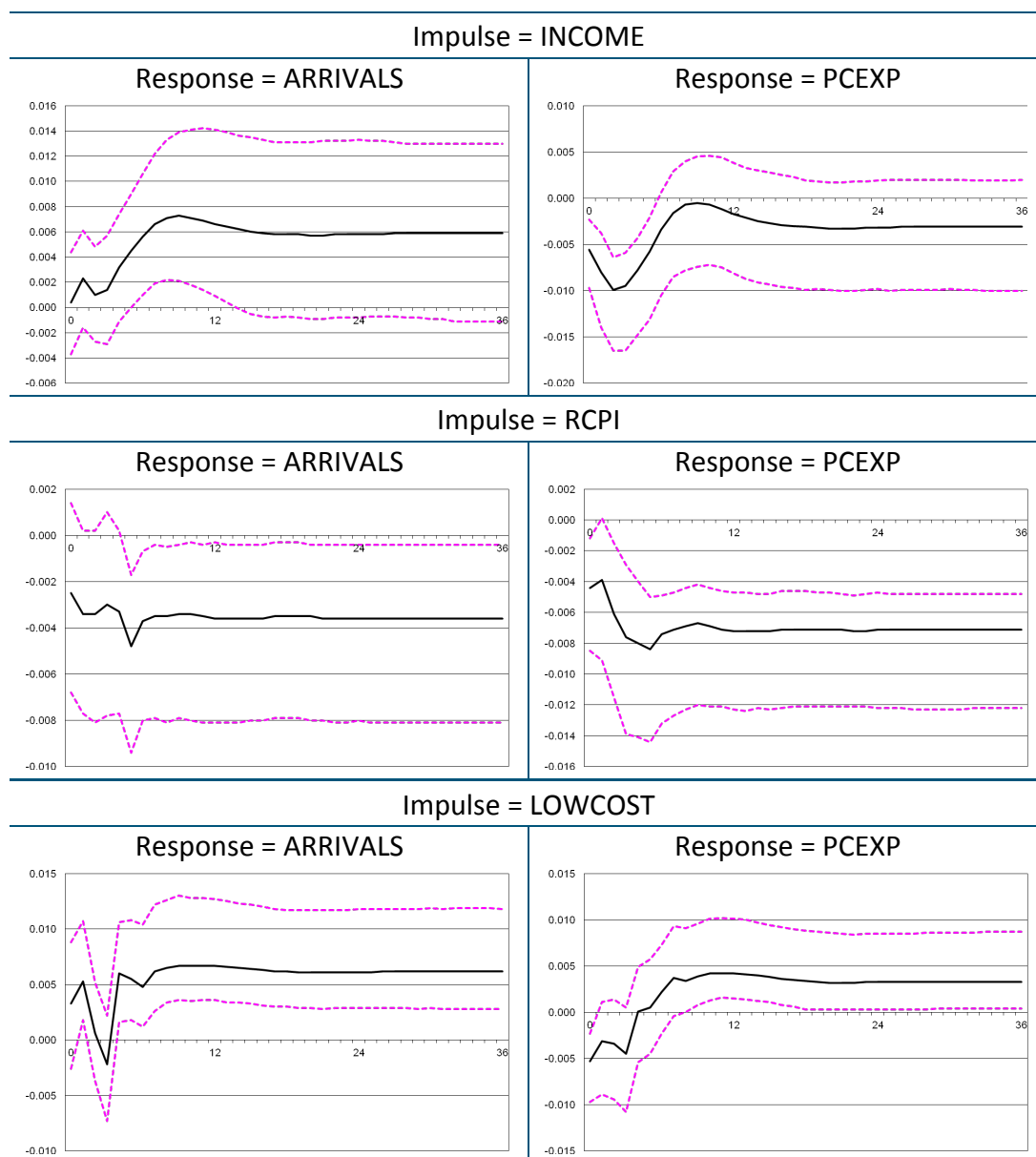
Figure 6: Impulse-response functions from the extended VEC model.

A more complex pattern is found in the case of per capita expenditure. The response to a positive LCC supply shock is estimated to be negative and significant in the first three months, although it subsequently picks up and becomes positive and persistent in the long run. This pattern can be interpreted as evidence that adverse selection effects are predominant in the short-run, while income effects dominate in the longer run. Foreign tourists who more quickly adjust demand after a LOWCOST shock appear to be marked by lower expenditure levels per trip, possibly because they opt for shorter vacations. As all potential foreign customers revise their tourism choices over time, the negative composition effect is eliminated, allowing the income effect to stand out neatly. The elasticity of per capita expenditure to LOWCOST is sizeable, although it is much smaller than that of arrivals (respectively 0.04 and 0.06 after six months and in the long-run).

The sum of the long-run elasticities of arrivals and per capita expenditure (0.18) turns out to be close to our baseline estimate of the long-run elasticity of total foreign expenditure. Overall, about two thirds of the persistent influence of an LCC supply shock on incoming travellers' expenditure can be related to the impact on arrivals and the remaining third to higher average individual expenditure after the shock.

In the baseline model a negative feedback from foreign tourism expenditure to LCC supply was found. To better qualify this occurrence we plot the response of LOWCOST to an identified shock alternatively to ARRIVALS or PCEXP (Figure 7). As explained above, to gain generality we consider both possible orderings of the two variables.
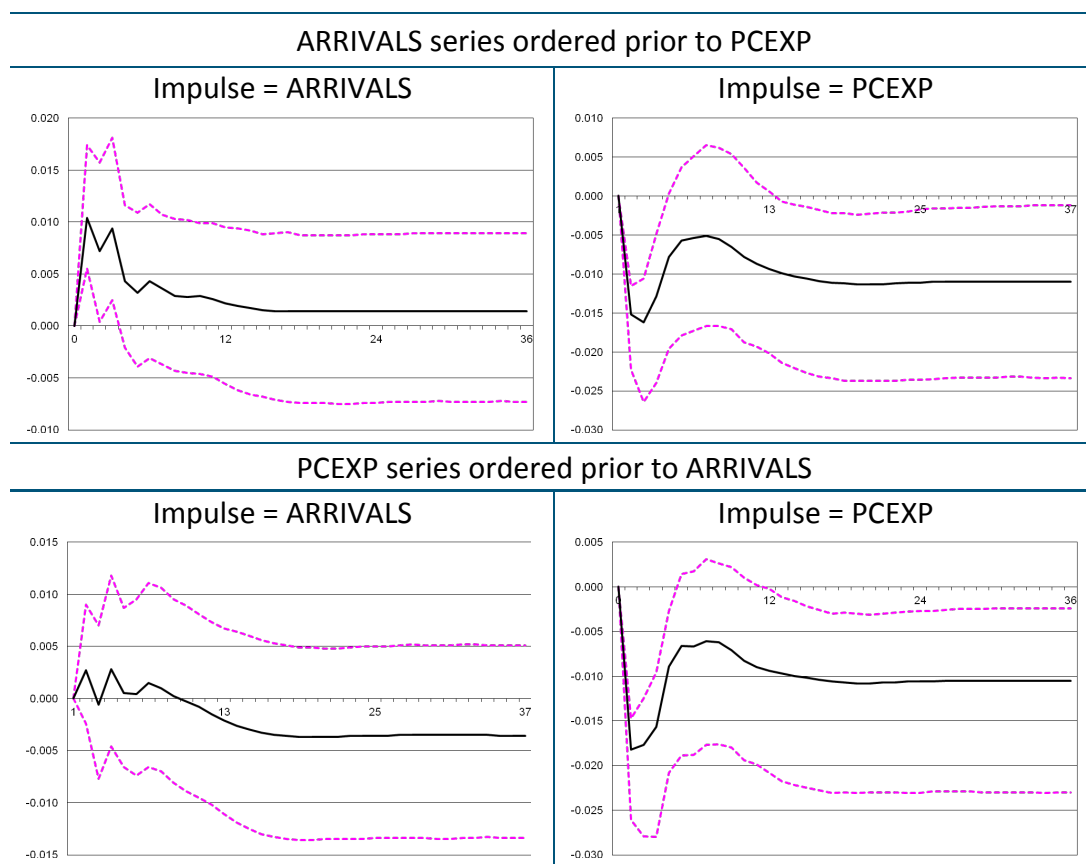

Figure 7: Response of the LC flight seats supply from the extended VEC model.

On the whole, the response patterns show a positive but negligible influence of a shock to foreign arrivals on LCC supply decisions, while a negative and significant effect is found out in the case of a shock affecting per capita expenditure.

This evidence appears to be in line with the expectations discussed in the previous section. The negligible influence of unexpected fluctuations in foreign arrivals can be explained if the shocks, which have mostly transitory effects on observed foreign arrivals, do not trigger a sizeable supply-side response owing to the existence of substantial fixed adjustment costs. The persistent negative relation between low fare supply and exogenous fluctuations of PCEXP confirms that the supply policies of LCCs are particularly sensible to exogenous shifts in the composition of the pool of foreign

travellers. A reduction in per capita expenditure, when interpreted by LCCs as a favourable structural modification of tourist preferences, may be reconciled with an increase in low cost flight seats supply, as evidenced by the estimated impulse response function.

5. Some evidence on regional dynamics.

While LCCs supply expanded rather symmetrically across Italy's four macro regions, the market shares of LCCs varied significantly from region to region. The possibly heterogeneous impact of LCCs supply shocks is worth investigating. In order to get empirical evidence on regional effects of the LCC travel industry, we proceeded to estimate the baseline VEC model for each of the four macro regions. In reporting the estimates we focus on the impact of low cost travel supply on local foreign tourism markets.

The impulse responses showing the dynamic effects of a one standard deviation positive shock to LOWCOST on the level of foreign tourist expenditure within the area are reported in Figure 8. The long-run response is positive and significant in all areas.
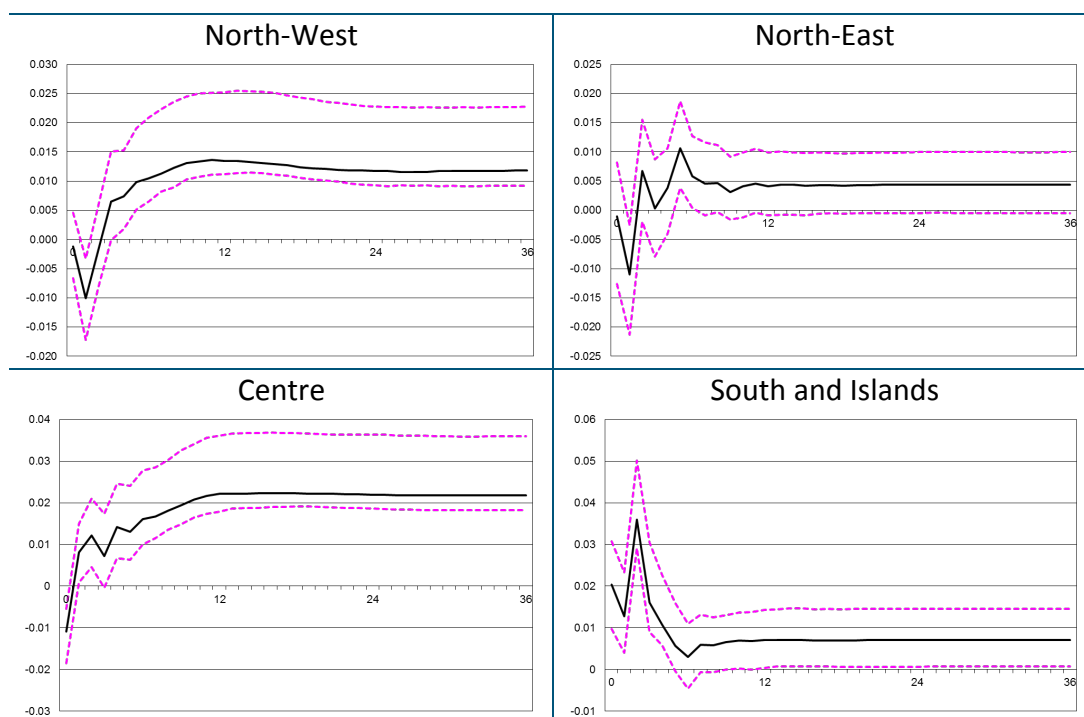

Figure 8: Regional responses of total foreign tourist expenditure to a 1 s.d. shock to local LC foreign flight seats supply.

Elasticity figures, by properly normalizing the regional impulse-response coefficients, allow for a direct comparison of the size of the LCC effect across areas.

Dynamic elasticities are reported in panel (a) of Table 2. On the whole, elasticity estimates for the North-West and the Centre are close to those previously obtained at

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the national level. Those for the North-East lie below the national average at all time horizons, while for the South they are far above the national level.

These findings confirm the expectations that structural differences in the regional tourism markets may imply heterogeneous effects of the expansion of low cost travel.

More insights on the possible sources of these asymmetries can be gained by separating the LCC influence on tourist arrivals and on individual expenditures, by estimating the extended VEC model discussed in Section 4 on regional data, even if some caution is required when interpreting empirical estimates.

Response functions for arrivals and per capita expenditure are given in Figures 9 and 10 respectively. The response patterns show a positive impact of LOWCOST shock on arrivals in all areas except the South.
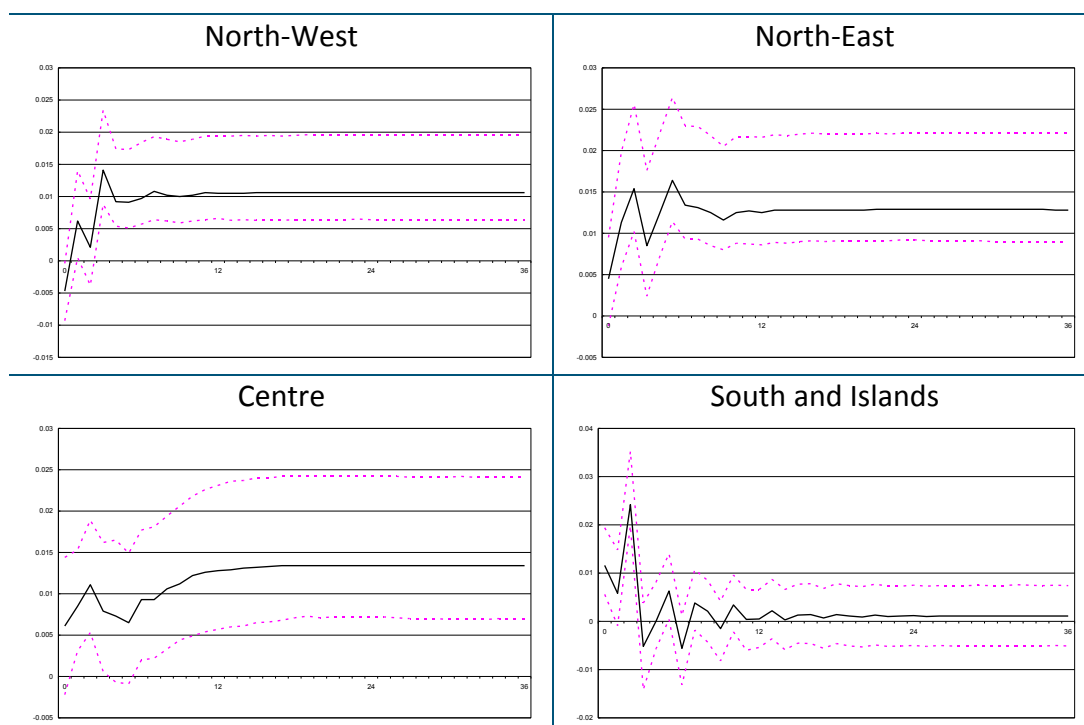

Figure 9: Regional responses of foreign arrivals to a 1 s.d. shock to local LC foreign flight seats supply.

Dynamic elasticities, reported in panel (b) of Table 2, show that, in contrast with total tourist expenditure, the highest values are attained in the North-East. Elasticity of arrivals is in line with national average in the North-West and the Centre, while it is particularly low in the South.

The picture is more varied when we consider the responses of per capita expenditure. In the case of the Centre, the pattern of dynamic responses rather closely matches the one already documented in Section 4 for Italy as a whole and thus could be explained using the same arguments.

In the North-West and in the North-East per capita tourist expenditure decreases after an exogenous shock to the LCCs supply and the effect is persistent over time. This

evidence could be consistent with the hypothesis of adverse composition effects reshaping local tourism demand after the expansion of low cost flight seats supply.

An opposite picture is found for the South: while there is almost no impact on arrivals, the low cost shocks exert a strong positive influence on per capita expenditure. This may reflect the operation of a strong income effect. In the case of the South, which also includes the two major islands (Sicily and Sardinia), a travel time effect may also be at work. LCCs supply in these areas may have displaced not only traditional high fare flight operators but also other modes of transport (train and ferry). By reducing their travel time to southern destinations, foreign tourists may have been able to devote more time to the actual vacation period, which in turn could have caused part of the observed increase in individual tourism expenditure.
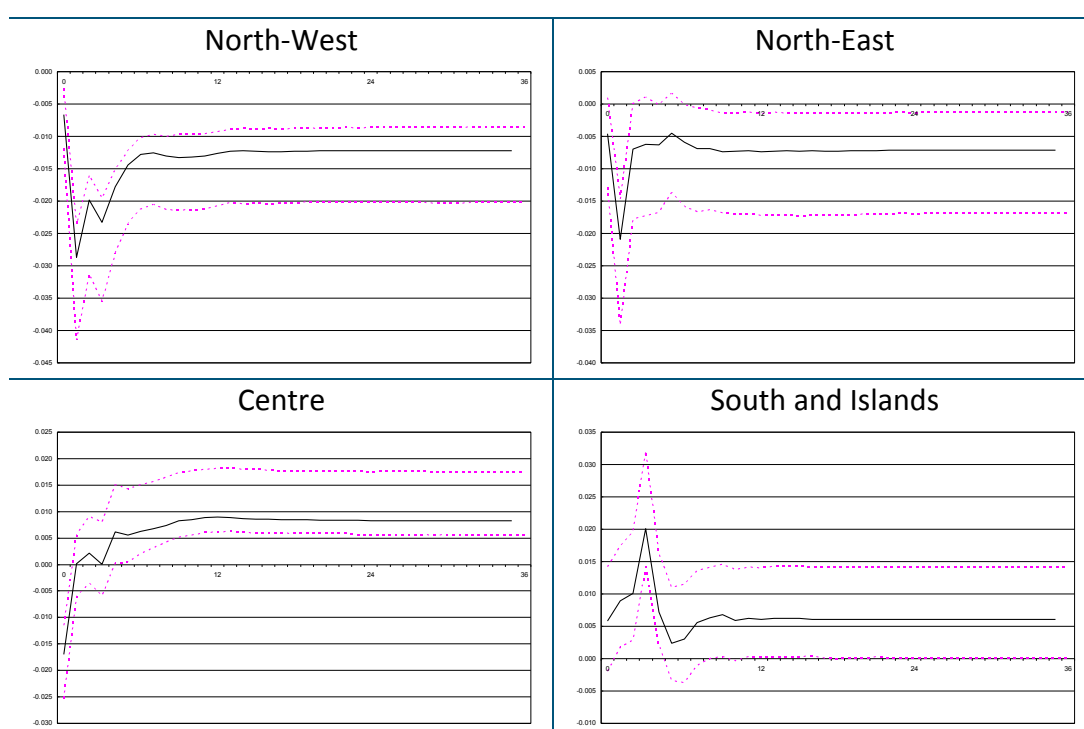

Figure 10: Regional responses of per capita tourist expenditure to a 1 s.d. shock to local LC foreign flight seats supply.

Dynamic elasticity estimates derived from the above impulse-responses are displayed in the panel (c) of Table 2.

A particularly high and positive elasticity is obtained for the South. The estimate is close to the corresponding national value in the case of the Centre. A much larger negative elasticity is estimated for the North-East than for the North-West (-0.11 and -0.05, respectively), which reconciles the high elasticity of arrivals with an overall moderate elasticity of total foreign expenditure in the North.

Finally, a comparison of the elasticity estimates obtained at the regional and national levels may yield some evidence on the scope of spatial externalities in the low cost travel market. Positive spatial spillover effects derive from the possibility that foreign

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travellers may take the opportunity of new low cost flights to arrive in Italy but then use internal means of transport to reach a different final destination within Italy. Negative spillover effects may be recorded when the increased local supply of travel services attracts new travellers to the area by diverting them from other destinations. When positive spillovers prevail, a higher elasticity of foreign tourism to LCC supply should obtain when the model is estimated at the national compared to the regional level. The opposite holds in the case of negative spatial externalities.

When we aggregate the long-run regional elasticities estimated from the baseline VEC specifications, weighting individual estimates by the average regional shares of the foreign tourism market, we obtain an aggregate value of 0.17. This estimate matches closely the elasticity yielded by the national VEC model (0.18) and may be taken as evidence that, at least at the level of four macro regions, spillovers are negligible, possibly because positive and negative externalities tend to offset each other.

When spillovers are highly localized in space their effects should be observed on a finer spatial scale than the one we use here.

Table 2: VAR-based elasticity estimates for the four macro regions.

	Time horizon		
	6 months	12 months	36 months
a) Total foreign tourist expenditure			
North-West	0.17	0.23	0.18
North-East	0.08	0.06	0.06
Centre	0.16	0.22	0.20
South and Islands	0.14	0.33	0.33
Italy	0.15	0.22	0.18
b) Total foreign arrivals			
North-West	0.14	0.13	0.13
North-East	0.20	0.19	0.20
Centre	0.10	0.14	0.14
South and Islands	-0.26	0.03	0.06
Italy	0.10	0.13	0.12
c) Per capita tourist expenditure			
North-West	-0.05	-0.05	-0.05
North-East	-0.09	-0.11	-0.11
Centre	0.07	0.10	0.08
South and Islands	0.14	0.31	0.31
Italy	0.04	0.08	0.06

Summary and conclusions.

In this paper we address the impact of the expansion of LCC industry on the foreign tourism market in Italy. The assembly of a specific data set permitted the implementation of standard multivariate time series analysis techniques in order to identify and estimate the impact of low cost travel supply on foreign tourism to Italy.

We were able to identify exogenous shifts of the low cost supply schedule under reasonably a priori restrictions. These require that the supply of low cost seats is sticky in the short-run, while it can fully adjust to unforeseen foreign tourism market demand and supply fluctuations in the long-run. The low cost supply is thus treated as an endogenous variable in the long-run, a condition that allowed us to single out interesting dynamic feedback effects from foreign tourist inflows to LCCs supply decisions.

The analysis was conducted first on data aggregated at the national level. We found evidence of the existence of a single cointegrating vector, which can be interpreted as a relation equating demand and supply of low cost travel services in the long run.

In line with expectations, a strong and positive impact of low cost supply shocks on foreign tourist expenditure in Italy is obtained on the basis of VEC models estimates. An exogenous shift doubling the national supply of low cost flights to foreign destinations is estimated eventually to induce an 18 per cent increase in real expenditure by foreign tourists. The initial impact of the low cost shock is essentially negligible, as most foreign travellers require some time to adjust their planned tourism decisions. However, dynamic responses pick up rather quickly and the new long-run equilibrium level of foreign tourist demand is attained about one year after the shock.

Quite surprisingly, an unforeseen shock to foreign tourist expenditure is found to induce a negative response of low cost carriers' supply-side decisions. By fitting an extended VEC model in which total foreign expenditure is related to its foreign arrivals and per capita expenditure components, we shed some light on this apparently puzzling behaviour.

While a drop in flight prices can be expected in all cases to drive an increase in foreign visitors, the impact on average individual expenditure may be non-trivial.

Both positive and negative effects may actually be expected. A positive income effect may operate through the reduction in air fares, which should boost tourist expenditure by relaxing the consumer budget constraint. Similarly, when consumers face a time constraint, by substituting low cost flights for alternative but much slower modes of travel they may be able to spend more time on the actual vacation, with an overall positive influence on tourist receipts.

Negative effects on per capita tourist expenditure may be observed if the introduction of low cost travel services causes an adverse selection effect, which alters the composition of the pool of incoming foreign tourists in favour of customers with lower budgets.

Based on the extended model estimation results, positive LCC effects are found in the long run both for arrivals and for individual expenditure, respectively explaining about

two thirds and one third of the long-run elasticity of foreign tourist expenditure to low cost travel supply in Italy.

No evidence of negative feedbacks from foreign arrivals to low cost supply is found out. A negative response was observed, however, in the case of a shock to per capita expenditure levels. It can be explained on the basis of an underlying structural complementarity between low budget tourist flows and low cost airlines.

In order to uncover heterogeneous patterns across Italy, the baseline and extended VEC model estimation was replicated for the four Italian macro regions. A positive long-run elasticity of total foreign tourist expenditure was found out for all regions, with heterogeneity in the case of the North-East and South, essentially related to the different sign of the response of individual tourist expenditure to low cost supply shocks. On average, a negative elasticity is estimated for the North-East and, to a lesser extent, for the North-West, pointing to the possible existence of adverse selection effects. A positive elasticity is estimated in the case of Centre and, to a much larger extent, the South, which can be related to strong income/time effects.

When individual regional elasticity estimates are aggregated they match the corresponding national estimate quite closely, apparently ruling out the existence of strong spatial externalities across the four macro regions.

Numerous local authorities have been reported to be subsidizing LCCs in order to have them increase the local flight seats supply. Our empirical estimates suggest that focusing on arrival statistics may provide only a partial view of policy outcomes, since we also found strong effects of low cost supply shocks on per capita foreign tourist expenditure, which may enhance or depress the direct effect on arrivals.

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