



Determinants of daily fluctuations in air passenger volumes. The effect of events and holidays on Milan Malpensa airport



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ABSTRACT

Air traffic flows show large seasonal variability, but arrivals and departures may also be significantly influenced by specific events which generate peaks, which generate peaks rising above baseline traffic. While seasonal variations of air flows are well studied in literature, the daily variations and their causes are seldom analysed and quantified. The paper aims at filling this gap by exploring and quantifying the effect of holidays and events (conferences, trade fairs, sport events) in terms of passenger daily fluctuations.

We identified the elements affecting these variations and searched for correlations with daily demand fluctuations using an OLS econometric model applied to Milan Malpensa airport. The model allows one to reproduce the observed daily traffic, identifying the baseline component of traffic (depending on the calendar) and the additional effect ascribable to holidays and occasional events.

Results show which types of events generate a visible traffic increase. The effect of some of them can be very significant indeed. The largest international design and fashion shows taking place in Milan generate up to more than 20% extra passenger traffic compared to the normal baseline traffic. In addition, the analysis showed that their effect is not limited to the event days, but impacted on the surrounding days as well. Holidays also influence the patterns of demand, creating additional traffic on certain days and more pronounced peaks, which also differ according to seasons.

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1. Introduction and aims

1.1. Aims

Air transport connectivity is a key element in a city's competitiveness and attractiveness. Milan, in northern Italy, plays a primary role internationally in the fields of fashion, design, commerce and services in general. This national and international importance translates into a large number of events annually taking place in the city, such as trade fairs, or conferences. In addition, Milan's area is among the most populated in the country and generates the largest outbound market in Italy, for both leisure and business traffic.

The effect of these events in terms of air traffic flows to and from

the city, is not captured by seasonal or monthly fluctuations, which is the typical information available in statistics and studied in literature (see below). Similarly, the positioning of departures and arrivals during holidays is important to foresee the most crowded days. A more detailed analysis of fluctuations at the daily level allows to more precisely understand and interpret the effect of events and holidays, which is otherwise impossible at the seasonal scale.

- Events such as trade fairs last a few days, but may involve a large number of passengers, generating large daily peaks not recognisable at the monthly scale;
- When trade fairs follow very tight calendars, their effect may overlap, sharpening the peaks;
- Holiday periods are not homogeneous, there are "peaks within peaks". The duration of events and holidays also matters in determining when, and how spread out, the arrival/departure periods are;
- The effect of holidays could be asymmetrical, with arrivals concentrated and departures spread out, or vice-versa;

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- e. Peak days within the week may change according to the month/season.

This paper aims at filling this gap by searching for the main determinants of daily passenger fluctuations in Milan Malpensa airport, quantifying the effect of holiday breaks and events taking place in the city. This approach can be of interest to local decision makers to better understand the impact of specific events (conferences, trade fairs, sport events) and holidays, as well as to support airport managers and airlines in a detailed analysis of demand and its determinants.

1.2. Transport and major events

With respect to our purpose, literature on events focuses mainly on mega events such as Olympic Games, FIFA World Cup or Expo world fairs (Fourie and Santana-Gallego, 2011; Fourie and Spontk, 2011; Allmers and Maennig, 2009; Lee et al., 2008; Matheson, 2012). These studies mainly look at the potential impact on the hosting country or city in terms of economic returns, employment, government revenues, tourism and cultural awareness. Instead, literature analysing the relations and consequences in transport terms is still developing (Borodako and Rudnicki, 2014). Nonetheless, there is a growing interest in understanding the effect of events, which is crucial in everyday management of infrastructure, because it is concentrated in time and potentially problematic in the short term (Robbins et al., 2007) and in terms of city promotion. Many studies focus on the short-term challenges and specific transport and logistics requirements posed by mega events, in terms of transport planning aimed at providing effective and reliable services considering infrastructure, traffic management, ticketing, communication to the public, institutional aspects, etc. (Coutroubas et al., (2003); Booth (2010); Howcroft et al., 2003).

Hensher and Brewer (2002) discuss the actions undertaken and the effectiveness of the transport provision plans for the 2000 Sydney Olympics, highlighting how the outcome for the spectators was good while the patronage forecasts were not. Bovy (2006) discusses the main transport planning issues related to mega events while Bovy (2009) focuses on the main measures implemented during the 2008 Beijing Olympic Games. ECMT (2003) presents several international mega events in terms of impact, solutions and lessons learnt with regard to transport.

Other studies (Kassens-Noor, 2012, 2013) focus on the legacies of mega events such as the Olympic Games, highlighting the role and influence of the International Olympic Committee in shaping the urban and transport framework of the hosting city.

1.3. Estimating the impact of smaller scale events

While mega events have been considered in literature also looking at their transport implications, “smaller scale” events have received less attention. To the best of our knowledge, there are few studies which look at the relationship between events (big or small) and airport daily traffic fluctuation, despite the potential interest for airport managers and airlines. The paper focuses on this point.

The model considers the airport of Milan Malpensa. This choice derives from its relevance among Milan’s airports (first in terms of passengers carried) and Italy in general (second after Rome Fiumicino). Moreover, with respect to the more specialised airports of Linate and Bergamo, Malpensa has a mixed supply, with both low cost and full service carriers, and thus represents the main gateway for the city for long-haul flights as well.

Even if total air traffic fluctuation is influenced by many variables (such as fuel price, airport and airline strategies, traffic

congestion, economic trends), these elements tend not to vary from one day to another and can thus be considered constant in limited periods. As we limit our analysis to the daily variations during one single year, we can thus focus our attention on the sole variables describing the differences among single days (seasonality, day of the week, etc.), trying to isolate their effect on daily traffic.

The remainder of the paper is organized as follows. Section 2 recalls the literature on forecasting, followed by the description of Milan’s context and airports (Section 3). Section 4 describes the model used, while Section 5 presents and discusses the results obtained. Finally, conclusions and policy indications are drawn.

2. Previous studies

The task of airport demand forecasting is crucial (Riddington, 2006) because it influences planning, infrastructure management and investment decisions, both in the medium-short and in the long term. Deciding on the appropriate forecasting model is influenced and limited by many factors, such as the availability of data, the time horizon, the costs. (Var and Lee, 1993).

With regard to the forecasting of future traffic, literature provides both qualitative methods (based on experience, surveys, knowledge) and quantitative ones (based on statistical relations or discrete choice models), aimed at systematically reducing forecasting errors and trying to track and isolate the variables that cause changes in the dependent variable (for a review see for example Doganis, 2010).

Among the quantitative techniques, the used approaches are behavioural (discrete choice models), non-causal (time series) and causal (econometric) methods (Vasigh et al., 2008; Song and Li, 2008; Peng et al., 2014).

Discrete choice modelling allows to evaluate the effect of specific situations, such as capacity constraints at the individual scale explaining future travel choice behaviours (Mandel, 1999; Pels et al., 2003; Hess, 2010).

Non-causal methods analyse the historical data to forecast future traffic, usually not considering the influence on air traffic of various economic, social and operational conditions (Ahmadzadeh, 2011).

To take into account the role played by external factors and the causal relationship between variables, econometric regression models are used instead (Dft, 2011, 2013; ICAO, 2006). Starting from the assumption that traffic variations have a cause-and-effect relationship with several variables such as GDP, population, travel costs, consumer spending, causal models try to explain how changes in one or more of these variables affect the level of demand (Karlaftis, 2008; Vasigh et al., 2008). In this way, it is possible to estimate how demand will change due to the predicted modifications in these exogenous variables.

The main group of such works deals with the effect of different aspects such as investments and policies on future airport demand. Chèze et al. (2011) use dynamic panel-data modelling to analyse the role and the magnitude of different variables on air traffic and to forecast the evolution of air traffic until 2025, highlighting the importance of regional heterogeneity in predicting traffic trends. Karlaftis et al. (1996) examine and test the predicting ability and forecasting accuracy of existing air-travel demand models using both criteria performance and post-fact analysis. Carson et al. (2011) compare the peculiarities of forecasting air travel demand, using aggregate data or through the sum of the airport-specific forecasts obtained from disaggregate data.

The issue of seasonality involves some specific interest, due to its implications both for airport management and for tourism. Abdelghany et al. (2011) quantify factors that contribute to airport demand variations and assess how external factors such as

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