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# Understanding air travellers' trade-offs between connecting flights and surface access characteristics

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A B S T R A C T

This paper reports on a study which seeks to improve our understanding of how people choose between different kinds of flight at competing airports, and how their choices are affected by access conditions. In particular, using stated choice data collected in Scotland, it investigates whether improving surface access to regional airports that are in relatively close proximity to one another (Glasgow and Edinburgh) leads people to avoid taking indirect flights from their nearest airport in favour of direct flights from an alternative airport. In line with expectations, our estimation results from Cross-Nested Logit models show strong aversion to connecting flights, resulting in a willingness to either pay higher fares for direct flights or accept non-trivial increases in access time. For the latter, even without the potential new direct rail link between the two airports, current access times are such that a scenario where direct flights were only available at the non-home airport, a substantial share of passengers would choose to travel from the alternative airport.



## 1. Introduction

Deregulation of US and European airline markets has allowed the development of different forms of route and network structure in air passenger transport, leading to greater choice for passengers regarding the airport they use and the type of service they fly with. The clearest examples of these differences is the contrast between the full service carrier, operating a hub and spoke network through a major hub airport (such as BA at Heathrow or Lufthansa at Frankfurt), as compared with the low-cost carrier operating a set of point to point services through a number of secondary airports. More recently, variations have emerged on these contrasting cases, involving hub and spoke networks being operated by alliances of airlines rather than by one airline and, on the other hand, point to point services serving some of the more major airports. Indeed, some of these point to point services, by linking in to major hub airports, start to provide for some of the onward connections features of the hub and spoke network (though without features such as through-ticketing and connection guarantees).

What emerges, particularly in Europe, are situations where passengers are increasingly faced with choices regarding which airport they fly from and what kind of service they fly on. However, as noted by Kouwenhoven (2008), little is known about the influence of the type or level of airline service or airport quality-related factors on actual passenger behaviour. In this paper, we report on a study which seeks to improve our understanding of how people choose between different kinds of flight at competing airports, with a particular focus on how these choices are affected by access conditions. We seek to generate new evidence to develop the understanding of the interaction of the type or level of airline service and the ease of surface access upon the choice of airport. In particular, we investigate people's preferences between direct and indirect flights from two airports that are in relatively close proximity to one another, and whether improving surface access to them leads people to avoid taking indirect flights from their nearest airport. In addition, we were also interested to understand more about how people choose between surface access options.

The focus of the study is on Edinburgh Airport and Glasgow Airport, the two busiest airports in Scotland and only 67 km apart from one another. With over 9 m passengers and serving over 100 destinations, Edinburgh Airport proclaims itself to be Scotland's busiest airport, whilst Glasgow, with over 7 m passengers and serving over 80 destinations, is by far the second busiest. A number of destinations are served by direct flights from both airports,

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including Heathrow, Paris CDG and Amsterdam, but there are also a number of destinations for which it is only possible to fly directly from one or other of the airports. For example, there are direct flights from Edinburgh to Brussels, Frankfurt, Vilnius and Zurich but not from Glasgow. At the same time, there are direct flights from Glasgow to Plymouth, Reykjavik, Dubai and Lahore, but not from Edinburgh.

Recent figures (BAA, 2009) show that, for 2009, 70% of Edinburgh Airport's passengers access the Airport by car or taxi, and that this figure is some 85% for Glasgow Airport. Furthermore, CAA data (CAA, 2005) shows that most people use their nearest airport, with 61% of Edinburgh Airport's domestic passengers and 58% of its international passengers coming from the Lothian region, and some 90% of Glasgow Airport's domestic passengers and 63% of its international passengers coming from the Strathclyde region.

The primary aim of the study[2] was to investigate how travellers may respond in a situation where, for a given trip, their *home* airport is more likely to offer only connecting flights to their chosen destination, while direct flights are available from the alternative airport. As an example, would a traveller living in or around Glasgow be willing to travel to Edinburgh airport if the latter offered direct flights to the chosen destination, while only connecting flights are offered from Glasgow? A secondary aim was to discuss the impact of a new direct rail access link in this context. Our sample focused on individuals who flew from either of the two airports to locations where interchange was appropriate, eg London travellers were excluded. Using a customised stated choice (SC) design, systematically varying the attributes of the journey across a series of scenarios, we analyse how the different attributes are traded off against each other. We analyse the choice of airport and access mode jointly using a Cross-Nested Logit (CNL) model to allow for flexible substitution patterns between options.[3] Our results highlight the strong aversion to connecting flights, showing very high willingness to accept higher air fares or increased access time in return for direct flights.

The novel aspect of our study in contrast with previous work making use of advanced nesting structure is a focus on the trade-offs between connecting flights and surface access characteristics while at the same time looking at the competition between two airports in different cities rather than airports within a single multi-airport city.

## 2. Literature review

Work on airport choice behaviour dates back to Skinner's (1976) use of multinomial logit models on air passenger survey data for the Baltimore Washington DC region, where he found higher sensitivity to ground accessibility than to air journey level of service.

The question of airport choice has been examined for many years through a number of studies, with accessibility and flight frequency consistently being highlighted as the key factors (Skinner, 1976; Ashford and Bencheman, 1987; Thompson and Caves, 1993; Windle and Dresner, 1995). Other studies have identified aircraft type (eg Innes and Doucet, 1990) and ticket price (eg Bradley, 1998) as also being significant.

Harvey (1987) used revealed preference (RP) data from the multi-airport San Francisco Bay area to estimate separate multinomial logit models for business and non-business travel, as a function of highway access time and flight frequency, with both having non-linear effects on utility. He finds that beyond a certain threshold level additional direct services to a destination do not make airports more attractive. However, there is a large disutility for connecting flights. The disutility of access time decreases with total time, and shorter flights have more sensitivity than long-haul. Fare and access mode were not included as attributes in this study.

There is also substantial evidence of variations across passengers in sensitivities, where Hess and Polak (2005) were the first to highlight this with the use of mixed logit models on the San Francisco Bay area RP data, showing significant heterogeneity in sensitivities across travellers. Ishii et al. (2009) also look at choices between airports in the San Francisco Bay area comparing mixed and multi-nomial models with separate specifications for business and leisure travellers. Mixing distributions estimated on departure airport and airline dummies, value of access time and travel delay. Results were similar to MNL, suggesting that much of the heterogeneity found in other studies may be due to different markets and trip types.

A number of studies have focussed more specifically on the choice of airline. O'Connell and Williams (2005) highlight the growing intensity of direct competition between full service and no-frills airlines. The brand intensity of low fare airlines was such that most of those surveyed on a low cost carrier did not look at other carriers. Full fare passengers prefer reliability, quality, connections, frequent flyer discounts and comfort, whilst low cost passengers choose their flight almost exclusively on the basis of fare and are willing to travel through secondary airports.

Mason (2001) finds there that there is little distinction between business travellers who use low cost and network carriers, and argues that they do not represent two market groups – price and value for money are prime considerations for both groups.

Barrett (2004) looks at the difference in services operated between low-cost carriers and the more established airlines. Deregulated low cost airlines operate on a point to point basis so their passengers do not need to transfer at hub airports, being more willing to transfer to smaller airports outside of destination cities. Low fare airlines have brought service to underutilised secondary airports. They are clearly tough operators, and airports have to respond to the new market power.

Whitaker et al. (2005) carried out a number of SC experiments to evaluate airline passenger preferences. Qualitative findings indicated that flights outside preferred schedules needed heavy discounting, while, in terms of airline products and services, many travellers were highly driven by check-in queue time.

The third dimension of air travel choice behaviour is that of ground level access. Gosling (2008) conducted a comprehensive review of nine airport ground access mode choice models, based on RP or SC. Whilst most models include travel time and travel cost, he concluded that there was still uncertainty over which other explanatory variables to include and the appropriate nesting structures of different modes.

A number of authors have correctly recognised that air travel behaviour is characterised by multi-dimensional choice processes which need to be analysed jointly rather than separately. Furuichi and Koppelman (1994) use an NL model for RP data on choice of departure and destination airport choice in Japan, finding significant effects by access time and cost and flight-frequency. Pels et al. (2001) use the San Francisco Bay area data to analyse the combined choice of airport and airline and find that airline choice is linked to the choice of airport, while Pels et al. (2003) jointly analyse airport and access-mode choice, finding high sensitivity to access time, especially for business travellers. Hess and Polak (2006a) go further, by jointly analysing the choice of airport, airline, and access mode,

[2] The work was undertaken as part of the EU FP7 project INTERCONNECT. The project is concerned with how to improve interconnectivity in long distance travel, and the impacts of making such improvements.

[3] While an error components model would allow for the same level of nesting flexibility, it would have led to very substantial increases in computational complexity and identification issues.