



The economics and geography of regional airline services in six countries



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ABSTRACT

Do the determinants of service and pricing on “regional” routes – linking towns and smaller cities to main trunk routes and/or to each other – differ from the established results from the literature? We study all flights (about 3000) on all regional routes (about 250) with scheduled airline service from one of about 130 regional towns or cities, in regional airline markets in six countries: Australia, Canada, New Zealand, Norway, Sweden, and a sample of three U.S. states which closely resemble the other regions studied. For each flight we have observations on up to five prices offered at different times before flight date. We also have equipment type and social-economic data. Overall, our results give qualified support to the standard gravity model of the extent of service between city pairs, though with two interesting differences: operators on regional routes have greater flexibility in the size of aircraft they can deploy, which results in a finer-grained variability of service offerings and, the presence of competition on regional routes has a large effect on the total supply of seats. We are able to successfully estimate a well-specified airfare model, which shows strong effects of competition on prices, quite substantial intertemporal price discrimination, and interesting differences between regional and main trunk route pricing.

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1. Introduction

The literature on the economics and geography of passenger air transport has largely analysed routes linking large cities – “trunk routes” – within and between countries. Most studies are concerned with the U.S. and Europe – the two largest aviation markets, and the two with the best publicly available data. The present paper aims to shed light on “regional” aspects of aviation economics, in two senses. First, the countries we study – Australia, Canada, New Zealand, Norway, Sweden – are all small or medium-sized economies, which as such are often considered as being in the hinterland of the big centres of the U.S., continental Europe, or Asia.¹ Second, within these countries, our focus is on what are called regional routes, linking smaller cities and towns, and their own hinterlands, usually with the nearest large trunk city or cities, but occasionally with each other.

Whereas the geography of the U.S., and of Europe, is basically a two-dimensional grid, all five of our regional countries happen to

be essentially long, thin, linear entities.² This may account for two striking differences in the economics of passenger aviation between our regional jurisdictions and the bigger markets: we do not observe the fully developed 360 degree hub-and-spoke systems linking large cities that predominate in the U.S., and we find literally *none* of the “secondary” airports, outside but within ground transportation range of large cities,³ that have facilitated the entry of low-cost carrier (LCC) services, especially in Europe. And then, a third distinctive feature of interest with our regional routes is that they are, on average, much shorter in distance than main trunk routes, to the extent that we can expect that air services will generally face serious inter-modal competition from surface transport – private cars, buses and trains.

We consider these and other factors of comparative significance in our analysis. Our paper reports econometric models of two types of variables: airfares and service – that is, the price regional services are offered at, and dimensions of the supply side, including the frequency of flights and the number of seats offered on regional

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¹ Populations in 2012 are: Norway, 5.0 million; Sweden, 9.5; Canada, 34.9; Australia, 22.7; New Zealand, 4.4. The average population of 34 OECD countries in 2012 was 36.8 million.

² We consider only the four large Eastern/Southern states of Australia.

³ In a grid system, such a secondary airport could be usefully located at any point of the compass around a large city; in a linear country, it basically needs to be on the line on one side or the other of the city, which limits the likelihood of such existing. We do find two secondary airports located within big cities: Bromma in Stockholm, and Toronto City Centre Airport.

routes. With both price and supply we uncover an important role for the extent of competition – the number and market shares of carriers. It might be expected that regional routes would tend to be “thin”, such that they would support no more than one viable airline. However, we observe many oligopoly routes, and find that the impact of intra-modal competition in the regions is actually larger than, typically, it is found to be on main trunk routes, mainly because of the implications of inter-modal competition from surface transport.

We have data on all regional services offered in our five countries, as of March–April, 2013. In addition, we collected data on all regional services flown in Arizona, Colorado and Oregon, these being the only U.S. states which have similar populations (4–5 millions) and total size (100–150,000 square miles) – though not shape! – as our two smallest countries, New Zealand and Norway.⁴ As well, we collected a sample of data on prices and service on main trunk routes, for comparative purposes.

The paper is organized as follows. In the next section, we summarise the literature that has investigated airfares and their determinants. This includes a summary of empirical evidence from the analysis of trunk routes and of the smaller number of studies of regional aviation markets. Section 3 defines our data and discusses its characteristics. Section 4 presents our models and the econometric results. We conclude with a summary of results and suggestions for further research.

2. The aviation markets literature

There is an extensive literature on the determinants of airfares on trunk routes and in international markets (see [Borenstein and Rose, 2014](#), for a survey). This literature is focused on intramodal (between airlines) competition. [Gillen and Hazledine \(2012\)](#) also summarise the previous studies on airline pricing and note the diversity of U.S. results.⁵ A number of papers have looked at average fares. [Hurdle et al. \(1989\)](#), for example, examined how market structure (ie, number of competitors) affected fare levels: duopoly routes tended to have fares 20 percent lower than monopoly routes. [Morrison and Winston \(1990\)](#) found similar evidence of links of lower fares with less market concentration. Other authors investigated the impact of the LCC business model on fares. [Goolsbee and Syverson \(2008\)](#) found that when the leading LCC Southwest Airlines entered a U.S. domestic market fares charged by existing network or “legacy” carriers decreased significantly, by 20 percent or more. [Alderighi et al. \(2012\)](#) find a substantial effect on legacy carriers’ pricing of the presence of an LCC on European trunk routes.

Other authors were interested in the dispersion of fares charged on the same route or flight, which is generally attributed to price discrimination. One interesting question here is how dispersion varies with industry structure. [Borenstein and Rose \(1994\)](#) find that a higher number of competitors has a greater impact on low fares than on high fares. [Stavins \(2001\)](#) finds similar results. However, [Gerardi and Shapiro \(2009\)](#), using panel data rather than simple cross sections, reverse this: they conclude that routes with more competition tend to have a smaller range between highest and lowest fares charged, as theoretical work ([Hazledine, 2006](#)) predicts.

Perhaps beginning with [Reiss and Spiller \(1989\)](#) some papers study both prices and measures of the quantity and/or quality of service on airline routes, with the latter measured as total numbers

of passengers carried, and sometimes as frequency of service ([Bilotkach et al., 2010](#)). The backbone of passenger flow modelling has, at least since the 1950s (cf. discussion in [Hazledine, 2009](#)) been the ubiquitous “gravity” model, in which international or interregional bilateral flows are increased by the attraction of larger populations and/or GDP at the two end-points, and decreased by the deterrent of a larger distance separating the origin and destinations countries, regions or cities, and by the existence of a significant geographical or cultural (eg language) border between them.

Though the gravity model has been a dependably – even, to economists if not to geographers, embarrassingly⁶ – successful predictor of commodity and most service trade flows, its performance in the well-studied North American aviation setting has been puzzlingly patchy; in particular, with respect to the effect of distance on market size. [Dresner et al. \(1996\)](#) find that, other things equal, passenger numbers on a route tend to first fall then actually rise with distance on US domestic routes, and [Gerardi and Shapiro \(2009\)](#) find something similar, whilst [Hazledine \(2009\)](#) gets the “wrong” sign for the distance coefficient for Canadian routes. What we might expect, as [Bilotkach et al. \(2010\)](#) indeed report for European routes, is that air passenger numbers might increase with distance up to some hundreds of miles, as the time disadvantage of competing surface transport modes increases, but will eventually obey the laws of gravity and decline over larger distances. We will investigate this issue for our cross sections of regional air travel markets.

The small literature focussing on regional aviation markets has been more interested in the provision of service or not, and the adjustment of regional markets to deregulation, as well as the shift to hub-and-spoke network structures, especially in the U.S. [Hanlon \(1992\)](#) examined the impact of the change in network structure and noted that small centres gained with increased frequencies to hub airports while point to point service declined; [Grubestic and Wei \(2013\)](#) investigate the activity of airports subsidised under the US ‘Essential Air Service’ (EAS) program. [Graham \(1997\)](#) looked at the shift in the role of smaller regional carriers towards an increasing role as “feeders” for an affiliated large network airline. [Forbes and Lederman \(2007\)](#) and [Gillen et al. \(2014\)](#) investigated the contractual relationships between regional carriers and network airlines. The former authors were interested in how regional feeder airlines allowed network carriers to compete with LCCs, and limit their market penetration. Gillen et al. examined how network airlines could use contractual relationships with regional airlines as an efficient tool to affect competition and market structure. They found, based on U.S. data, that market size, cost differences between network airlines, as well as cost differences between network and regional airlines, are the chief determinants of the network airlines’ decisions on whether or not to serve a market with their own fleet, as well as on how many regional airlines to contract with.

Another set of researchers has been interested in how two important developments – the introduction of the regional jet and the emergence of the low cost carrier (LCC) business model – might lead to differences in how “thin” regional markets developed and how fares were affected. [Starkie and Starrs \(1984\)](#) examined the outcomes in regional markets in South Australia with deregulation in 1979. They found that considerable entry took place initially and, surprisingly, that fares on single firm routes did not differ significantly from those offered on multi-firm routes. They also found greater entry in larger markets, and that as

⁴ However, the more box-like shape of the U.S. states results in smaller internal distances, on average, such that a number of regional flights cross state borders (eg, Yuma, CO – Los Angeles, CA). Therefore it might be best to consider our 42 US regional routes as just a random sample for comparative purposes.

⁵ We note that the vast majority of empirical studies are U.S. based, since the U.S. is the only country with publicly available fare data.

⁶ Potentially embarrassing to economists because the model generally succeeds in explaining most of the variation in trade flows without needing help from standard “economic” variables such as differences in comparative advantage, factor costs and tariffs.

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