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Causality in direct air services and tourism demand

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ABSTRACT

Unlike income or relative prices, air transport attributes and tourism demand on a given route can be endogenous. Using instrumental variables, this study attempted to account for the circular causality in estimating the effect of direct air service on tourism demand. Although we found evidence of endogeneity, the nature of the circular causation is context-specific; while direct air service can be regarded as an exogenous variable in one direction, it can have an endogenous relationship on the other. Findings emphasise the need to explicate information about the network nature of transportation and its endogenous relations with tourism.

Introduction

Direct air services to regions may be viewed as an important means through which an environment conducive for greater socio-economic developments can occur. By one estimate, around 35 million of the 58 million jobs created by aviation worldwide is in the tourism sector (Air Transport Action Group (ATAG), 2014). Otherwise known as the catalytic impact of aviation, Oxford Economics – the entity which undertook the research – defined this as the economic impact arising from the spending by visitors arriving on air transport. Thus, it is reasonable for peripheral tourism destinations with regional development objectives to consider direct international air access as having the potential to help develop tourism.

However, as evident in the firm location choice research literature (e.g., Combes, Mayer, & Thisse, 2008), firms will tend to locate where there is potential/actual demand for the firm's products, all other things being equal. This certainly applies to commercial airlines. Thus, in the absence of these services, and if the availability of direct international air services can be crucial for the socio-economic development of a tourism-reliant region, there is *potential* justification for aviation policy intervention to foster greater direct air service links. This potential justification relies heavily on the assumption that the potential demand is also shaped by the firm, i.e., the relationship between air service availability and tourism demand is mutually reinforcing. This type of circular causation is similar to the endogenous firm location and demand that is a feature of new geographical economics theory (e.g., Head & Mayer, 2004). Assuming inter-regional mobility of firms, which is reasonable given spatially flexible deployment of aircraft, airline entry itself may spur more entries due to the effect the entry has on lowering cost of production through economies of scale. According to the theory, assuming that consumers (travellers) exhibit preferences for variety, the lower costs and greater availability of direct access services to a variety of destinations will spur demand. Thus, there is potential theoretical basis for the bi-directional causality between direct air services availability and tourist flows.

Some may regard the 'direct air access–tourism' relationship as a classic “chicken or the egg” dilemma. Although the relationship may seem obvious, this poses a significant methodological challenge to disentangle, and to the best of the authors' knowledge, to-date

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the direct attempts to disentangle these effects in the aviation and tourism context have been very limited (a recent exception is Tsui, 2017). This is surprising because it is not uncommon for governments with regional development mandate to offer economic incentives to airlines for direct air services (e.g., Halpern & Graham, 2015). In Australia, this may take the form of marketing partnership between destination marketing organizations, airports and airlines as well as a significant involvement by the State government; for instance, although not a direct payment of cash, South Australian government has contributed to the marketing of the non-stop direct Qatar Airways flight to Adelaide, which commenced in 2016 (ABC, 2015). Similarly, Western Australian government agreed to spend Au$14 million in the upgrade of Perth International Airport so as to enable the infrastructure necessary for Qantas' Perth-London direct service (ABC, 2017).

Thus, in regards to the circular causality, it would be useful to know where the weight of evidence is: while (1) airline enters a route because they have information that there is sufficient demand, it could also be that (2) the entry (the direct service) stimulates additional tourism demand. The latter resembles the experience of "Ryanair effect" of demand generation as a result of direct air services. This effect is also what many tourism destinations desire. However, we know from airline scheduling processes that in many circumstances carriers will supply direct services because there is demonstrated demand such as in (1) – (e.g., Tan, Koo, Duval, & Forsyth, 2016;Wu, 2010). Clearly, both effects are not always present in every context because if they were to prevail to large extents together then there would be many more direct air services. Instead, to appease tourism stakeholders, the airline may adopt the rhetoric of (2) but with the full information about (1). A reverse of this, where the airline enters on the grounds of (1) but there is a large effect of (2), is an example of self-fulfilling prophecy.

If the circular causation is not accounted for in the empirical analysis, the effect of air service on tourist flows (refer to 2 above) and the effect of tourism demand on air service levels (refer to 1) will be confounded. In a regression context, the inability to isolate these effects from one another creates correlation between the suspect endogenous variable (the direct air service factor) and the error terms in the model. It is well-established that undertaking a regression analysis as if the independent variable (direct air service factor) is uncorrelated to the error of the model violates the consistency estimation property of linear regression, which renders the estimated coefficient untrustworthy (e.g., Wooldridge, 2002). A well-known remedy to this problem in econometrics is the use of an instrumental variable (IV). However, this is not without significant challenges because finding a theoretically appealing instrument can be very difficult.

This paper aims to gain some progress in addressing the above challenges. Our research specifically aims to determine the direction of causality ("1" or "2" as described above) on which there is greater weight of evidence in a given context thereby providing an empirical basis for an aviation policy-relevant tourism development issue. This is a non- trivial task; inferring causality between two highly correlated variables requires the ability to change the levels of one while holding the other constant. Without the ability to conduct designed experiments, instrumental variable (IV) methods can be used on historical data to investigate these relationships. We use the IV method for panel data with limited information maximum likelihood (LIML) estimator in the context of inbound and outbound tourist flows to/from Australia. Degree of air liberalization and total available flights are used as instrumental variables.

Related work

It is acknowledged that the availability of air services is a necessary but insufficient condition for the stimulation of long-distance tourist flows. The theoretical underpinning for the causal connection between transport and tourism demand has been conceptualized and its importance highlighted from the perspective of industrial organization and air liberalization (Papatheodorou, 2002), general equilibrium (Forsyth, 2006), as well as individual demand (Prideaux, 2000).

Importantly, although the evidence for such a causal relationship emerges from a variety of sources, including meta-analyses (e.g., Crouch, 1994, 1995), systemic models (e.g., Bieger & Wittmer, 2006), surveys (e.g., Gomezelj & Mihalič, 2008) and tourism industry stakeholder feedback (e.g., Dwyer & Kim, 2003), the most comprehensive source of evidence, arguably, comes from tourism demand elasticity estimates. Crouch (1995) shows, based on a meta analysis of tourism demand elasticities, that transportation cost elasticity has a "mean of the means" of -0.85 with standard deviation of 1.15 (the corrected mean is also provided at –1.17). In Crouch (1995), it is noted that the transport cost elasticities should be used with caution because there are considerable difficulties in measuring the transport cost with accuracy. In particular, in air transport elasticities measurement errors is a known issue (Seetaram, 2010). Furthermore, the elasticities are subject to the simultaneity problem (where circular causality implies an association, not causality), not to mention the theoretical ambiguity in whether to treat transport cost as a standalone causal factor independent of prices (Sinclair, 1998). The implication of how the transport factor is treated in the empirical studies can be important: in a recent meta-analysis of tourism demand elasticities, Peng, Song, Crouch, and Witt (2015) show that the omission (inclusion) of the travel cost factor is associated with more (less) price elastic estimates of tourism demand.

The causal relations between air transportation and tourism demand is linked to the attributes of the air services. Although sometimes a proxy such as distance between origin and destination (e.g., Eilat & Einav, 2004) can be used, the most common transportation-related factor is undoubtedly transportation cost (e.g., Qui & Zhang, 1995), despite its challenging nature following seasonal, class and transport mode variations (Crouch, 1994). Alternatively, transportation is considered through infrastructures at destination (number of terminals, length of the main road network, share of national expenditure in transport, etc.) (e.g., Khadaroo & Seetanah, 2007, 2008) or seat capacity (Koo, Tan, & Duval, 2013; Tsui, 2017). As evident from the studies estimating tourism demand elasticities, in many empirical studies transportation cost (in terms of the price paid for air transportation services) is often the sole transportation factor considered.

However, transportation embodies not only the ease of access measured in monetary units, but also attributes such as time,