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The causal relationship between air transport and economic growth: Empirical evidence from South Asia

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ABSTRACT

This paper examines the causal relationship between air transport and economic growth in the South Asian context. Using panel data over a period of 42 years (1973–2014), we apply Pedroni/Johansen cointegration test methods, followed by Granger long-run and Wald short-run causality tests. To allow for spatial heterogeneity we then apply Time Series Cross Section (TSCS) Granger causality tests for each of the eight analysed countries separately. Our results confirm a long-run uni-directional Granger causality which runs from GDP to air passenger traffic and also to air freight volumes. Contrary to the existing literature we do not find a long-run bi-directional causality which confirms that spatial dimensions and context matter (i.e. low income and large populations). The absence of short-run causality and the identified time lags of 3–4 years should guide aviation firms and policy makers in the preparation of necessary infrastructure required to support the strong air transport growth potential.

1. Introduction

There have been a number of empirical studies on the relationship between air transport demand and economic development (Goetz, 1992; Chou, 1993; Green, 2007; Ishutkina and Hansman, 2009; Baker et al., 2015). However, wrong signals may be provided to policymakers, airports/airline managers, logistics and tourism companies and strategic transport planners by accepting the causation without knowing its direction, whether it is of short or long run nature and perhaps most importantly whether there is a correlation to start within the given regional context. The direction of causation as well as the involved time lags (in either none, one or both ways) could vary substantially across regions due to different spatial, economic, cultural and social characteristics of the geographic area under consideration (Mukkala and Tervo, 2013).

The South Asian economy has experienced sustainable and strong economic growth over the last two decades with a total GDP of $2.59 trillion (current US$) in 2014 and a growth rate of 6.9% in 2014 (World Bank, 2016). The South Asian region is seen as a future economic powerhouse with significant potential for growth (and importance to the global economy now that China appears to slow down a little) and could become a very lucrative success story for aviation and associated supply chain/logistics industries. This growth will however only materialise if the necessary aviation support infrastructure is put in place in time which requires careful consideration of the spatial dimensions and very significant up-front investment (sunk cost) that involve risks and uncertainties around the forecasted growth numbers for aviation (recent examples on failed investments in airport infrastructure can be seen in the so called white elephant airports in Spain). We argue that the causal relationship of air transport and economic growth in South Asia might be different from other regions. For example, while the populations of South Asian countries are very large, their income per capita is much lower than the OECD average. In addition, travel motivations are different from western countries with the main reasons to use air travel in South Asian countries being manpower (human capital) export/commute (particularly to the Middle East), travelling for higher education abroad and religious visit to Mecca, Kingdom of Saudi Arabia.

The scope of this study is on Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. These eight countries are commonly accepted to be South Asian countries and have come together to form the South Asian Association for Regional Cooperation (SAARC, 2016). The registered air carrier departures in South Asia have risen from 154,700 in 1973 to 912,858 in 2014 (World Bank, 2016). This is in spite of the political and economic turmoil endured by some of these countries over the 40 years under scrutiny. While this may sound very much, it is not when one considers its combined population and that the combined region has now become the third largest global economy in the world after the USA and China in terms of purchasing power parity (PPP). Approximately 4% of the world's air cargo traffic in tonnage and 4% in tonne-kilometres were traded in the South Asian market (Boeing, 2014). The amount of air freight carried in South Asian trade was 2688 million ton-km in 2014. While India contributed the most with approximately 64%, Sri Lanka accounted for 14%,

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Bangladesh accounted for 10% and Pakistan contributed >8%. The total number of air passengers has increased from 5.14 million in 1973 to 99.15 million in 2014 (World Bank, 2016).

While there has been significant growth in the South Asian aviation market, penetration of air travel and growth in passenger numbers are still relatively low compared to other regions. For example, according to figures from Airbus (2016) there have been 0.08 air trips per in India compared to 0.30 trips per capita in China and 1.8 trips per capita in North America capita in 2015. However, given its large population and strong growth potential of both GDP and available income, many analysts expect the South Asian aviation market to grow much faster than any other region (e.g. according to Airbus (2016) the Indian market is expected to grow more than fourfold to 0.33 trips per capita by 2035) and it is thus interesting to evaluate whether traditional causality claims are justified and applicable to the South Asian context.

The causality analysis has grown in popularity as it has become important to policy makers, airlines, airports and other stakeholders to better understand whether there is a unidirectional or bidirectional or indeed no relationship between GDP and air transport activity and whether there are any time lags in those relationships. To better understand which way the causalities run (chicken or egg question) can for example guide policy makers in answering whether it is better value to publicly support economic growth (which may then boost aviation) or aviation directly (which may then boost economic growth). Most empirical literature that has analysed the causal relationship between air transport and economic growth has focused on high income (e.g. Baker et al., 2015) and higher middle income countries (e.g. Marazzo et al., 2010) with very little attention on lower middle income and low income countries. Specifically, there are no studies and no robust empirical evidence on the causal relationship between air transport and economic growth in South Asian countries. The remainder of this paper, which aims to close this research gap, is organized as follows: Section 2 reviews the literature on air transport and economic growth in different countries/regions. Section 3 outlines the methodology of our study and in Section 4 we discuss the empirical findings. Section 5 provides conclusions and policy recommendations.

2. Literature review and setting the scene

It is well established that there exists a strong correlation between air traffic and economic growth, however, the direction of causation is unclear (Green, 2007) and only a few causal analyses have been done so far in the transportation field. Button et al. (1999) studied causality between airport traffic and employment using Granger causality tests and observed airport traffic significantly increases employment. What is more, Marazzo et al. (2010) studied the relationship between air passenger demand and economic growth (GDP) in Brazil and found that GDP and air passenger growth are cointegrated. They have shown for a middle income context that there is a strong positive impact on air passenger numbers due to a positive change in GDP and to a lesser extent also and impact of air passenger growth on GDP. Similarly, Fernandes and Pacheco (2010) analysed the causal relationship between economic growth and domestic air passenger traffic by using time series data of Brazil from 1966 to 2006. Their results, however, suggest a unidirectional Granger causal relationship from economic growth to domestic air transport demand.

Button and Yuan (2013) applied Time Series Cross Section (TSCS) analysis to test the causal relationship between air freight and economic development across 32 metropolitan areas in the United States. They found uni-directional causality running from air freight growth to per capita income in metropolitan areas and a bi-directional relationship between air freight growth and metropolitan employment. In addition, Van De Vijver et al. (2014) investigated causality between trade and air passenger travel by applying heterogeneous TSCS Granger causality tests to a number of Asia-Pacific country-pairs. Interestingly, the found all four types of causal relationship (i. independent, ii. air traffic to trade iii. Trade to air traffic and iv. bi-directional) across the different country pairs. As with Button and Yuan (2013) they based their TSCS analysis on F-statistics and did not test the short-run and long-run aspects of causal relationships.

Acknowledging the importance of heterogeneity across countries and time, Mukkala and Tervo (2012, 2013) investigated causality between air transportation and regional growth in Europe by using annual data of 86 European regions and 13 countries for the period of 1991–2010. They noticed peripheral regions have higher (and more homogenous) causality from air transport to economic growth compared to core regions. Hu et al. (2015) investigated the short-run dynamics, the long-run equilibrium relationships and the Granger causal relationship between economic growth and domestic air passenger traffic. By covering quarterly panel data (of 2006Q1 to 2012Q3) of 29 provinces in China they employed various tests for panel unit roots, cointegration in heterogeneous panels and panel causality in a bi-variate panel vector error correction model (PVECM). The study concluded that there is a long-run and strong bi-directional Granger causal relationship between these two series. It is also found that there is a short-run uni-directional Granger causality running from the domestic air passenger traffic to the economic growth.

Closer to the Asia context and by using Augmented Dickey Fuller tests (ADF), Johansen cointegration tests, Granger causality tests and the Vector Error Correction Model (VECM), Chang and Chang (2009) examined the causal longitudinal relationship between air cargo and economic growth in Taiwan over the period 1974–2006 and the results suggest a bi-directional causal relationship between air cargo and economic growth. Their results indicate that air cargo expansion plays a crucial role in promoting economic growth in that market. Although much of the existing literature used time series data for the causal analysis, we follow Baltagi (2005) and Hood et al. (2008) who concluded that panel Granger tests are more efficient than usual Granger test with time series data. In a recent study, Baker et al. (2015) investigated the causality between regional aviation and economic growth in Australia using panel data. They found a significant bi-directional relationship between regional aviation and economic growth by analysing 88 regional airports in Australia over a period of 1985–86 to 2010–11. Importantly, they found that there appears to be a two year time lag of economic growth impacting on aviation traffic which suggests that public support should go directly to airports rather than to indirect regional development (also because the magnitude of the airport to economic growth causality is higher than the other way around).

To overcome some of limitation of Granger causality framework in terms of multivariate causality, Pesaran and Shin (1999) and Pesaran et al. (2001) introduced an autoregressive distributed lag (ARDL). Although Narayan and Smyth (2005) suggest that ARDL and Granger causality tests provide similar results, ARDL causality tests are still used to examine the role economic growth in combination with unexpected market shocks such as the 9/11 terrorist attacks, wars, the SARS epidemic or the 2008/09 global financial crisis and the potential multivariate causality with aviation (e.g. Chi and Baek, 2013). This stream of literature stresses the importance of long-run versus short-run effects for different market segments (air passenger services versus freight) but confirms similar to the existing Granger causality literature economic growth as the primary determinant of air travel (e.g. Chi, 2014).

Interestingly, most of the literature on causality analysis between air transport and economic growth focuses on high income countries (with often matured aviation markets) and results suggesting bi-directional causality between air transport and economic growth are therefore limited to that context. In contrast, causality results from middle income countries such as Brazil showed strong causality run from economic growth to air transport but weak causality run from air transport to economic growth (Marazzo et al., 2010). Most importantly, there is no literature on causal analysis between air transport and economic growth for low income countries (with potential for very strong growth of air transport demand), which is a fundamental gap as context appears to