The impact of air transportation on trade flows: A natural experiment on causality applied to Italy

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ARTICLE INFO

ABSTRACT

Efficient air transportation services can boost regional economic development by allowing access to the world market, facilitating integration and labor mobility, and fostering local industries. In this regard, aviation can act as a means of both transporting traded "goods" and providing complementary services of labor mobility. The Lombardy region in Italy is an interesting case, as it is one of Europe's wealthiest and most industrialized areas with almost 10 million inhabitants. It has three of the top four Italian airports—Milan Malpensa (MXP), Bergamo Orio al Serio (BGY), and Milan Linate (LIN)—as well as a small airport in Brescia Montichiari (VBS) mainly used for cargo flights. On March 31, 2008, Malpensa Airport experienced the de-hubbing of Alitalia. This exogenous event allows us to study the relation between international trade and civil aviation by exploiting a quasi-natural experiment without endogeneity problems. We investigate this relation by estimating a before/after augmented gravity-econometric model applied to a panel data set for the period of 2004–2014. The data set includes, for each of the considered 30 European countries, information on trade flows divided by commodities sector, distance from Lombardy, GDP per capita, population, transport infrastructures and a set of other control variables. We estimate the gravity model under three different econometric specifications: random effect panel data, PPML, and PPML with fixed effects to include countries' multilateral resistance. Furthermore we estimate a DID model as a robustness check for possible endogeneity among trade and aviation, using the region of Veneto (similar to Lombardy but not affected by the de-hubbing) as a control case. We find that civil aviation has a positive impact on international trade, with elasticity ranging from +0.003% to 0.13% in the different econometric specifications, and that this effect is stronger in high tech- and medium-tech manufacturing sectors.

1. Introduction

As stated by the European Commission, civil aviation is "a strategically important sector that makes a vital contribution to the EU's overall economy and employment." The industry generates about 5 million jobs and produces 2.1% of the European GDP.[1] In the U.S., civil aviation contributes to about $460 billion (5.4% of GDP) to the economy and supports 11.8 million jobs (FAA, 2015). It has been acknowledged that civil aviation provides essential infrastructure for the economy and supports innovative activity, the exploration of new economic opportunities, and connections for business and social relationships. This vital role is further emphasized

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when considering local economies; that is, residents, businessmen, and policymakers regard an efficient local aviation system to be a crucial gateway to the regional economy as well as to the global market. In some peripheral regions, aviation is the main infra-structure for mobility. This has stimulated research on the regional development-aviation relationship in order to identify the casual relation and magnitude of the effect.[2]

Interestingly, most previous contributions have not investigated the impact of civil aviation on regional trade. Other papers have studied the impact on local employment (Benell and Prentice, 1993; Button et al., 1999; Button and Taylor, 2000; Brueckner, 2003; Green, 2007; Button, 2010; Percoco, 2010; Neal, 2012; Mukkala and Tervo, 2013), income (Button et al., 2009; Sellner and Nagl, 2010; Mukkala and Tervo, 2013; Button and Yuan, 2013; Allroggen and Malina, 2014; Baker et al., 2015; Baltaci et al., 2015; Blonigen and Cristea, 2015; Button et al., 2015; Fernandes and Pacheco, 2015; Hu et al., 2015), population growth (Green, 2007; Blonigen and Cristea, 2015) and wages (Biloktach, 2015). To the best of our knowledge, the only previous studies that have investigated such a relation are those of Kulendran and Wilson (2000) and Van De Vijver et al. (2014). However, both studies mainly focus on testing the causality links between these two variables, rather than estimating the effects of aviation on trade (after dealing with the possible endogeneity). Hence, this paper is an attempt to fill this gap by studying the relationship between trade and air transportation. The latter is investigated by looking at the various types of industries that may be affected by civil aviation (i.e., the manufacturing sector, high-tech industries, low-tech industries, and so forth). The relationship is estimated using an econometric model that takes into account the possible endogeneity between trade flows and aviation activity. We then apply the model to a data set covering the trade flows between Lombardy, the richest and most populated (10 million inhabitants) Italian region, and 30 European countries from 2004 to 2014.

In dealing with the possible endogeneity issue we exploit a quasi-natural experiment that stems from the exogenous shock in the regional aviation system of Lombardy that occurred on March 31, 2008. Alitalia, the main Italian carrier (the former flag carrier), decided to de-hub from Malpensa Airport, cutting 181 flights per day (two-thirds of its total daily Malpensa flights) and transfer 14 intercontinental routes (out of a total of 17) to Rome Fiumicino (Redondi et al., 2012), which, since that day, has become the unique Alitalia hub. In this case, we exploit the significant change in civil aviation due to a formerly dominant airline's decision to identify the impact of air transportation on trade. The variation in traffic after the Malpensa de-hubbing is relevant because it was not due to trade variation in Lombardy, but rather to Alitalia's financial crisis, which lost € 844 million in 2004, € 168 million in 2005, € 627 million in 2006, and € 495 million in 2007. In an attempt to rescue Alitalia, which was privatized in 2005 but still retained a 49.9% stake under public control, management launched a restructuring plan. It dropped the previous business model based on two hubs (Milan Malpensa and Rome Fiumicino) to concentrate activities in Rome and exploit the possible savings coming from a single hub-and-spoke system. Alitalia's financial crisis has been a long-running phenomenon, dating back to 1992, when the European market began to liberalize and the company was unable to operate in a competitive market (Malighetti et al., 2009). Since then, the Italian government pumped public money into the company, about € 7.4 billion. Thus, Alitalia's de-hubbing decision could be considered as exogenous to a possible variation in trade between Italy and other European countries during the observed period. Such an exogenous change in civil aviation determines a variation on Lombardy's 2008 air transportation activity, and we employ a before/after econometric model to identify a casual impact on trade, as well as to obtain a non-endogenous estimate of the contribution of civil aviation on trade. Furthermore, as a robustness check in our investigation, we analyze a difference-in-difference (DID) model to further control for possible endogeneity between trade and air transportation by including another Italian region, Veneto, which was not affected by Alitalia's de-hubbing decision.

We analyze the civil aviation-trade relationship through several perspectives that include total trade, aggregate agriculture and industrial trade, total agriculture trade, total industrial trade, the manufacturing trade, the high-tech sector trade, the medium-high sector trade, the medium-low sector trade, and the low-tech sector trade. We intend to determine whether some sectors are more sensitive to civil aviation-trade ability than others. Moreover, following recent trends in international trade literature, we develop an augmented gravity model (Anderson and Van Wincoop, 2003) taking explicitly into account countries' multilateral resistance (MR) using fixed effects (Feenstra, 2004; Zhang et al., 2016)[3]; moreover we consider possible distortions in coefficient estimates by adopting alternative econometrics models (panel data and a Poisson pseudo-maximum likelihood (PPML) estimator, as suggested by Santos Silva and Tenreyro, 2006).[4] Hence, this paper is one of the first attempts to consider the potential endogeneity problem in gravity models, a topic that has been largely neglected in the air transportation gravity-model literature, as stated by Zhang et al. (2016). To ensure that the effect of civil aviation on trade is not influenced by other factors—and in line with other gravity-model studies—we introduce in our model a number of control variables. These variables include the distance between Lombardy and each European country in the data set, the real per-capita income in each European country, whether the country is a member of the European Union, whether it is under the Schengen Agreement (institutional settings reducing possible barriers to trade), and a time effect to take the business cycle into account.

The paper is organized as follows. Section 2 presents the literature review. Section 3 discusses the econometric model. Section 4 examines the data set, while Section 5 shows the obtained empirical results and robustness checks. Section 6 draws some conclusions.

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[2] See Baker et al. (2015) for a updated review of previous studies and findings.

[3] Multilateral resistance captures the general costs when exporting and importing with other countries (Zhang et al., 2016).

[4] A PPML is particularly indicated in the presence of countries with zero trade values, which may create problems in estimation if the values are not randomly distributed. Moreover, as shown by Santos Silva and Tenreyro (2006), a PPML can also deal with possible heteroscedasticity problems. We are grateful to an anonymous referee for raising this issue.