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Determinants of partnership levels in air-rail cooperation

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ABSTRACT

This paper is the first empirical attempt to collect information for all existing air-rail cooperation cases around the world and analyze the factors that are related to their partnership levels with multiple statistical methods. We find that whether the rail station is located at the airport is the main factor affecting the air-rail partnership level. In particular, air-rail cooperation cases with co-location of airports and rail stations have significantly higher partnership level than the cases without. Furthermore, we also find that air-rail cooperation cases in Asia have significantly lower partnership levels compared with those in Europe.

1. Introduction

High-speed rail (HSR) is one of the most important technological breakthroughs in the transport industry. As a popular transport mode that carries 1600 million passengers per year (UIC, 2017), HSR has been regarded as the biggest threat to airlines. In short-haul markets HSR usually dominates airlines, resulting in big decline in airlines' market shares. Many examples show that these two transport modes fiercely compete with each other and HSR has encroached the territory of airlines aggressively (e.g., Park and Ha, 2006; de Rus Mendoza, 2012; Fu et al., 2012, 2014; Jiménez and Betancor, 2012; Jiang and Li, 2016; Wan et al., 2016; Zhang et al., 2017a). On the other hand, aviation still has its own competitive advantages, especially its extensive network and its ability to offer long-haul travel. The competitiveness of HSR decreases with route distance and its market shares become modest on routes over 400 miles (Albalate and Bel, 2012).

Under such background, in recent years the two transport modes have moved beyond pure competition and into cooperation in some particular cases. In particular, the hub-and-spoke network makes such airline-HSR complementarities possible. In a hub-and-spoke network, two flights ("legs") are connected through a centrally located hub airport as one journey to provide services. With the airline-HSR complementarities, however, HSR can be one leg and used in cooperation with a flight to provide services.[1] We can simply regard such intermodal cooperation as a particular type of "code sharing" which has been widely adopted by airlines (e.g., Oum et al., 1996; Oster and Pickrell, 1988; Ito and Lee, 2007). Under a code sharing agreement, two separate airlines operate connecting flights with each offering one leg while the non-operating airline can allocate its own code to the operating airline's flight number. Policy makers also encourage and support air-rail cooperation since it is generally believed that the substitution of air services with equivalent HSR services can help mitigate the air pollution and airport congestion (Janic, 2011). Due to the positive impacts of air-rail cooperation on the environment and the society in general, some studies have shifted focuses from the competition to the cooperation between these two transport modes (e.g., Givoni and Banister, 2006; Jiang and Zhang, 2014; Albalate et al., 2015; Jiang et al., 2017).

Despite the growing importance of the air-rail intermodal cooperation, there is one interesting aspect that is under-explored in literature. Jiang et al. (2017) is the only paper to focus on the considerable differences among air-rail intermodal cooperation cases. In particular, they point out that different partnership levels appear among the existing air-rail cooperation cases. Some cases achieve high partnership levels with advanced features like baggage handling, coordinated scheduling, and integrated ticketing, and can be comparable to connecting flights. For instance, the AIRail service offered by Deutsche Bahn and Lufthansa at Frankfurt Airport is one of the best intermodal practice examples.[2] By contrast, some cooperation is at considerably lower partnership level. A good example can be found in

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[1] Sometimes, the complementarities are not even confined with HSR. In some countries, such as Canada and the US, the intermodal cooperation is offered without real HSR. So we refer this intermodal cooperation as air-rail cooperation instead of air-rail cooperation in the rest of the paper.

[2] AIRail provides intermodal services on the Frankfurt-Cologne route with 50 min of total travel time and a frequency of 16 daily links. Moreover, the position of an 'intermodal manager' has been created at Frankfurt airport to further support the air-rail cooperation, with the main responsibility being a coordinator between rail operators and airlines.

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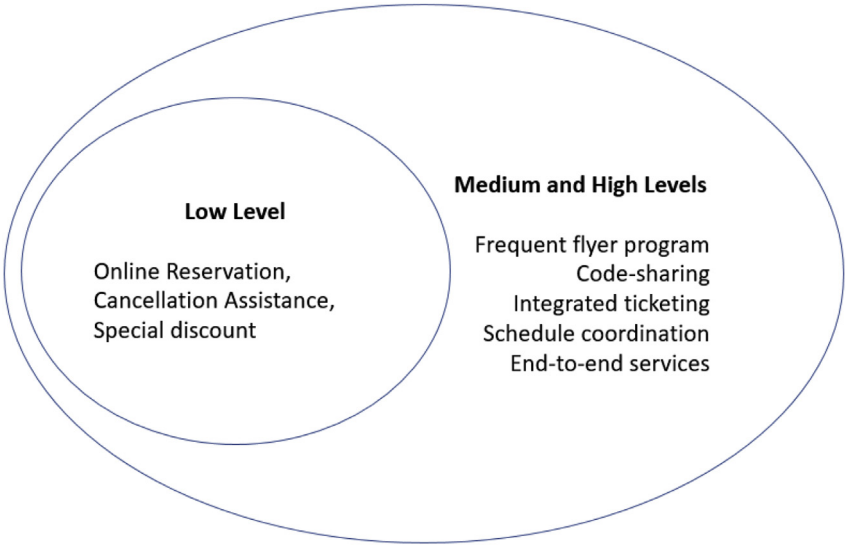

Fig. 1. The summary of the air-rail partnership features for Low, Medium and High Levels of partnership.

the cooperation between VIA Rail and Air Canada, where they co-operate with each other only under delay or cancellation disruptions. This is nothing more than an alternative back-up strategy for emergent situations. Most partnerships lie in between these two extremes. These observations lead to an important query: what are the driving forces behind the various partnership levels of air-rail cooperation cases? Jiang et al. (2017) offer a theoretical study to answer this question, but they mainly focus on one element, i.e., whether the airlines involved in a particular air-rail cooperation case are domestic or foreign, due to the limited capability of modeling studies. Providing useful insights, the authors also acknowledge that there are more factors that might play a role in determining the partnership levels of particular air-rail co-operation cases, and it is hard to capture the full picture of this phe-nomenon without a broader view of case comparisons. This paper aims at filling this gap as the first empirical attempt to collect information for all existing air-rail cooperation cases around the world and analyze the factors that are related to their partnership levels with multiple econometric methods.

We have two major findings. First, we find that whether the rail station is located at the airport is the main factor affecting the air-rail partnership level. In particular, air-rail cooperation cases with co-lo-cation of airports and rail stations have significantly higher partnership level than the cases without. Second, air-rail cooperation cases in Asia have significantly lower partnership levels compared with those in Europe. We believe that the results reveal some policy lessons about how to better promote this intermodal cooperation, including better infrastructure planning and a positive policy environment.

The rest of the paper is organized as follows. Section 2 summarizes all the existing air-rail cooperation cases around the world, identifies their main features, and then categorizes them into different air-rail partnership levels. Section 3 presents two econometric methods for the analysis of the major determinants behind the partnership levels of air-rail cooperation. Section 4 analyzes the empirical results, followed by a detailed discussion. Finally, section 5 contains concluding remarks.

2. Partnership levels of air-rail cooperation

It is important to find a way to compare the various air-rail co-operation cases in order to understand what causes the wide-ranging differences of their partnership levels. It is perfectly possible that one air-rail cooperation case shows some features that the other case lacks and also lacks some features that the other case shows at the same time. Therefore, the first step we adopt is to summarize the existing air-rail cooperation cases and identify their features that are related to various partnership levels. Then we count the number of such characteristics attached to each cooperation case so as to rank these existing cases. From the ranking, we try to draw some preliminary conclusions about the driving forces for a high partnership level air-rail cooperation case. Admittedly, we are essentially giving the same weight to every feature that we identify, i.e., treating these characteristics equally, which might not be accurate. For example, for a large number of passengers, time coordination might be more important than frequent flyer miles. Meanwhile, we can only categorize the cases into three partnership levels, the distinction of which is also somewhat arbitrary. We ac-knowledge that these might not be the best ways to rank the partner-ship levels, but they are the most feasible approaches at the current stage. Serving as the first empirical study trying to quantify the degree of air-rail cooperation, we do not aim to present the most accurate methodology but to open up a new avenue for future improvement. The potential follow-up directions will be provided in the conclusion sec-tion. Despite this simplification to measure cooperation level by counting features, as shown Fig. 1, we found that the “Medium” and “High” level cooperation cases always nest the features of “Low” level cooperation and provide more advanced cooperation features, which justifies our counting approach. Next, we discuss the details about the cooperation features.

First, the relevant cases of the cooperation between air and rail were mapped, as shown in Table 1.[3] Looking closer to each case (Table 1) with their main features (Table 2), the main features are associated with the agreements in the air-rail cooperation. For example, code-sharing agreements enable each operator to allocate its own code to the other operator's service (usually flight number to train trip). Passengers may transfer between these two different transport modes and complete the entire journey with a single ticket or with multiple tickets. Some-times the joint ticket price is offered with special discounts. For ex-ample, in the case of the cooperation between Shanghai Railway Bureau and China Eastern Airlines, the joint ticket price is about 50% less than the total price of buying a train and flight tickets separately. In some cases, the online reservation has made the whole booking process much easier with just one booking of the entire journey. There may be schedule coordination between flights and trains to allow connection opportunities and reduce transfer time and eventually, achieve the

[3] It should be noted that our dataset only consists of cases with specific cooperation schemes between air and rail transport. There exist many other cases where airports are connected with rail link, such as in Japan. However, these cases are not included in our study as there is no concrete contractual agreement between the two modes.