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Effects of Southwest Airlines' entry and airport dominance

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ABSTRACT

We empirically analyzed the pricing behavior of Southwest Airlines and its rivals in markets into which Southwest Airlines had newly entered. We used simultaneous demand and price equations using US airline industry data for the fourth quarters of 2003–2010. Our results produced two important findings. First, Southwest Airlines may set flexible prices while enjoying own airport dominant power after its entry. Second, Southwest Airlines' rivals set competitive prices after it entered their markets, but they set more competitive prices beginning in the fourth year after Southwest Airlines' entry on routes through airports where Southwest Airlines was not a dominant power.

1. Introduction

Recently, many low-cost carriers (LCCs) have emerged among the world's airlines. Southwest Airlines may be the most famous LCC. Southwest Airlines was founded in 1965, and currently has a large network. The airline is often credited with establishing the fundamental business model for LCCs, and most LCCs refer to Southwest Airlines' business model for guidance. However, Southwest Airlines' network is larger than those of other LCCs. Southwest Airlines also purchased AirTran Airways in 2010 and has expanded its international routes.

Many researchers have studied LCCs, and many studies have focused on Southwest Airlines. Most of these studies found that LCCs make the routes they enter more competitive. For example, LCCs induce full-service airlines (FSAs) to behave competitively. However, Southwest Airlines has a large network, equal to those of FSAs. Thus, Southwest Airlines' strategy may be different from those of other LCCs because of the size of its network.

We empirically analyzed the pricing behavior of Southwest Airlines and its rival airlines on routes that Southwest Airlines had newly entered. In the present study, simultaneous demand and price equations were estimated using US airline industry data for the fourth quarters of the years 2003–2010. There were two findings of note. First, Southwest Airlines did not change its pricing behavior from the first entry year to the seventh on routes through airports where it was dominant. Second, rivals set competitive prices after Southwest Airlines' entry into their markets, while they set more competitive prices beginning in the fourth entry year on routes through airports where Southwest Airlines did not have dominant power.

In Section 2, we review the literature related to LCCs. In Section 3, we present the simultaneous demand and price equations that we used to analyze the strategies of Southwest Airlines, and we give our dataset. In Section 4, we present and discuss the empirical results. Finally, Section 5 contains our concluding remarks.

2. Literature review

Many studies have analyzed the impact of LCCs, including Southwest Airlines. Morrison and Winston (1996) empirically demonstrated that Southwest Airlines forces its competitors to reduce their fares. Dresner et al. (1996) and Windle and Dresner (1999) analyzed the effect of the entry of LCCs, and showed that they caused airlines to significantly decrease their rates. Vowles (2000) found that Southwest Airlines, other LCCs, and the market share of LCCs had statistically significant airfare-lowering effects. Morrison (2001) also showed that the entry of LCCs influenced airfares on the LCCs' potential routes. Meanwhile,

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Alderighi et al. (2004) demonstrated that competition between European LCCs and FSAs reduced all classes of FSAs' airfares. Du et al. (2008) examined the impact of the code-sharing agreement between Southwest Airlines and ATA airlines on airfares and passenger volumes. They found that the incumbents' airfares decreased and passenger volumes increased on code-shared routes. Oliveira and Huse (2009) studied the effects of LCC entries on the incumbent airlines' responses. To study the dynamic effect of the new entry of LCCs, Goolsbee and Syverson (2008) analyzed the case of Southwest Airlines using quarterly data and found that incumbents significantly cut their airfares when threatened with the entry of Southwest Airlines. Murakami (2011a) studied whether the price-lowering effects of LCC entry lasted over time, and estimated the change in social welfare that corresponded to the change in the airfares of FSAs and LCCs. Huse and Oliveira (2012) analyzed the effects of the entry of LCCs on the pricing of legacy carriers in the Brazilian airline industry. They found that incumbents responded to an actual entry but not to a potential entry, and product differentiation softened the intensity of the reaction. Murakami et al. (2015) studied the impacts of entries on airfare in Japanese airline industry and found that new carriers discounted their prices at the time of an entry and raised their airfares year by year.

Most studies have indicated that LCCs intensify competition in the airline industry. However, LCCs have diversified in recent years. For example, JetBlue Airways and AirAsia X place more importance on long-distance routes than conventional LCCs. Some studies have focused on this change in LCCs and FSAs' strategies. Dziedzic and Warnock-Smith (2016) indicated that LCCs tend to try to capture business passengers. Dobruszkes et al. (2017) suggested that LCCs are increasing their routes from major airports. Scotti et al. (2016) found that legacy carriers improved by airline operations imposing baggage fees, while Southwest Airlines and JetBlue did not impose baggage fees. Daft and Albers (2015) showed empirically that the similarity among airlines' business models increases over time.

Some studies have analyzed the relationship between LCCs and airports. Bilotkach and Lakew (2014) examined the airport concentration-price relationship. They suggested that, on average, airport concentration affects prices, and that this effect depended on airport size. Martini et al. (2013) implied that LCCs do not affect airports' technical/environmental efficiency. Choo and Oum (2013) suggested that having an even mix between FSA and LCC service at an airport results in inefficiency.

Many researchers have focused on LCCs, but there are not many studies on the impact of growing LCCs on airfares. Below, we empirically analyze Southwest Airlines' and its rivals' fare strategies upon the entry of Southwest Airlines to a route.

3. The econometric model and the data

To analyze the effect of the entries of LCCs, most researchers use a price function. We use simultaneous demand and price equations to derive the effect of entry on pricing behavior. This method has been used by Dresner et al. (1996), Murakami (2011a) and Murakami et al. (2015). This analysis employs the following model specifications. The demand equation is given by:

$$\begin{aligned}\log q_{ijt} =& \alpha_0 + \alpha_1 \log p_{ijt} + \alpha_2 \log \mathrm{Dist}_j + \alpha_3 \log \mathrm{INC}_{jt} \\ &+ \alpha_4 \log \mathrm{POP}_{jt} + \sum_{t=04}^{10} \tau_t \mathrm{D\_time}_t + \sum_{k=2}^{9} \varphi_k \mathrm{D\_MT}_j^k + \nu_{ijt}.\end{aligned} \tag{1}$$

The price equation is given by:

$$\begin{aligned}\log p_{ijt} =& \beta_0 + \beta_1 \log q_{ijt} + \beta_2 \log \mathrm{MC}_{ijt} \\ &+ \beta_3 \log \mathrm{HHI}_{jt} + \sum_{t=04}^{10} \tau_t \mathrm{D\_time}_t \\ &+ \sum_{u=1}^{7} \left(\gamma_1^u \mathrm{D\_WNB}_i^u + \gamma_2^u \mathrm{D\_WN}_i^u\right) \\ &+ \gamma_3 \mathrm{D\_WNUKB}_i \\ &+ \sum_{u=0}^{7} \left(\delta_1^u \mathrm{D\_WNRB}_i^u + \delta_2^u \mathrm{D\_WNR}_i^u\right) \\ &+ \delta_3 \mathrm{D\_WNRUKB}_i + \delta_4 \mathrm{D\_WNRUK}_i + \varepsilon_{ijt},\end{aligned} \tag{2}$$

where p_{ijt} and q_{ijt} are the average airfare and output of route j of carrier i in year t, respectively. Dist_j is the distance between a pair of cities on route j, INC_{jt} is the arithmetic per capita income of route j in year t, POP_{jt} is the arithmetic average of the O/D population in year t, $\mathrm{D\_time}_t$ is the time dummy variable that takes 1 for year t (the benchmark year of this binary variable is 2003Q4), and $\mathrm{D\_MT}_j^k$ is a binary variable that takes 1 for the market where k carriers compete (the benchmark market of this binary variable is a duopoly). The $\mathrm{D\_MT}_j^k$ is introduced to control the market size in the demand equation.

$\mathrm{D\_WN}_i^u$ is a binary variable that takes 1 for Southwest Airlines, which has operated for u years since entry. $\mathrm{D\_WNR}_i^u$ is a binary variable that takes 1 for competitors that Southwest Airlines has faced since entry, and after u years have elapsed. D_WNRUKB is a binary variable that takes 1 for competitors when it is not clear when they began to compete with Southwest Airlines in routes through base airports. D_WNRUK is a binary variable that takes 1 for competitors when it is not clear when they began to compete with Southwest Airlines. The benchmark of these binary variables is Southwest Airlines when its entry year is not clear.

MC_{ijt} is the marginal cost of route j for carrier i in year t. This variable will have a positive effect on airfares. We used the following equation to calculate marginal cost:

$$\mathrm{MC}_{ijt} = \mathrm{AC}_t^i \left(\mathrm{Dist}_j \Big/ \mathrm{AFL}_t^i\right)^{-\lambda} \mathrm{Dist}_j, \tag{3}$$

where AC_t^i is the average cost of carrier i in year t, and AFL_t^i is the average distance flown by airline i in year t. This method has been used by Brander and Zhang (1990, 1993), Oum et al. (1993), Murakami (2011a, 2011b), and Zhang et al. (2014).[1] HHI_{jt} is the Herfindahl index of route j in year t; a higher HHI_{jt} means that the market is more concentrated. Since a high concentration may lead to strong market power, the parameter will be positive. In this study, we treat Southwest Airlines' base airports as Dallas Love Field Airport, Chicago Midway Airport, Baltimore Washington International Airport, and Hobby Airport. We supposed that Southwest Airlines was the dominant power at these airports. Table 1 summarizes the definitions of these variables.

We used US airline industry unbalanced panel data for the fourth quarters of years 2003–2010 (2003Q4, 2004Q4, …, and 2010Q4). We chose the fourth quarters in order to analyze more competitive behavior in a period when airlines avoided competitive

[1] To obtain λ, we estimate the following price equation by the nonlinear least-squares method. $p_{ijt} = \left\{\mathrm{AC}_t^i \left(\mathrm{Dist}_j/\mathrm{AFL}_t^i\right)^{-\lambda} \mathrm{Dist}_j\right\} \eta / \{\eta - (1+\theta) s_{ijt}\} + \kappa_{ijt}$. η is the route-specific price elasticity of demand, θ is the conduct variation and s_{ijt} is the market share of route j of carrier i in year t. Previous studies, such as Brander and Zhang (1990, 1993), Oum et al. (1993) and Murakami (2011a,2011b), found that λ ranges between 0.15 and 0.67. This study uses 0.634.

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