



Modeling the effects of wage premiums on airline competition under asymmetric economies of density: A case study from Brazil[☆]



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This paper investigates the effects of wage premiums on the competition between Full Service Carriers (FSC) and Low Fare Carriers (LFC) in the airline industry. We study the impact of changes in the labor market and the resulting effects on performance in the product market and examine the role of economies of density. We develop an oligopoly model of airline competition with endogenous wages and simulate increases in labor costs. We apply the model to the case of the most important domestic route of Brazil using airline/route-specific demand and costs data. Our chief contribution relies on the empirical model of asymmetric economies of density for the competing business models. We estimate that LFCs have higher economies of density than FSCs. With the empirical models of demand, costs and wages, we compute the wage-elasticities of price-cost markups. We find that, on account of the higher sensitivity of marginal costs to labor costs of the FSCs, their markups are more affected by wage premium increases than the markups of the LFCs. The results are attenuated by higher economies of density, but amplified by higher price-elasticities of demand and lower economic growth.

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1. Introduction

This paper analyzes the impact of wage premiums on the product market competition of major Full Service Carriers (FSC) and Low Fare Carriers (LFC) in the airline industry. We impose exogenous flight crew unit cost increases on the cost structures of airlines engaged in Bertrand–Nash competition with product differentiation. The cost increases are caused by pilot and cabin crew wage hikes with airlines facing stronger union power, short-term labor scarcity and resulting higher labor market rents. We apply our model to a booming airline market with rapid growth in the demand for cabin crew – the Brazilian airline industry of the late 1990s and early 2000s. More precisely, we apply the model to the case of the densest domestic route of Brazil using airline/route-specific demand and costs data.

Labor relations issues such as collective bargaining and strike threat power have gained increasing attention in the Brazilian air

transportation market over the years. As the market has faced a clear shortage of qualified labor with the continuing departure of many experienced pilots for job opportunities abroad, stronger pilot and air traffic controller unions began demanding better working conditions and wages. Strike threats and non-strike work actions – such as work-to-rule procedures – have been implemented in many situations since then, particularly after the last major strike episode of 1988. The situation has been exacerbated since the 1990s with the notable expansion of the industry permitted by the country's macroeconomic stabilization, opening of the economy and, more specifically, deregulation of the air transportation sector. Actually, demand for air travel has more than tripled since the early 1990s.² In addition to the emergence of airport capacity bottlenecks, demand pressure has factored into the rapid growth in industry labor costs that has outpaced any other cost category in recent years.³

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² According to the Institute for Applied Economic Research (www.ipeadata.gov.br), airlines produced 29.0 billion revenue-passenger kilometers (RPK) in 1990, against 95.9 billion RPK in 2010.

³ Although labor unit costs declined during the 2000s (to a low of 12.72% of total operating cost in 2004), they have had been on an increasing path since, reaching 19.39% in 2010. By contrast, labor costs were typically greater than 20% of operational costs during the 1990s (source: regulator's Statistical Yearbooks, 1997–2010). See Turola et al. (2011) for a discussion.

We model the impact of increases in wage premiums on the competitive interaction of FSCs and LFCs.⁴ So far the impact of crew costs on downstream airline competition has received little attention in air transportation studies. The chief contribution of the present paper relies on modeling asymmetric economies of density between the different business models of carriers. Since Brueckner et al. (1992) the literature has incorporated the fact that increases in traffic volume on spokes of a network of an FSC typically decrease fares on account of economies of spoke density. In parallel, it has been reported that not only FSCs may benefit from economies of density. For example, Boguslaski et al. (2004) note that in the 1990s the most prominent LCC, Southwest Airlines, focused almost exclusively on short haul, dense markets aiming at rapidly expanding and keeping low unit costs to exploit economies of density. However, virtually no previous study has explicitly assumed asymmetric economies of density among FSCs and LFCs when modeling airline competition. Assuming asymmetries mean that the production processes of the different business models are also asymmetric, and that differences that are not only due to relative sizes of carriers must be taken into account in the airline competition model. We therefore make use of this assumption when inspecting the effects of wage premiums on competition, and assess the impacts of a wide range of possible returns to density values on the relative competitive advantage of carriers.

In this paper, we also assume that wages are endogenously determined and therefore explicitly model wages as a function of endogenous and exogenous carrier-specific shifters. Neven and Röller (1996) and Neven et al. (2006) also considered endogenous airline labor costs, by assuming that carriers bargain over wages. We also utilize instrumental variables aiming at consistent econometric estimation of wage determinants. The contribution of our identification strategy is that, as opposed to the previous literature, we test for the relevance and validity of the proposed set of instrumental variables.

Thus, our model of differentiated oligopoly aims to pinpoint the product-market effects of wage hikes in the airline industry. More specifically, we propose to apply this model to the case of the most important Brazilian route – the São Paulo–Rio de Janeiro air shuttle. We estimate panel data models of demand, costs and wages. Estimated structural parameters are then used to simulate the effects of labor cost shifts – increases in wage premiums that result from stronger union bargaining power – on airline competition. We compute the wage-elasticities of quantities, prices, marginal costs and price-cost markups, and consider alternative scenarios of economies of density, price elasticities and economic growth in performing a sensitivity analysis with respect to the effects of wage hikes. We find that markups for FSCs are considerably more affected by shocks in wage premiums than the markups for LFCs in all scenarios, even considering that the cost-price pass through of FSCs is slightly higher than that of LFCs. This result is driven by the fact that FSCs' marginal costs and demand are more vulnerable to wage premium shocks. The results are amplified by weaker (more exhausted) economies of density, higher price-elasticity of demand and lower economic growth.

This paper is organized as follows. In Section 2, we present the Brazilian airline industry and the evolution of airline labor costs in the country. Section 3 presents the theoretical model, the available data and the estimation results of the empirical models of demand, costs and wages. In Section 4, we present the results of comparative-static simulations that attempt to assess the impact of a wage

premium increase by computing the wage-elasticities of each group of carriers. In Section 5, we present the concluding section.

2. Labor relations in the Brazilian air transportation of the late 1990s

Brazilian flight crew regulations are provided for in Federal Law Number 7,183, enacted on April 5, 1984. This law provides safety, operational and flight rules for crewmembers, including work assignments and work limits with respect to the number of consecutive hours of rest between assignments. The Brazilian regulatory framework of airline labor relations is considered by many analysts to be strict and outdated, particularly in comparison to other jurisdictions in South America, such as Chile and Uruguay. These countries allow greater flexibility in terms of working hours. Moreover, the Brazilian law explicitly forbids recruitment of foreign pilots. By contrast, in India, for example, carriers are allowed to hire expatriate pilots, who have recently become a majority of the workforce at certain airlines. China is another emerging market that began allowing foreign crew recruitment. In Brazil, conversely, qualified pilots have been leaving the country in recent years for better salaries in expanding airline markets abroad, which complicates a labor market for airlines already saddled with a prohibition on hiring foreign pilots.⁵

Historically, the major labor union representing pilots, flight attendants, mechanics, and other classes in Brazil has been the Aeronauts National Union (SNA), founded in 1946. In 1960, another important labor association was founded, Varig Pilots Association (APVAR), to represent pilots at the Brazilian flagship carrier, Varig Airlines. Although employees of other carriers had their own associations, APVAR was the most significant until the early 2000s. In Brazil, the outcomes of negotiations between labor unions, associations and airlines now typically cover the employees of all major carriers, with the signature of a Collective Work Convention.

During the late 1990s, labor costs were typically more than 20% of carriers' total operating costs.⁶ From this period forward, air transportation in Brazil began a considerable expansion. After several episodes of crisis and intense economic problems in the 1970s and 1980s, the scenario in Brazil changed dramatically in the mid-1990s. First, a macroeconomic stabilization policy led to the end of hyperinflation and a relative increase in consumer income. In parallel, a set of measures of economic liberalization in the airline industry provided greater price competition between carriers. The expansion of income combined with increasingly competitive pricing resulted in a considerable expansion of air transportation during this period. In fact, the demand for air travel in the country increased from 29 billion RPK in 1990, to more than 95 billion RPK in 2010 – representing growth of 228% over twenty years. As a comparison, the country's entire economy grew approximately 82% during the same period.⁷

Fig. 1 shows the evolution of certain important metrics of the Brazilian air transportation industry during the period. Medium-term growth rates of revenue passenger kilometers ("RPK") and pilot workforce ("Pilots") may be observed. Medium-term growth rates were calculated using the average growth rate over a period of three years – denoted by "yo3y". Fig. 1 also depicts the evolution of average captain compensation ("Wages") during the period. There

⁵ According to flightglobal.com, in 2008, more than 200 Brazilian pilots were flying for carriers based in the Middle East and India, among other regions outside the Americas.

⁶ Source: regulator's Statistical Yearbooks (1990–2000). After Gol's entry in the market, because of cost restructuring and the bankruptcy of incumbents, the proportion of labor-related costs dropped to figures close to 14%.

⁷ Source: www.ipeadata.gov.br (series of annual Revenue Passenger-Kilometers and real Gross Domestic Product, deflated by using the country's Consumer Price Index – IPCA).

⁴ See Hofer et al. (2008) for a study of the determinants of price premiums in the airline industry. For an application of an oligopoly model to the Brazilian airline industry, see Silveira and Oliveira (2008).

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