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Ex post mergers evaluation: Evidence from the Brazilian airline industry

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CADE
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Ex post mergers evaluation: Evidence from the Brazilian airline industry[1]

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Executive Summary

Competition policy aims to preserve market competition by, for example, preventing mergers that harm consumers. Mergers can diminish competition by facilitating either tacit or explicit collusion or may creating a unilateral incentive to increase price. While these possibilities provide an economic rationale for merger enforcement, mergers might be related to improving how markets function. Maldonado and Severino (2019) show that more productive firms acquire target firms that are more productive, which indicates the synergy that M&A can bring.

Generally, Antitrust Authorities (AAs) analyze cases of M&A and potential anticompetitive conducts, such as collusion. In this study, we will focus on the decisions carried out by the Brazilian Antitrust Authority, the Administrative Council for Economic Defense (CADE), regarding M&A's in the Brazilian airline sector in recent years. The Brazilian airline sector has a fundamental role in the economic development. In 2019, it represented approximately 1% of the global GDP and faced a growth of 3.3% in air transport expenses regarding to the previous year (IATA, 2019b).

In Brazil, Section 88 of the Law 12529/2011 regulates the M&A cases which must be reviewed by Cade. During reviews, the Antitrust Authority studies the impacts that the operation can have on the market. Some well-known international methodologies, such as the Upward Pricing Pressure (UPP) and merger simulations, are commonly used to identify the likelihood of a merging firm raising prices after the operation – which can be widespread to the entire market. If prices are expected to rise, consumers will be adversely affected by the merger; thus, to prevent it, CADE can clear a transaction subject to remedies, or block it. On the other hand, if the deal does not pose any competition issues, Cade may clear the transaction unconditionally.

Nowadays, many studies indicate the importance of evaluating mergers outcome, especially within the Antitrust Authorities, since "ex-post evaluations can help to determine if an intervention (or non-intervention) has achieved its objectives and, if not, the reasons it failed to do so" (OECD, 2016). In response to this demand, the Competition Division of the OECD published a Guide for ex post evaluation to advise authorities on the importance of monitoring the outcome of their decisions, which can help to better design future interventions. Furthermore, it is worth noting that by carrying out and disclosing ex post merger evaluations, the antitrust authorities present more transparency towards society and

highlight the importance of competition enforcement. In 2019, for instance, Cade published its first ex post merger evaluation, which analyzed the impact on products prices of a merger between two firms of the food industry – namely the Sadia-Perdigão case (Severino, Resende, Bispo, 2019).

The present study aims to analyze the effects on the average airfare on domestic routes by two mergers cleared by Cade in this sector (GOL and Webjet; and Azul and Trip). This study contributes to monitoring the competition policy in Brazil in the airline industry, a key sector for the country's economic development, by estimating difference in differences (DID) models considering as dependent variables fare prices and seats sold from July 2010 to December 2019. The results indicate a reduction of about 8% in GOL's fare on routes in which GOL and Webjet operated before the merger (overlap routes) and an increase of approximately 38% in the number of seats sold by GOL in those same routes after the merger. On the other hand, in the merger case of Azul and Trip, we did not find a statistically significant effect on the fare, but we found an increase of nearly 27% in the number of seats sold by Azul on overlap routes after the transaction.

These results present relevant implications. First, we cannot find anticompetitive effects resulting from these mergers in the Brazilian airline sector; at the international field, similar results were found by Carlton et al. (2019) during the analysis of three legacy mergers in the United States (namely Delta-Northwest, The United-Continental, and The American-US Airways). Secondly, these two mergers were cleared by the Brazilian authority subject to conditions related to the efficiency of the Santos Dumont airport; thus, it is possible to state that Cade achieved its purpose of protecting competition for the benefit of consumers. Finally, we must take into consideration that these were specific mergers in a particular period, which does not indicate that these results should be found in every transaction in the airline sector.

Keywords: Mergers and Acquisitions, competition policy, ex post evaluations.

Sumário Executivo

As políticas de defesa da concorrência têm como objetivo preservar o ambiente concorrencial no mercado, prevenindo que fusões e aquisições (F&A) tragam prejuízos aos consumidores. Fusões e aquisições podem diminuir a concorrência ao facilitar colusão tácita ou explícita ou criando incentivos de aumento de preços de forma unilateral. Enquanto essas possibilidades são o racional econômico para o controle de fusões e aquisições, essas operações também podem trazer melhorias no funcionamento dos mercados. Maldonado e Severino (2019) mostram que firmas mais produtivas tendem a adquirir firmas alvo também mais produtivas, indicando as sinergias que as operações de F&A podem trazer.

Normalmente, as Autoridades de Defesa da Concorrência atuam no controle de concentrações, analisando casos de F&A, bem como na repressão de condutas anticompetitivas, como colusão (tácita ou explícita). Neste documento, o foco será analisar os impactos das decisões do Conselho Administrativo de Defesa Econômica (Cade), em relação as operações realizadas recentemente no mercado de aviação civil brasileiro. Destaca-se que este mercado é fundamental para o desenvolvimento econômico, representando cerca de 1% do PIB mundial, tendo apresentado em 2019 um crescimento de 3,3% no gasto em transporte aéreo em relação ao ano anterior (IATA, 2019b).

No Brasil, o artigo 88 da Lei 12.529/2011 define os critérios para notificação obrigatória de operações para análise da autoridade brasileira. Durante essa análise, a autoridade observa os impactos que a operação pode gerar no mercado. Com a aplicação de metodologias internacionalmente conhecidas, como "pressão para aumento de preços" (*Upward Pricing Pressure - UPP*) e simulações de fusões, é possível identificar a probabilidade de aumento de preços após uma operação. Além disso, é importante ressaltar que esse aumento de preços pode também ser repassado para outros mercados. Se isso acontecer, o resultado será uma piora na situação dos consumidores após a operação. Para evitar esse tipo de efeito, o Cade pode aprovar uma operação com restrições ou até mesmo reprová-la. Por outro lado, se a operação não traz preocupações concorrenciais, o Cade pode aprovar a operação sem restrições.

Atualmente, muitos estudos tem mostrado a importância de realizar avaliações de impacto das operações de F&A no mercado, especialmente dentro das próprias autoridades antitruste, visto que "avaliações *ex post* podem ajudar a determinar se uma intervenção (ou não intervenção) atingiu o seu objetivo e, caso não tenha, as razões por não ter atingido"

(OECD, 2016, tradução livre). Em resposta a essa demanda, a Divisão de Concorrência da OCDE produziu um Guia de Referência para avaliação *ex post*, com objetivo de advertir as Autoridades de Defesa da Concorrência sobre a relevância de acompanhar os resultados das suas decisões, para um melhoramento de futuras decisões. Além disso, é importante dizer que ao fazer avaliações *ex post* de operações de F&A e publicá-las, as autoridades têm maior transparência em relação a sociedade. Pensando nessa discussão internacional, em 2019, o Cade publicou a sua primeira avaliação *ex post* de ato de concentração, analisando o impacto sobre os preços da fusão de duas empresas de alimentos – a operação Sadia-Perdigão (Severino, Resende, Bispo, 2019).

Este estudo tem como objetivo analisar os efeitos no preço médio da tarifa aérea em rotas domésticas considerando duas operações aprovadas pelo Cade nos últimos anos no setor (GOL-Webjet e Azul-Trip). O estudo visa contribuir com o monitoramento da política de defesa da concorrência no Brasil em um setor chave para o desenvolvimento econômico, o setor de aviação civil, ao estimar modelos de Diferenças em Diferenças (DID) considerando como variáveis dependentes preço da tarifa e assentos vendidos de julho de 2010 a dezembro de 2019. Os resultados obtidos indicam que houve uma redução de aproximadamente 8% na tarifa da Gol nas rotas em que tanto ela quanto a Webjet atuavam (rotas com sobreposição antes da operação) e um aumento no número de assentos vendidos também nas rotas com sobreposição de aproximadamente 38% após a operação. Para o caso da Azul, não foram encontrados efeitos estatisticamente significativos na tarifa, mas houve um crescimento de cerca de 27% no número de assentos vendidos nas rotas sobrepostas após a operação.

Esses resultados possuem importantes implicações. Primeiro, não é possível observar efeitos anticompetitivos derivados das duas operações analisadas no mercado de aviação civil brasileiro; no cenário internacional, resultados semelhantes foram obtidos por Carlton et al. (2019) ao analisar três fusões ocorridas nos EUA (Delta-Northwest, The United-Continental, e The American-US Airways). Segundo, as duas operações foram aprovadas pela autoridade brasileira com restrições, ou seja, com condições especiais relativas à eficiência no aeroporto de Santos Dumont. Assim, é possível afirmar que o Cade cumpriu seu propósito de proteger a concorrência em benefício dos consumidores. Por fim, deve-se considerar que essas são operações específicas, em um período particular, o que não indica que esses resultados devem ser encontrados em qualquer operação no mercado de aviação civil.

Palavras-chave: Fusões e Aquisições, política de defesa da concorrência, avaliações *ex post*.

Summary

1. INTRODUCTION

Competition policy aims to preserve market competition by, for example, preventing mergers that harm consumers. Mergers and acquisitions (M&A) can diminish competition by facilitating either tacit or explicit collusion or may creating a unilateral incentive to increase price. While these possibilities provide an economic rationale for merger enforcement, mergers might be related to improving how markets function[2].

In this study, we will focus on the decisions carried out by the Brazilian Antitrust Authority, the Administrative Council for Economic Defense (Cade), regarding M&A's in the Brazilian airline sector in recent years. The Brazilian airline sector has a fundamental role in the economic development. In 2019, it represented approximately 1% of the global GDP and faced a growth of 3.3% in air transport expenses regarding to the previous year (IATA, 2019b). Like other countries, Brazil went through the process of airline deregulation. Between the 1990s and early 2000s, Brazil had a restatement on the airline sector. It is possible to highlight an entry of private actors in charge of some Brazilian airports after decades of low or scarce investments in infrastructure. Furthermore, some operations such as joint ventures, joint business agreements and mergers and acquisitions between airline companies have been increasing the connectivity of different routes and optimizing domestic and international operations.

Even though Brazil is the most important economy in Latin America and is ranked the second travel destination in this region, the consecutive increase in the number of domestic passengers (95.25 million) represented only 1.6% of employment in the Brazilian airline industry and 1.4% of the Brazilian GDP in 2019 – which is less than Chile, Ecuador and Colombia. These numbers combined make Brazil the second country in the world with the greatest number of airports and the third in the number of passengers in the domestic market, which indicates room for improvements and the relevance to analyze the competitive effects of recent mergers in this sector in Brazil (ABEAR, 2019; NETHERLANDS, 2020).

An extensive worldwide literature on ex post merger, in particular on the United States market, has found a dominant average increase in route fares affected by airline mergers that occurred at the end of the 1990s in comparison to the average fares of other routes unaffected by the mergers (KIM; SINGAL, 1993; MORRISON, 1996). It is common to consider an approach

[2] Maldonado and Severino (2019) show that more productive firms acquire target firms that are more productive, which indicates the synergy that M&A can bring.

that can categorize each route by the relationship between the two merged companies at the time of the merger. For instance, if the route has both companies operating before the merger, it is considered as an overlapping market; and, if only one of the companies operated in the market, to which there was a potential entrant (an entrant that possibly operates in some of the route point cities), it is considered a non-overlapping market or route (KWOKA; SHUMILKINA, 2010). Comparing overlapping and non-overlapping routes shows that companies involved in a merger may have greater market power after the operation, with likely higher fare prices and fewer seats available in the short run, specially in overlap routes.

Although mergers between airline companies with overlap routes are more likely to have anticompetitive effects, the motivation for these mergers can be to gain substantial efficiencies, which can be obtained through economies of scale by lowering fixed and variable costs (HÜSCHELRATH; MÜLLER, 2015). Even though the majority of researches compares overlap with non-overlap routes and the antitrust literature estimates price rises in overlap routes, mergers with fewer overlap routes can also result in post-merger fare increases due to the elimination of potential competitors and the market power increase of the merged firms (MA *et al.*, 2020).

There is not only one post-merger effect expected for the airline sector. Some researches about mergers in the early 2000s found a procompetitive effect of mergers: they increased passengers traffic and the market capacity without significant adverse effects on nominal fares (CARLTON et al., 2019). Even if anticompetitive effects on prices could not be found, the effects of merging firms and their rivals (legacy and low cost of low fare companies), in response to some merge, could be distinct, if hub routes were distinguished from leisure and big-city routes. The firms could use different price strategies. In the market hubs, merged firms and legacy rivals increase prices, whereas in leisure markets merged firms reduce fares and legacy rivals increase them. In big-city routes, the merged firms increase prices for business travelers and maintain the price for leisure travelers (FAN, 2020).

On the other hand, ex post merger effects could also be related to the quality of the air travel services provided to consumers and the airport concentration level. The merging company could increase prices, in different magnitudes, and change the service quality (route) in markets where they did not operate before the merger, and decrease prices in markets where they already competed (CHEN; GAYLE, 2019). The fare analysis considering the route competition level in comparison to the airport concentration shows that route dominance is

the primary source of market power in airline fares, especially in large and medium hubs (BILOTKACH; ASHEBIR, 2014).

Although the impact of airline mergers on fares has been subject to many types of studies, the analysis of the Brazilian airline industry is sporadic. Considering the relevance of the topic and the possibility to have positive or negative competitive effects on a post-merger scenario, two mergers, in particular, consummated between 2011 and 2013, have been selected for analysis of their competitive effects on Brazilian airlines. Both mergers involved Brazilian firms with low cost and low fare characteristics. The first was notified in 2011 when the company GOL announced the acquisition of Webjet Airlines. The second merger, an operation between Azul Airlines and Trip Airlines, was announced in 2012. The Brazilian Antitrust Authority cleared these two transactions after considering they would result in different synergies that could be passed on to consumers, such as fare reduction.

Previous studies about the effects of the potential efficiency gains and the possibility of financial gains of these two mergers could be found in the literature. Using Data Envelopment Analysis (DEA), it was found that the efficiency gains by Azul-Trip were small and it probably could be obtained individually by each company, without the merger (DE CASTRO; SALGADO E SILVA; MARINHO, 2019). As to the financial gains, there was no gain of synergies for the GOL shareholders at the acquisition of Webjet. The transaction presented gains only for the Webjet shareholders in case the discounted cash flow method (DCF) and estimated Tobin´s Q applied (ROCHA AND BRITTO (2012).

Furthermore, Lima (2020) applied a Difference-in-Differences (DID) approach by grouping the routes with the same number of competitors using Anac's data from July 2010 until December 2018. The author identified a price increase in fares of Gol-Webjet, especially in concentrated routes, and a statistically non-significant effect on fare prices by Azul-Trip. In another study, Neto (2020) founded an increased in yield mean fare, which represents an index of Reais (R$) by kilometer considering the distance of the route, and a decrease in quantity of seats using a data from October 2008 until September 2016. When it looked to the effects on each route, the results were not sufficient to indicate the direction of the effect of the merger.

Considering these studies, and motivated by Carlton et al. (2019), our primary purpose is to understand how consumers were affected by these two prominent mergers in Brazil, in terms of service price (fare) and the number of seats sold. This type of analysis is essential to

verify if the antitrust law is guaranteeing a competitive environment. Our improvement is the use of the complete National Civil Aviation Agency (ANAC in its acronym in Portuguese) microdata about fares and seats sold from July 2010 to December 2019 and applying the difference-in-differences (DID) approach.

Unlike some studies, we concluded that the mergers did not adversely affect consumers. It was possible to estimate a reduction of about 8% in GOL's fare in routes where the two merged firms operated before the transaction (overlap routes). We find a non-statistically significant effect in Azul's fare. The increased amount of seats sold by GOL in overlap routes was approximately 38%, in contrast to nearly 27% by Azul. We can state that the consumers of GOL-Webjet overlapping routes were in advantages after the merger, with a reduction in fare and an increase in the number of seats sold. Although there was no change in fares for Azul consumers of Azul-Trip overlapping routes, compared to other routes, the number of seats sold also increased. Thus, the reviewed mergers did not present anticompetitive effects, with results similar to those found by Carlton et al. (2019) during the analysis of three legacy mergers in the USA (Delta-Northwest, the United-Continental, and the American-US Airways).

The next parts of this work are organized as follows: Section 2 presents the background of the Brazilian airline sector and how the context of the mergers was considered for analysis; Section 3 shows the empirical methodology used in the research and, in the subsequent section, we describe the database and descriptive statistics; in Section 5, we show and discuss the results, in addition to present robustness checks and heterogeneity analysis; finally, in Section 6, we present the conclusions of the study.

2. BACKGROUND OF THE BRAZILIAN AIRLINE SECTOR

2.1 GENERAL OVERVIEW

The Brazilian airline industry follows the international trend of the sector, working towards global economic development. In Brazil, as indicated by IATA (2019), the air transport sector represents approximately 1.1% of the country's GDP, with airlines, airport operators, airport on-site enterprises (restaurants and retail), aircraft manufacturers, and air navigation service providers employing 167,000 direct employees. Considering indirect services, around 839,000 jobs are supported by air transport and tourists arriving by air.

From ANAC's annual report (ANAC 2020), we noted that, in 2019, the number of take-offs in the Brazilian airline industry decreased and, at the same time, the number of

passengers increased. In relation to 2018, the results for 2019 are 1.7% lower in the number of take-offs and 1.4% higher in the number of total passengers. It is important to highlight that the number of total passengers for 2019 (119.4 million) is the highest number registered, considering all data from 2010 until 2019. As to the domestic market, in particular, we had 804.900 flights and 95.3 million passengers that represents, respectively, a decrease of 1.4% and an increase of 1.8%. This trend could be explained by the loss of one significant player, Avianca Brasil, whose operation was suspended in May 2019. In 2018, Avianca Brasil was responsible for 12% of the domestic passengers and 3% of the international passengers in the Brazilian airline industry.

Looking at ANAC's database about airline sales, which will be detailed in Section 3, we can observe that the number of companies that sold tickets for airline services varies within a year. For example, considering only Brazilian domestic flights, we can see in Figure 1 that, since 2002 (the year our database initiates), the maximum number of players selling tickets in the same month was registered as sixteen companies in July 2010. In December 2019, five companies were registered in this context.

We know that the number of companies is a relevant aspect to understand the competition level in a certain market, but competition in the airline sector is better measured by the evolution of the Herfindahl-Hirschman Index (HHI)[3]. Using ANAC´s database from the number of seats sold, we can see, in Figure 2, sub-periods with higher concentration; however, considering the general trend, we conclude for a decreasing course from 2002 to 2019 – although this trend seems to be shifting within the last few years.

Using the same database, Figures 3 and 4 indicate that, for domestic travels in Brazil from 2002 to 2019, there was a growing tendency in the demand of paid seats with a simultaneous decrease in the average fare. All the average Brazilian fares were weighted by the number of seats sold, per unit, in the Brazilian currency, real (BRL), until December 2019.

[3] The United States Department of Justice (DOJ) says that HHI is "a commonly accepted measure of market concentration. The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers (DOJ, 2018). The HHI can be represented by the formula below, in which s_i is the market share of firm "c", considering the number of seats sold by this company divided by the total seats sold by all the companies at the same time.

$$HHI = \sum_{c=1}^{n} s_c^2$$

Figure 1 – Number of companies for domestic flights (2002-2019)

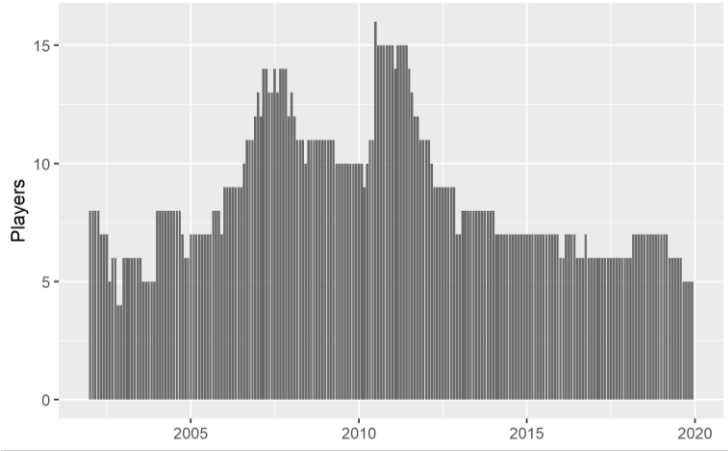


Figure 2 – Herfindahl-Hirschman Index (HHI) in the Brazilian airline market (2002-2019)

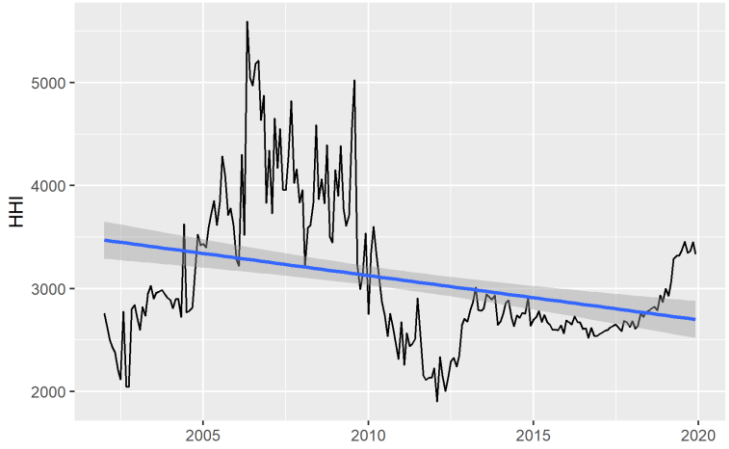


Figure 3 – Average Brazilian fare (2002-2019)

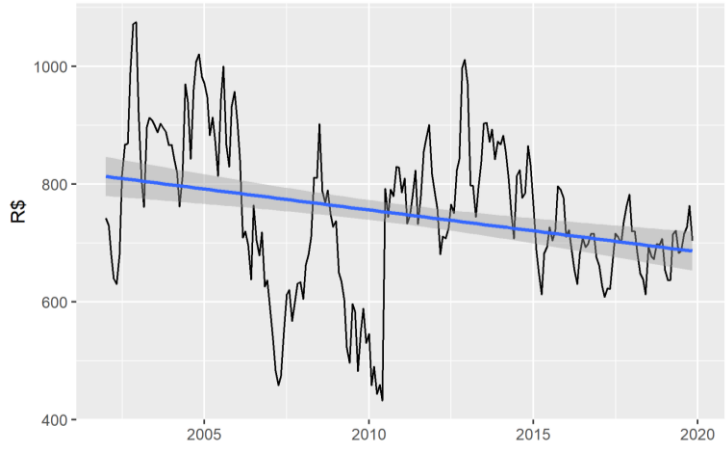
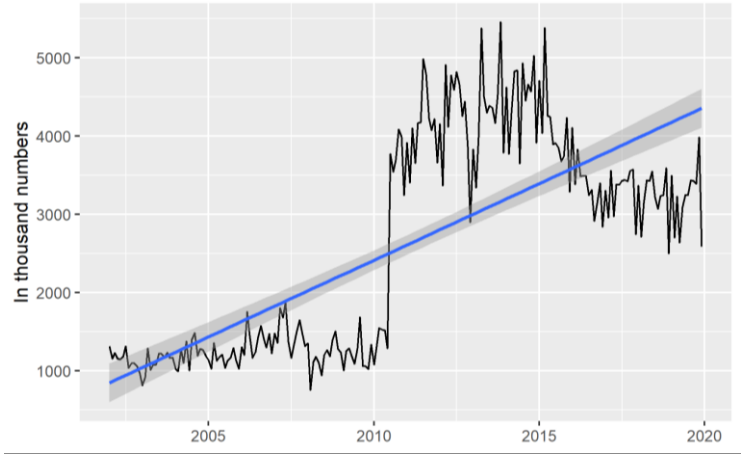


Figure 4 – Total demand for Brazilian paid seats (2002-2019)



Source: Elaborated by the authors from ANAC's database.

In recent years, especially since 2008, the Brazilian government carried out many actions to achieve better development and efficiencies in the airline sector as a response to a demand increase due to big international events placed in Brazil, such as RIO+20, the Olympic Games, and the FIFA World Cup (NETHERLANDS, 2020). In July 2010, concurrently to the privatization of airports (since the World Cup, twenty-three Brazilian airports have been privatized until 2019), there was an important regulatory change about how the companies could make promotional prices. ANAC's Resolution 140/2010 and Ordinance 804/SRE/2010 ended the time lag in competitors' response to promotional fares. Additionally, they compelled every company to send information about the number of fares sold for each route, not only for specific routes as previously required. Thus, in section 4, for econometrics estimation, we will consider the period after these regulatory changes.

Brazil holds the fifth position in the world rank, with more than 90 million air passengers transported in 2019. The other countries ranked in the top 4 are Japan with the air passengers transport ranging from 95 to 100 million, followed by India with almost 150 million, China with 500 million and the United States of America, holding the first position, with more than 800 million passengers transported (ABEAR, 2019).

Other possibilities to measure the uses of airline transportation are by the market penetration of passengers in this transport modal, which is measured by the ratio between the number of passengers transported with the population of the country, and the economic capacity of the population. The economic capacity is the relation between the annual GDP per capita and the annual boarding per capita. ABEAR (2019) shows that, considering the biggest twenty-two domestic markets worldwide, which represents 94% of the world air traffic, the Brazilian airline market has a passenger penetration in the domestic market higher than its economic capacity prospect. In this regard, Brazil is close to Russia, Turkey, Colombia, and China.

2.2 THE MERGER CASES

In July 2011, the company GOL Airlines (GOL), known as GLO by the International Civil Aviation Organization (ICAO), decided to acquire the company Webjet Airlines (Webjet), known as WEB. At the time, the Brazilian law in force was Law 8884/1994, which determined that the Brazilian antitrust authority should carry out post-merger reviews.

GOL is a Brazilian airline company for cargo and passengers that started its operation in 2001 with a clear purpose to expand the airline transportation in Brazil and South America by operating as a "low cost, low fare" company. In 2002, GOL went through a changing phase, in which it focused only on "low cost". Therefore, the company was successful in its strategy of achieving a market share of about 24% to 27% in 2005 (the year in which Webjet started operating). Although Webjet was also a "low cost, low fare" company, its operation was focused only on passenger's transportation. Webjet tried different strategies, such as applying the same fare for all routes and having autonomy in sales by selling fares without travel agents. It is important to highlight that GOL started its operation with access in major Brazilian airports (e.g. Congonhas, Santos Dumont and Pampulha), whereas Webjet could only operate by Guarulhos airport. Consequently, Webjet did not succeed in its strategy. The company was sold in 2007 for a Brazilian travel operator, CVC, and its flights have been expanded for domestic destinations previously operated by CVC charter flights (ANAC, 2009).

During CADE's review on Gol-Webjet case, in June 2012, the transaction between Azul Airlines (Azul) and Trip Airlines (Trip) was also notified to the agency (companies known by ICAO as AZU and TIB, respectively)[4]. Both Azul and Trip operated in cargo and passenger transportation. The strategy of Azul concerned using only one kind of aircraft, smaller than aircraft used by the other companies in operation. At the beginning of 2008, suchlike Webjet, Azul started operating via an alternative airport (Viracopos), and in May 2012, the airline company was covering 49 destinations. On the other hand, Trip was founded in 1998 as a regional air company. In 2012, when the merger was consummated, Trip had 40 regional aircrafts, which characterized it as the third biggest regional aircraft fleets. Furthermore, Trip operated in more than 80 cities covering all Brazilian regions.

At the review of the two mergers, CADE classified Brazilian airports in three levels of competition by taking into consideration possible new entries in relation to slots availability. The three levels were defined as follows:

i. Free or open access airports: airports that accept new entrants with at least 20% of the slots at all times;

ii. Restricted airports: airports with slots available, but limited to some specific time bands and with possible new entrants with the size of Webjet, Azul or Trip; and

[4] (CADE, Process Nº 08700.004155/2012-81).

iii. Closed airports: airports with no slots available to accommodate the entry of a new company with the size of Webjet, Azul or Trip.

Considering airports infrastructure for both cases, six airports with overlap routes were considered as restricted, which were the airports of Brasília, Campinas, Confins, Curitiba, Galeão and Guarulhos. The airports of Congonhas and Santos Dumont, on the other hand, were considered closed airports. At evaluating the closed airports, Santos Dumont raised the greatest concerns, since merged firms had a relevant portion of its slots.

In October 2012, CADE cleared the merger between GOL and Webjet subject to remedies[5], which will be the focus of this research. Later, in March 2013, the Brazilian authority also cleared the transaction subject to remedies between Azul and Trip.

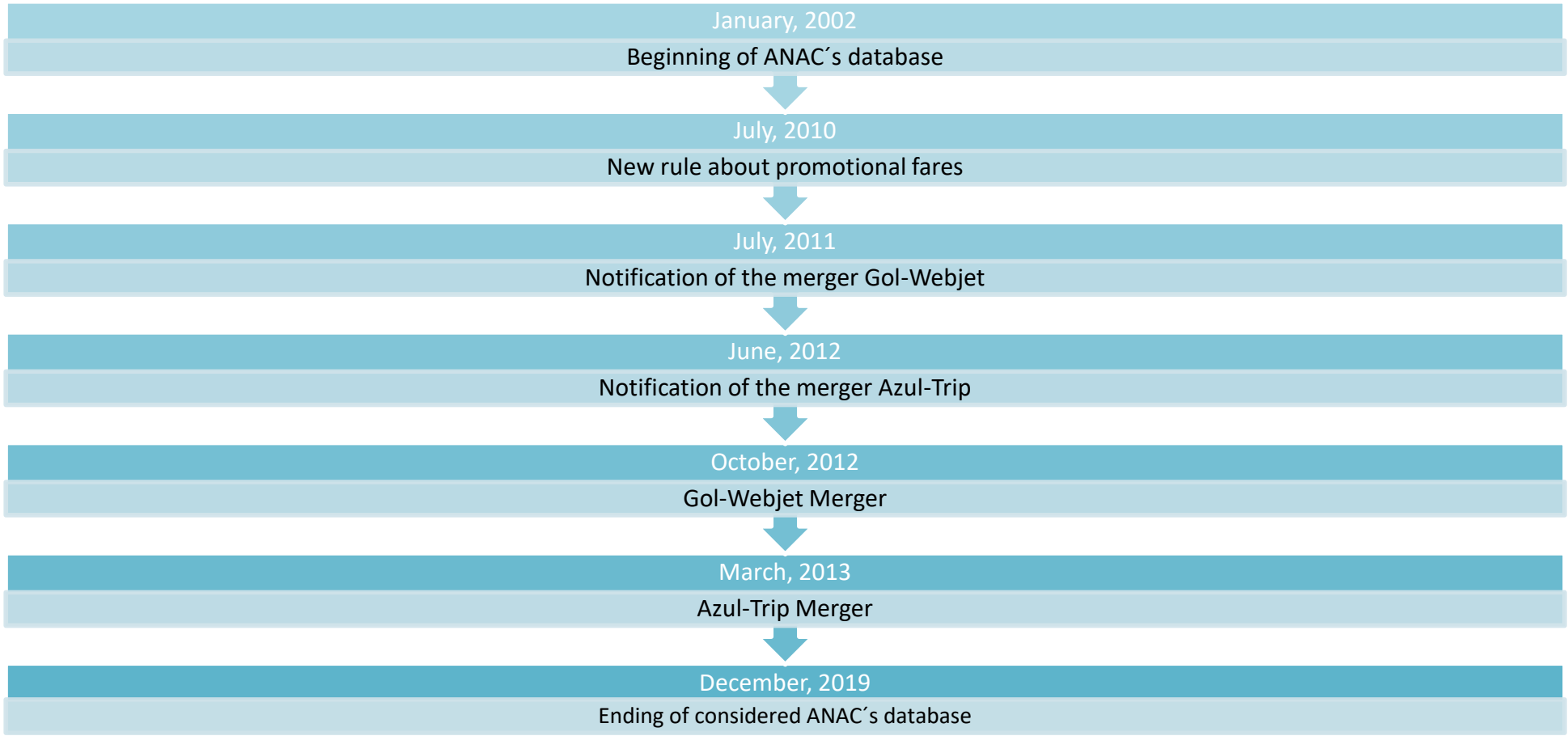
These two transactions were part of GOL and Azul's strategy of growth in the domestic airline market, which was justified by many complementary services among the merged firms. Considering the growth expected in the Brazilian airline market, GOL stated that merging with Webjet (i.e, with another low cost low fare company) would permit to offer more routes and services to consumers, creating synergies (which justified the merger). In Azul's case, the transaction was part of the company's strategy of regional development to broader its national operation after the merger, which would allow the company to compete for the market's leadership.

Figure 5 represents the timeline of important events in the Brazilian airline market for the period of our data analysis. Although the Anac's microdata starts in 2002, we will focus our analysis from July 2010 until December 2019. However, during our robustness tests, we will expand the period for 2002 until 2019.

Using data from Euromonitor (2019), it was possible to observe that GOL, Azul, and Latam are the biggest airline companies in Brazil, representing together more than 90% of the market share. It is important to state that GOL and Azul are usually classified as low-cost carriers and Latam as a scheduled airline brand.

[5] In general terms, the conditions involved the guarantee of efficiency uses of Santos Dumont/RJ slots. In a case which this efficiency did not achieve the value stipulated, it was necessary to return the slots to ANAC (BRASIL, 2012).

Figure 5 – Timeline of events during the period of analysis



Source: Elaborated by the authors.

3. METHODOLOGY

Many ex post evaluations of M&A apply the before-and-after and Difference in Differences (DID) methodologies. Considering that airlines' fares could be affected by different economic factors over time and that a simple before-and-after analysis of the event could not be efficient to understand the post-merger effects on competition, we choose to use the DID estimation technique, as Carlton *et al.* (2019).

The DID estimator can be understood as the average difference between two groups before and after the merger. The treatment group represents the products/services expected to be more affected by the merger, and the control group represents the movements in the market of the treatment group whether the merger did not occur (JIMÉNEZ AND PERDIGUERO, 2014; KWOKA, 2015). This estimation has the advantage of comparing fare changes in overlap routes (treatment group), which are expected to happen, with fare changes in non-overlap routes (control group), which are not expected to have been affected by the merger. To have a good control group, we must assume that, before the merger, both treatment and control groups have a parallel common trend, so that the control group captures what happened in the market because of the merger.

It is common to separate overlap routes from non-overlap routes because the analyses of Antitrust Authorities expect overlap routes to be most likely to present anticompetitive effects after merger activity (KIM; SINGAL, 1993; KWOKA, SHUMILKINA, 2010; HÜSCHELRATH; MÜLLER, 2015; CARLTON *et al.*, 2019; FAN, 2020).

The specification of Model 1 uses two options of data: i) the average fare and seats for a given route of the merging companies that continued to operate in the market (in our case, GOL and Azul); and ii) the average fare and seats across all companies for the same route (not just the merged firms). Following Carlton *et al.* (2019), it is relevant to look at the average behavior of fares and seats across all the companies operating in the market, since the merger may affect not only the prices of the merged firms but the average price of routes, as the pricing strategy of the merged firms could be followed by other competitors. Therefore, the behavior of the average prices and seats, both of the merged companies and across all companies in the market in the pre- and post-merger periods, is expressed by the following regression:

$$\ln(y_{i,t}) = \beta(DID_{i,t}) + X'_{i,t}\Theta + \mu_i + \delta_t + t.\gamma_i + \varepsilon_{i,t} \qquad (1)$$

Where y_{it} is the dependent variable which can assume the values of "Fares" and "Seats" individually for both merged firms or the average of all companies in the market; $DID_{i,t}$ is a dummy variable that takes the value of 1 for the period after CADE's decision to clear the mergers (for GOL-Webjet, as of October 2012, and for Azul-Trip, as of March 2013) in overlap routes (routes in which the merged companies operated before their merger); and 0 in other cases. $X_{i,t}$ represents the control $Market\ size_{i,t}$, which is the sum of seats of all companies; μ, δ and γ captures the fixed effects for route, time, and route-specific time trends; finally, ε represents the error. In this specification, the key parameter of interest is β: if it is statistically significant, it indicates the effect of changes in prices (fares) and seats sold by a company after the merger.

The fixed effects capture specific characteristics that could influence the behavior of the dependent variables (fares and sold seats). The time fixed effect could control other events that occurred during the period of the analysis, such as big international events hosted in Brazil: the RIO+20, the Olympics Games, and the FIFA World Cup, as already mentioned. The route fixed effect is essential because Brazil is a huge country, and each market, defined as origin-destination, must be understood as a different market. One cannot look at the behavior of fares and seats sold for the main Brazilian route, Congonhas-Santos Dumont (SBSP-SBRJ), and consider it similar to Bauru-Santos Dumont (SBAE-SBRJ), even if the origin and destination airports are in the same states for the two examples (the states of São Paulo and Rio de Janeiro). Finally, the route-specific time trend is the interaction between the routes and time. It allows the treatment and control routes to follow different trends. Hence, these three fixed effects are necessary and sufficient, as seen in Section 5, to isolate the effects of the mergers from other effects that could impact the movement of fares and seats sold during the period of analysis.

It is important to remember that these two models are log-linear, so the coefficients estimated for dummies' interactions must be interpreted as the effect $=(\exp(\beta)-1)*100$.

Our analysis tried to be careful with the definition of the control group and the selection of the period of analysis. Against this background, we will present several sensitivity analyses after the main results, which indicate that our results are not driven by specific decisions on either of these dimensions.

4. DATA AND DESCRIPTIVE STATISTICS

The primary data source for this study was the national agency ANAC, which since 2017 publishes on their website microdata about the number of seats sold and their corresponding price by month, company, and route (by origin and destination). This microdata involves all tickets sold for the general adult public and excludes tickets concerning flights of specific groups, such as kids, and flights from frequent-flyer programs. Despite these exclusions, the microdata provided about 50% of the total of paying passengers. It is necessary to highlight this database does not show the flight date, so the analysis needs to be limited to the price of sold tickets in a given period. Besides, the fares correspond only to the price of air transportation and do not include airport taxes or additional services (ANAC, 2020b).

We defined a market as a directional origin-destination-time period combination. Directional data means that Guarulhos (SBGR) to Galeão (SBGL) is a different market to Galeão (SBGL) to Guarulhos (SBGR). Using only data about national flights operated from January 2002 until December 2019, it is possible to estimate the average fare weighted by the number of seats sold (hereinafter referred to as "Fares") as the following equation:

$$\text{Fares}_{c,i,t} = \frac{\sum(fare)_{c,i,t} * (seats)_{c,i,t}}{\sum(seats)_{c,i,t}} \qquad (2)$$

Where c indicates the company, i indicates the route (origin-destination), and t indicates the period.

We also constructed the variables (i) Company demand: the total of seats sold by company-route-time; (ii) Market size: the sum of seats sold by route-time, aggregating seats of different companies for the same route and time; and (iii) HHI: the value estimated by the Herfindahl-Hirschman Index (HHI) using ANAC's database for the quantity of paid seats sold for a same route-time.

Then, we disaggregated GOL's and Azul's database, separating the routes in which the two merged companies operated before the transaction from routes in which there was no overlap. In Figures 6 to 9, the behavior of domestic fares and demand of GOL and Azul seats can be observed. The vertical dotted lines in red indicate the date of each merger.

In GOL's sample, the average fare of overlap routes is different from the non-overlap routes one. But if one focuses on the behavior of the average fare and demanded seats, it is possible to assume that, before the merger, these two variables had the same trend behavior.

Therefore, we slightly fit the differences between GOL and Webjet's overlap routes and non-overlap routes before the merger (Figures 6 and 7). Azul, on the other hand had a different result, as seen in Figure 8. The company presented a similar behavior in fare evolution, even when the price level of all routes, overlapping or not, is considered. A little while before CADE's clearance and some period after it, there was a divergence in the level of fares, but the behavior continued to be similar. The analysis of Azul's seat demand is different too, as Figure 9 shows: the company had a steadier demand in non-overlap routes. Regarding the overlap routes between Azul and Trip, there were two movements: an increasing trend in seats demanded in the period before the merger, followed by a decreasing trend.

Figure 6 – GOL's domestic fare evolution

Figure 7 – GOL's domestic demand evolution

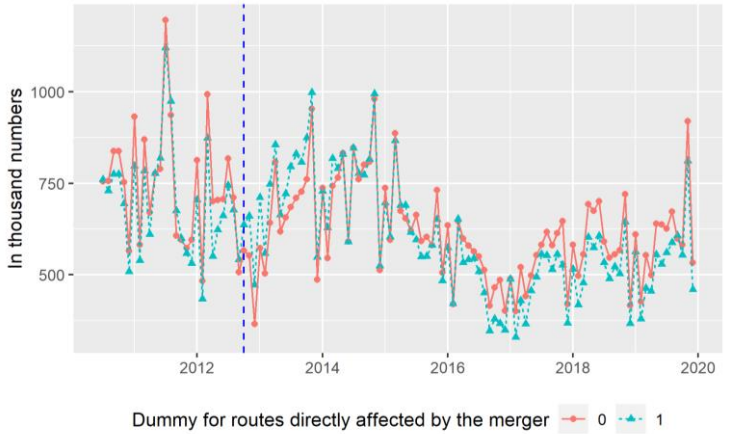
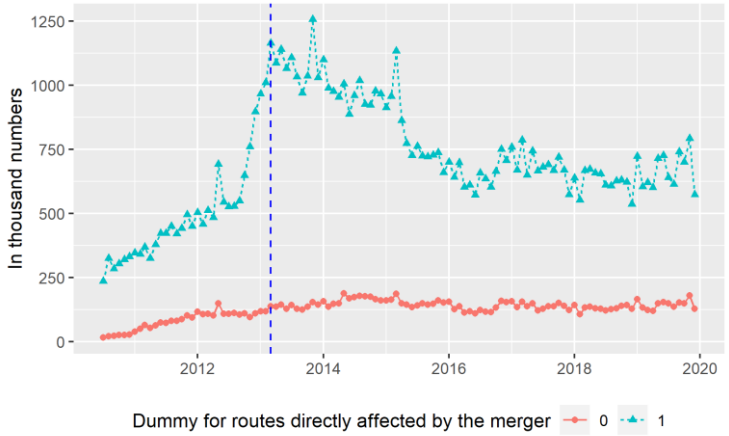


Figure 8 – Azul's domestic fare evolution

Figure 9 – Azul's domestic demand evolution



Source: Elaborated by the authors from ANAC's data.

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Table 1 shows the descriptive statistics of GOL and Azul's samples and the complete market database regarding fares, seats, and market size, considering the period from July 2010 until December 2019, by separation of overlap and non-overlap routes in the pre- and post-merger periods for each of the transactions. It is noticeable that the minimum and maximum values of the variables are discrepant, which is justified by the nature of this market. The price of air transportation depends on a series of variables, e.g. the flight's time and day of the week and the time gap between the date of purchase and the date of the flight.

From the data, one can note that the average fare is higher in non-overlap routes than in overlap routes, both for Azul and GOL's samples and across all companies in the market. In general, the average GOL fare is lower than the mean Azul fare. Considering all the companies in the market, we observe a higher average fare than that observed only at the two merged companies. Another point to be highlighted is that GOL's average difference between the average fare of its overlap and non-overlap routes is bigger than Azul's for the pre- and post-merger periods. In addition, looking at the number of seats sold and the market size, GOL operates with a higher average quantity of sold seats than Azul. In this regard, the aircraft size should be taken into account: as we already mentioned, Azul has smaller aircrafts than those used by the other companies.

Table 1 – Descriptive statistics (2010*-2019)

	Pre-merger				Post-merger			
Variables	**Mean**	**SD**	**Minimum**	**Maximum**	**Mean**	**SD**	**Minimum**	**Maximum**
Fare GOL – non-overlap routes (BRL)	775.43	393.64	1.52	4249.55	753.10	431.54	17.10	5610.37
Fare GOL – overlap routes (BRL)	467.61	207.63	81.25	2127.51	464.34	234.79	40.50	2408.20
Fare Azul – non-overlap routes (BRL)	809.02	433.56	1.45	5965.07	797.52	381.85	1.22	6290.06
Fare Azul – overlap routes (BRL)	755.02	400.82	1.45	6536.62	781.09	364.50	30.10	5038.23
Fare across all companies – non-overlap routes – GOL-Webjet (BRL)	813.97	446.67	1.52	7169.18	758.85	391.95	1.22	9748.12
Fare across all companies – overlap routes – GOL-Webjet (BRL)	523.93	272.44	15.02	4157.80	480.95	229.15	34.49	3439.22
Fare across all companies – non-overlap routes – Azul-Trip (BRL)	887.39	518.09	1.45	9748.12	771.11	386.24	122	6290.06
Fare across all companies – overlap routes – Azul-Trip (BRL)	775.04	444.05	1.45	6945.15	693.47	358.68	30.10	5505.51
Seats GOL – non-overlap routes	341.17	1029.39	1.00	21229.00	300.19	886.42	1.00	19910.00
Seats GOL – overlap routes	3284.95	5204.78	1.00	55419.00	2976.10	4277.18	1.00	57795.00
Seats Azul – non-overlap routes	166.56	612.16	1.00	11574.00	49.99	221.76	1.00	13696.00
Seats Azul – overlap routes	394.03	1297.34	1.00	23513.00	277.66	909.33	1.00	22806.00
Seats across all companies – non-overlap routes – GOL-Webjet	272.23	911.72	1.00	23513.00	207.98	722.33	1.00	22806.00
Seats across all companies – overlap routes – GOL-Webjet	2108.32	3919.81	1.00	55419.00	2328.59	3761.19	1.00	60012.00
Seats across all companies – non-overlap routes – Azul-Trip	221.31	813.09	1.00	17733.00	132.04	558.97	1.00	19910.00
Seats across all companies – overlap routes – Azul-Trip	550.83	1836.55	1.00	55419.00	541.58	1700.39	1.00	60012.00
Market size – non-overlap routes – GOL-Webjet	857.72	2237.54	2.00	36420.00	604.27	1745.02	2.00	37152.00
Market size – overlap routes – GOL-Webjet	10220.11	13067.74	2.00	115879.00	8843.94	11438.83	2.00	117197.00
Market size – non-overlap routes – Azul-Trip	659.89	2295.06	2.00	38163.00	385.46	1473.23	2.00	35838.00
Market size – overlap routes – Azul-Trip	2256.05	6255.69	2.00	115879.00	1823.73	5191.34	2.00	117197.00

Source: Elaborated by the authors from ANAC's data.

5. RESULTS

5.1 MAIN RESULTS

Table 2 shows the results of Model 1 (Eq. 1) using ordinary least squares (OLS) with three different specifications estimated considering a linear model with multiple group fixed effects. We present the results for GOL and Azul's samples with data from July 2010 until December 2019. The first specification (Column I) considers only the dummy for treatment, which is the date of the merger and the fixed effects of time and time trend-route. The second specification (Column II) adds a control variable for market size and maintains the other fixed effects. The third one (Column III) presents the same specification as Column II but adds the time trend-route as another fixed effect. The dependent variable is the log fare for each company.

The results of Table 2 indicate that the two analyzed mergers had a different effect on fares. If we look at the effects of the GOL-Webjet merger, it is possible to conclude that there was an estimated reduction on the price of transportation service of about 8%[6] in routes where the two merging firms were operating before the merger (overlap routes). The same effect did not occur in Azul's fares. Considering the date of the Azul-Trip merger and the treatment group, we did not find a statistically significant effect on the fare in the overlap routes. Although the two mergers involved companies with regional operations, the effects on fares were diverse. It is possible to state that airline customers of GOL-Webjet's overlap routes benefited from the merger, but the customers of Azul-Trip's overlap routes had no fare reduction in the overlap routes, compared to other routes.

Table 2 - Model 1 – Firm's regression – Fare – Date of the merger – July 2010 to December 2019

	GOL			Azul		
	(I)	(II)	(III)	(I)	(II)	(III)
DID	-0.0046	-0.0718***	-0.0804***	0.0184*	-0.0163*	-0.0019
	(0.0132)	(0.0116)	(0.0129)	(0.0098)	(0.0084)	(0.0080)
log(Market size)		-0.2049***	-0.2072***		-0.1747***	-0.1721***
		(0.0037)	(0.0036)		(0.0020)	(0.0018)
Route FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Time trend-Route FE	No	No	Yes	No	No	Yes
Num. obs.	256652	256652	256652	515319	515319	515319
R^2 (full model)	0.5574	0.6057	0.8915	0.5349	0.5887	0.8440
F statistic (full model)	58.7445	71.6508	2.9357	48.5786	60.4592	3.1815

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is the log of the fare.

[6] Because it is a regression in the logarithms of the dependent variable, the coefficients (β) estimated for the dummy variables of interest should be interpreted as (exp(β)-1)∗100. Hence, the following calculation has been made for all the DID coefficients: Effect =(exp(-0,0804)−1)∗100 = 8 percent approximately. For small values of β, there is not much difference between the usual interpretation (β ∗ 100) and the correct transformation, (exp(β)-1)∗100. However, the difference grows when the absolute value of β moves away from zero.

Another variable that indicates if the consumers were benefited from an airline merger is the number of seats available for passengers. As seen in the last section, ANAC's database unfortunately provides only the number of seats demanded by customers, not the number of seats supplied. The regressions using the number of seats sold show, in Table 3, that there was an increase in sold seats for both companies' overlap routes, with positive and statistically significant values for the DID model. The same effect was found by Carlton et al. (2019) during the analysis of three legacy mergers that occurred in the USA (Delta-Northwest, The United-Continental, and The American-US Airways) where there was both an increase in passengers' traffic and in the capacity of the market.

Using Column III's results, the increase in seats sold by GOL in overlap routes was approximately 38% and the increase in Azul's overlap routes was 27%. It is important to remember that during the analysis of the Brazilian antitrust agency, the companies involved in these transactions argued that numerous synergies could be passed on to consumers later, generating procompetitive effects[7].

Table 3 - Model 1 – Firm's regression – Seats – Date of the merger – July 2010 to December 2019

	GOL			Azul		
	(I)	(II)	(III)	(I)	(II)	(III)
DID	0.1913***	0.4611***	0.4542***	0.1697***	0.3644***	0.3541***
	(0.0510)	(0.0446)	(0.0390)	(0.0312)	(0.0252)	(0.0225)
log(Market size)		0.8174***	0.7945***		0.9695***	0.9651***
		(0.0129)	(0.0119)		(0.0052)	(0.0046)
Route FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Time trend-Route FE	No	No	Yes	No	No	Yes
Num. obs.	259847	259847	259847	521624	521624	521624
R^2 (full model)	0.8316	0.8730	0.9671	0.8165	0.9101	0.9645
F statistic (full model)	228.7180	318.2827	10.5353	189.7907	431.8988	16.1598

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is the log of the fare.

[7] Although, in previous studies, Neto (2020) and Lima (2020) founded an anticompetitive effect due Gol-Webjet merger, the divergence of results obtained should be related that they applied the DID methodology considering a different database, period and model estimated, as well as different groups of treatment and control. An improvement in the present study is the use of the complete ANAC´s microdata, in order to identify the effects of the mergers on Brazilian consumers of airline services. We understand that the main contribution of our study, is that we think that expanding the analysis for all routes with a longer period of data, it is possible better understand all the movements and tendency of Brazilian airline sector, including the effect on average fare, considering all companies in operation.

5.2 ROBUSTNSS CHECKS

As results could be influenced by the period selected or the date of merger (taken as the date of CADE's clearance), it is important to test robustness. Table 4 shows the results of the estimation of Model 1 (Eq. 1) using ordinary least squares (OLS) for each company's sample (GOL and Azul), with ANAC's database, which goes from January 2002 until December 2019. We used the control variable for market size and three fixed effect variables: time, route, and time trend-route.

The dependent variable is the log of fare and seats for each company. As can be seen, the results confirm the previous effects shown in Table 2, especially for GOL. The merger between GOL and Webjet had an estimated effect of reduction of about 8% in the price of transportation services, using data collected since 2002. The results for Azul present no statistically significant effects on fares.

For both companies, the effects on seats sold follow the same trend shown in Table 3: an increase in seats sold by GOL in overlap routes of about 54% and an increase for Azul overlap routes of about 48%. These results must be relativized because, as explained in Section 2, a regulation change in July 2010 affected ANAC's database, imposing a rule that required companies to start sending information on all the routes traded, which did not occur before.

Table 4 - Model 1 – Firm's regression – Date of the merger – January 2020 to December 2019

	GOL's-fare	Azul's-fare	GOL's-seats	Azul's-seats
	(I)	(II)	(III)	(IV)
DID	-0.0790***	0.0030	0.4319***	0.3918***
	(0.0132)	(0.0085)	(0.0415)	(0.0237)
log(Market size)	-0.1964***	-0.1742***	0.8054***	0.9654***
	(0.0039)	(0.0019)	(0.0123)	(0.0048)
Route FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Time trend-Route FE	Yes	Yes	Yes	Yes
Num. obs.	267127	515537	270322	521842
R^2 (full model)	0.9433	0.9093	0.9833	0.9793
F statistic (full model)	2.6464	2.7104	9.5728	13.1211

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is in log.

Law 12529/2011, the current Brazilian Competition Law, does not allow that mergers that require mandatory pre-merger notification implement the transactions before receiving clearance from the competition authority. However, we decided to use the companies' merger announcement dates as treatment date to check the robustness of Model 1. Furthermore, the first transaction we analyzed, GOL-Webjet, occurred as the country

experienced a change in the competition legislation, leading the transaction to be reviewed under the former Law 8.889/1994, which was in force at that time. Although the former law did not explicitly prohibit a transaction implementation before the final decision of the authority, we can observe in ANAC's database that the companies Webjet and Trip only left the database at the date of CADE's clearance, hence being the real dates of the mergers.

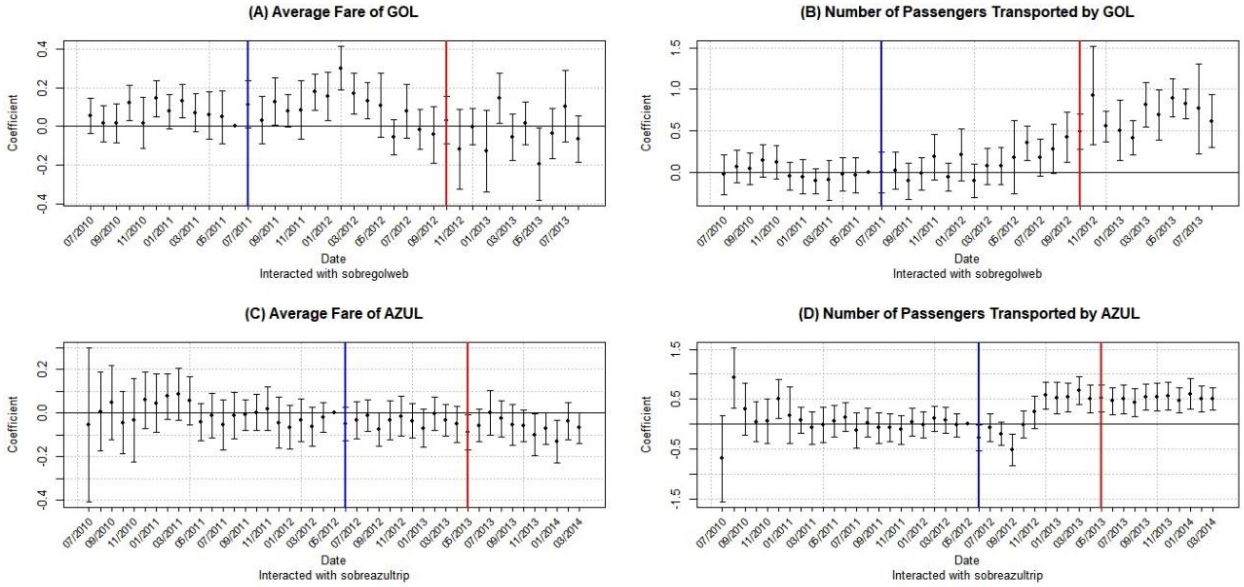
Angrist and Pischke (2009) clarify that when a sample includes many periods, Granger causality test (1969) should be applied to identify if the causes happened before the consequences, and not vice versa. Taking this into account and assuming that the effects could be heterogeneous with regard to the policy time (in our case, the merger), it is possible to estimate Model 1 with additional dummies and, thus, create Model 2 (Eq. 3), where the sums on the right-hand side allow m lags ($\beta_{-1,}\beta_{-2}, \ldots., \beta_{-m}$), or posttreatment effects, and q leads ($\beta_{+1,}\beta_{+2}, \ldots., \beta_{+q}$), or anticipatory effects:

$$\ln(y_{it}) = \sum_{k=0}^{m} \beta_{-k} \left(DID_{i,t-k}\right) + \sum_{k=1}^{q} \beta_{+k} \left(DID_{i,t+k}\right) + X'_{it}\Theta + \mu_i + \delta_t + t.\gamma_i + \varepsilon_{it} \quad (3)$$

Considering that the merged companies could change their pricing strategies after the announcement of the transactions, we estimated Eq. 3 using leads and lags to test the causality. If the merger affected the fares and seats of the company (dependent variables), then the lead dummies, which represent anticipatory effects, should not be statistically significant. Moreover, if the lag dummies are statically significant, it is possible that the causal effects of the mergers grow or fade as time passes.

Figure 10 shows the DID estimations leads and lags. The time period starts in July 2010, considering the date immediately before the announcement of each transaction as a base (June 2011 for GOL and May 2012 for Azul). The blue lines indicate the date of the announcement of each transaction by the companies, and the red line represents the date of the mergers. To avoid capturing effects that are not related to the merger, we restricted the period to 10 months after the mergers' dates.

Figure 10 – DID leads and lags



As demonstrated by Figure 10, there are no anticipatory effects on GOL and Azul's average fares or number of seats sold, thus supporting our thesis of parallel tendency of control and treatment group before the merger. Thereby, the results of the DID shown in Table 2 and 3 are robust. We also observe that it is possible that the mergers had already presented some synergies in the period between their announcement and CADE's clearance, because both companies sold a higher number of seats a few months before the antitrust authority's decision.

Although many ex post evaluations focus on the probability of firms to increase their own prices after a merger as a result of a higher market power, we consider important to observe if the analyzed mergers could increase the overall level of prices and seats sold in the market (CARLTON *et al.*, 2019; CHEN; GAYLE, 2019), as competitors can follow the strategy of the merged firms and increase their prices too. Therefore, we estimated Model 1 using the entire ANAC's database, looking at the behavior of fares and seats sold across all the companies in the market.The database includes the fares and seats sold for each company that was operating in the Brazilian domestic market from July 2010 until December 2019. Table 5 indicates the estimated effects on the market average fare considering the date of the GOL-Webjet merger. The results had a statistically non-significant effect on average fares if

the overlap and non-overlap routes of the two merged companies are compared. Looking at the average market fares, it can be seen that the Azul-Trip merger had the effect of reducing the average market fare by approximately 4.5% in overlap routes in comparison to non-overlap routes. The effects on average market seats indicated a rise in seats sold in overlap routes of around 62.5% and of 50% after the GOL-Webjet and the Azul-Trip mergers, respectively.

Table 5 - Model 1 – Average across all companies of the market regression – Date of the merger – July 2010 to December 2019

	Market fares – GOL-Webjet	Market fares- Azul-Trip	Market seats – GOL-Webjet	Market seats - Azul-Trip
	(I)	(II)	(III)	(IV)
DID	-0.0072	-0.0462***	0.4857***	0.4052***
	(0.0076)	(0.0047)	(0.0260)	(0.0126)
log(Market size)	-0.1758***	-0.1763***	0.9204***	0.9215***
	(0.0017)	(0.0017)	(0.0035)	(0.0035)
Route FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Time trend-Route FE	Yes	Yes	Yes	Yes
Num. obs.	1127059	1127059	1138477	1138477
R^2 (full model)	0.6800	0.6801	0.7755	0.7758
F statistic (full model)	4.3700	4.3724	7.1240	7.1346

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is in log.

5.3 HETEROGENEITY

There may be a few other dimensions of potential heterogeneity in our main estimation. To verify that we are not capturing specific effects, we will present two more estimations considering the possibility of having different effects of routes of specific airports and of routes' market size.

During CADE's analysis of GOL-Webjet, the authority considered that six[8] airports needed more attention, as they are more restrict and have specific distribution rules. The authority concluded that only one airport, Santos Dumont (SBRJ), raised competition concerns. The same occurred in Azul-Trip's analysis: initially, Cade suggested that eight[9] airports could lack market contestability due to a high level of slot utilization. SBRJ was again indicated as a potential source of concern, with routes that limited, or even blocked, the possibility of new entrants. Therefore, the Brazilian Antitrust Authority approved the mergers subject to special conditions that involved ensuring an efficient use of the slots of the Santos

[8] SBBR, SBRJ, SBGL, SBGR, SBSP and SBCF.
[9] SBBR, SBKP, SBCF, SBCT, SBGL, SBGR, SBSP and SBRJ.

Dumont airport, in Rio de Janeiro. In case the merging parties failed to meet the minimum requirements, they would be required to return the slots to ANAC.

Considering this, we estimated Model 1 adding two interactions of dummy DID: i) with the Santos Dumont airport; and ii) with the other airports selected, excluding SBRJ. Table 6 indicates the results for GOL's database, considering the GOL-Webjet merger and a 5% significance level. The table shows a reduction of around 6% in fares of the other selected airports and an increase in the number of seats sold for SBRJ; however, there are no statistically significant effects on other restricted airports (Column I and III). Regarding the Azul-Trip merger, there is no statistically significant effect on fare and seats in SBRJ; while in selected airports, which Cade analysis demonstrate possible negative effects for competition, we found an increase of about 6.6% in fares (Column II) and of 16.3% in the seats sold (Column IV).

Considering that Cade imposed special conditions on the SBRJ airport for these two mergers, this ex post evaluation is also a way of analyzing the effectiveness of the decisions of the antitrust authority (TENN; YUN, 2011). Therefore, we can conclude that the conditions can not only help maintain the competition level in the airport that raised most concerns but also improve competition, by reducing fares and increasing the number of seats sold.

Table 6 – Model 1 – Firm's regression – Date of merger – July 2010 to December 2019 – Effects on SBRJ and selected airports

	GOL-fares	Azul-fares	GOL-seats	Azul-seats
	(I)	(II)	(III)	(IV)
DID	-0.0318	-0.0203**	0.3626***	0.3082***
	(0.0286)	(0.0085)	(0.0822)	(0.0235)
DID*SBRJ	-0.0772*	0.0271	0.5380***	0.1052
	(0.0449)	(0.0167)	(0.1510)	(0.0747)
DID*Selected airports	-0.0616**	0.0640***	0.0619	0.1514***
	(0.0307)	(0.0104)	(0.0885)	(0.0403)
log(Market size)	-0.2071***	-0.1718***	0.7941***	0.9656***
	(0.0036)	(0.0018)	(0.0119)	(0.0046)
Route FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Time trend-Route FE	Yes	Yes	Yes	Yes
Num. obs.	256652	515319	259847	521624
R^2 (full model)	0.8915	0.8441	0.9671	0.9645
F statistic (full model)	2.9361	3.1838	10.5421	16.1743

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is in log.

Table 7 presents the second heterogeneity test, in which we analysed if there is a different effect by introducing an interaction of the market size of the routes. The results

indicated that the larger the market size of a route, the greater the fare reduction (Columns I and II) and the greater the number of seats sold (Columns III and IV).

Table 7 – Model 1 – Firm's regression – Date of merger – July 2010 to December 2019 – Effects considering the market size

	GOL-fare	Azul-fare	GOL-seats	Azul-seats
	(I)	(II)	(III)	(IV)
DID	0.3553***	0.1640***	0.0224	0.1456***
	(0.0822)	(0.0109)	(0.1981)	(0.0305)
DID*log(Market size)	-0.0521***	-0.0329***	0.0517**	0.0413***
	(0.0092)	(0.0017)	(0.0228)	(0.0068)
log(Market size)	-0.2051***	-0.1573***	0.7925***	0.9465***
	(0.0036)	(0.0018)	(0.0121)	(0.0056)
Route FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Time trend-Route FE	Yes	Yes	Yes	Yes
Num. obs.	256652	515319	259847	521624
R^2 (full model)	0.8916	0.8447	0.9671	0.9645
F statistic (full model)	2.9388	3.2000	10.5369	16.1915

***p < 0.01, **p < 0.05, *p < 0.1. Standard errors in parenthesis. The dependent variable is in log.

6. CONCLUSION

In this study, we looked at price behavior and the number of seats sold by two national airline companies, GOL and Azul, after their respective mergers, GOL-Webjet in 2012 and Azul-Trip in 2013. As shown by Kim and Singal (1993), Morrison (1996), Carlton et al. (2019), and Chen and Gayle (2019), the analysis of post-merger effects are necessary and relevant to understand if the transactions resulted in procompetitive or anticompetitive effects.

Our main contribution is to present an ex post merger analysis of the Brazilian airline sector, following the global tendency in the public policy to improve the decision-making processes, which is a good way to analyze if the objective of maintaining a competitive environment in the market was achieved. In fact, it is possible to estimate if the implemented remedies were sufficient or insufficient (OECD, 2016). For this reason, we estimated DID models considering as dependent variables fare and seats sold from July 2010 until December 2019. The results indicated a reduction of about 8% in GOL´s fare in routes in which the merging firms operated before the merger (overlapping routes) and an increase of approximately 38% in seats sold by GOL in those same routes after the transaction. For Azul´s data, we did not find a statistically significant effect on the fare, but we found an increase of nearly 27% for seats sold by the company on overlap routes.

These results present relevant implications. First, we cannot observe anticompetitive effects resulting from these mergers in the Brazilian airline sector, which are similar results to those found by Carlton et al. (2019) during the analysis of three legacy mergers in the United States (Delta-Northwest, The United-Continental, and The American-US Airways). Furthermore, the two mergers were cleared by the Brazilian Antitrust Authority subject to conditions related to the efficiency of the Santos Dumont airport; thus, it is possible to state that CADE achieved its purpose of protecting competition for the benefit of consumers. Finally, we must consider that these were specific mergers in a particular period, which does not implicate that these results should be found in every transaction in the airline sector.

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