BAGGAGE FEES AND THEIR EFFECTS ON AIR TRANSPORT DEMAND: AN EMPIRICAL STUDY ON TRANSPORT MODE SUBSTITUTION EFFECT

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ABSTRACT

Due to the fierce competition between airlines in the air transport industry, many of them are turning to the unbundling strategy as a way to increase their competitiveness. Unbundling in the airline industry is the act of dividing the fundamental transportation service from ancillary services, such as checked baggage. In this way, airlines can keep their airfares in check to attract price-sensitive passengers who may not make use of ancillary services. While this strategy proved to be successful for airlines, as it also represents a new revenue source for them, studies show that passengers are unhappy with this trend in the airline industry. In this context, this paper aims to examine the effects of baggage fee implementation on passenger demand by analyzing the case of the Brazilian airline industry, which implemented that policy in 2017. We use a Fixed-Effect regression model to analyze data from 2016-2018 to investigate if and how the baggage fee policy has affected the demand for domestic flights in Brazil. Our results show that the baggage fee implementation in the Brazilian airline industry caused a short-term decrease in overall passenger demand. Moreover, our results also indicate that neither leisure nor business passengers are explicitly affected by this policy. That is, the decrease in the number of passengers was generalized, and cannot be attributed only to the leisure or business segment of passengers. Finally, our results suggest that passengers who have previously traveled between city pairs by car are more likely to stop flying because of baggage fees, thus providing evidence of a substitution effect in the transport sector.

Keywords: Airline industry, Baggage fees, Passenger demand, Substitution effect, Regression.

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1. INTRODUCTION

One of the reasons why the civil aviation market is extremely dynamic is due to the fierce competition between airlines since the industry's deregulation. The earliest airline industry deregulation occurred in 1978 in the US. In the first 30 years after the liberalization, passengers in that market see airfares decline by 41.2% in real terms, which experts attribute to the increased market penetration of low-cost carriers and the increased use of the internet to buy tickets (Garrow et al., 2012). Even with the sharp decline in ticket prices after the deregulation, passengers today can still experience a continuous reduction in airfares due to the highly competitive aspect of the civil aviation sector. For example, in the period between 1993 and 2019, the US airline industry saw an average yearly decrease in airfares of 2.3% in real terms, with tickets costing 37.6% less in 2019 when compared to 1993 (BTS, 2022).

Another reason that explains the dynamicity of the airline industry is how the airlines' profitability is heavily affected by external factors in the sector. In this regard, in the past decades, we had a series of worldwide events that challenged airlines – such as the 9/11 attacks, several sanitary crises (SARS in 2003, H1N1 in 2009, and COVID-19 in 2020), global financial crisis, economic recessions, and oil price shocks. Because of the financial pressure caused by factors both within and outside the civil aviation sector, airlines and regulators have started an unbundling trend in the industry to keep airfares in check (Garrow et al., 2012).

In general, unbundling is the act of dividing a product or a service into separate elements and selling them individually, each one at a different price. In the airline market, this trend has divided the fundamental service of air transportation from other services considered additional or ancillary, the latter being the term formally used in the civil aviation industry. Examples of ancillary services are: checked and excess baggage, pre-assigned seats, priority boarding, in-flight entertainment, in-flight internet access, and food & beverage. With this strategy, airlines can keep their airfares low enough to attract price-sensitive passengers. With unbundling, the base ticket price only covers the fundamental air transport service, so if passengers wish for additional services such as checked baggage, they have to pay an extra fee on top of the base ticket price. This strategy proved to be successful for airlines, as ancillary fees allowed them to explore an extremely valuable source of revenue and increase their financial performance. (Warnock-Smith et al., 2017).

While airlines view the unbundling trend as something positive, customers in the industry have an opposite perception. Public opinion during the implementation of baggage fees in the US was skeptical about whether it would reduce airfares for passengers, or if it would be yet another way for airlines to profit. Studies, such as Tuzovic et al. (2014) and O'Connell & Warnock-Smith (2017), further confirmed customer acceptability issues regarding the ongoing unbundling trend and ancillary fees in the airline industry, raising concern about whether they would affect flight demand or induce substitution effect from air travel to other modes.

In this context, this paper analyzes the case of baggage fee policy implementation in the Brazilian civil aviation industry. Up until 2016 that market was still regulated in terms of baggage allowances, which mandated airlines to check for free one 23kg baggage for domestic flights and two 32kg baggage for international flights. In December 2016, the Brazilian National Civil Aviation Agency (ANAC) announced a series of regulatory changes to the Brazilian airline industry, which included the introduction of baggage fees. This announcement was ill-received by the population, skeptics that the proposed change would reduce ticket prices. Their skepticism was partially supported by Barros Jr et al. (2021), which showed that while the introduction of baggage fees in Brazilian civil aviation has reduced the average ticket price, its implementation had also increased the average total price (i.e., ticket price + checked baggage fee) in the period analyzed.

In this context, this paper has the objective to analyze the effects of baggage fee introduction on passenger demand. To do so,

we employ a regression model to analyze the Brazilian domestic airline industry data from 2016 to 2018 - one year before and one year after the introduction of baggage fees in that country.

Besides investigating the effects of the policy on demand, we have a secondary objective to analyze whether baggage fees affected leisure passengers more than business passengers, due to the former commonly flying with more baggage and being more price-sensitive. Although Scotti & Dresner (2015) and Yazdi et al. (2017) have partially analyzed the effects of baggage fees on demand, their study focused more on analyzing and discussing the effects of the policy introduction on ticket prices and airline on-time performance. Thus, we posit that further investigation into the effects of the baggage fee policy on demand is needed, specifically to investigate what segment of passengers is most affected by baggage fees. In this context, one of the contributions of this paper is to expand the literature on the effects of baggage fees on demand by analyzing if there is any association between baggage fees with a decrease in demand from leisure passengers.

We also aim to explore another segmentation of passengers and analyze those who have previously traveled by car or bus (i.e., road transport) between city pairs. Our goal here is to investigate whether the implementation of baggage fees in the airline industry caused a substitution effect, with passengers deciding to stop flying and start driving to their destination. Although the substitution effect is not a novelty topic in the transport literature, studies have mostly focused on analyzing the interaction between high-speed rail and air transport (Givoni & Dobruszkes, 2013; D'Alfonso et al., 2015; Castillo-Manzano et al., 2015; Albalate & Fageda, 2016; Zhang et al., 2018; Bergantino & Madio, 2020). Regarding the specific interaction between the road and the air transport system, Borhan et al. (2017) have briefly examined this issue through a survey study to predict car drivers' intention to use low-cost airlines in Libya. Apart from this study, the literature on the road-air transport substitution effect is relatively scarce. Thus, another contribution of this paper is to empirically analyze whether the introduction of a policy such as baggage fees can cause a substitution effect in the transport sector, specifically between road and air transport.

2. LITERATURE REVIEW

This section presents and discusses the previous studies on the topic of ancillary fees and their acceptability by passengers and the effects of baggage fee policies in the airline industry.

Unbundling and ancillary fees are closely related to each other. Unbundling is the act of dividing a product or service into individual elements and selling them separately. For example, unbundling in the airline industry refers to dividing the service of air transportation from ancillary (i.e., additional) services, such as checked baggage, food & beverage, in-flight internet access, etc. By doing this, airlines can stay competitive in the market, keeping their airfares in check, while also being able to explore a new source of revenue. In this context, Table 1 shows a synoptic table for studies on the topic of ancillary fees and their acceptability in the airline industry.

Table 1 Ancillary fees and their acceptability in the airline industry

Authors	*Main findings*	*Methodology*
Garrow et al. (2012)	Ancillary fees are increasingly becoming more important to airlines' financial performance.	Data analysis
Tuzovic et al. (2014)	Passengers feel betrayed by airlines that introduced baggage fees.	Structural Equation Models
O'Connell & Warnock-Smith (2017)	Passengers accept baggage fees better than other ancillary fees.	Data analysis
Warnock-Smith et al. (2017)	Passengers have stronger opinions towards 'necessity' products, such as checked baggage.	Data analysis

Several studies in the literature have shown that passengers are dissatisfied with the ongoing unbundling trend in the airline industry. With this dissatisfaction in mind, we argue that the introduction of an ancillary fee, such as one for checked baggage, may

discontent passengers to the point that a portion of them become discouraged to use the air transport system, thus reducing the demand for this service. To further investigate this matter, we also review studies that analyzed the effects of the introduction of baggage fees in the airline industry.

One of the objectives of the introduction of baggage fees in the civil aviation industry was to allow airlines to become more competitive by reducing their ticket prices, achieved by unbundling the free checked baggage allowance from the airfare. In this regard, Table 2 shows a synoptic table for studies on the topic of baggage fees and their effects on the airline industry.

Table 2 Baggage fees and their effects on the airline industry

Authors	*Main findings*	*Methodology*
Henrickson & Scott (2012)	Baggage fees allow airlines to reduce airfares but still increase their revenue.	OLS; SAR
Scotti & Dresner (2015)	Baggage fees lead to a reduction in ticket prices and demand.	3SLS
Scotti et al. (2016)	Baggage fees are associated with a reduction in delayed flights and mishandled baggage rates.	OLS
Nicolae et al. (2017)	The introduction of baggage fees is associated with improved on-time performance.	Event study
Yazdi et al. (2017)	The introduction of baggage fees is associated with improved on-time performance.	3SLS
Kwoka & Wang (2020)	Airlines can use baggage fees to divert high-cost passengers to their rivals.	OLS

Table 2 briefly presented empirical studies analyzing the effects of the implementation of baggage fees in the airline industry – such as their effects on ticket price, flight demand, and airline operational performance. Although Scotti & Dresner (2015) and Yazdi et al. (2017) have partially investigated the effects of baggage fees on demand, they did not investigate this matter beyond that point. To expand upon those studies, our paper intends to investigate the effects of baggage fees on passengers depending on their purpose of travel (i.e., tourism or business). Furthermore, we also inspect another segment of passengers and investigate whether previous car or bus travelers stopped flying due to the implementation of baggage fees, which would indicate evidence of a substitution effect in the transport sector. This is the main scientific contribution of this research, as the literature on the road-air transport substitution effect is scarce.

3. METHODOLOGY AND DATA

The main objective of this paper is to investigate the effects of baggage fee implementation on passenger demand. To achieve this goal, we employ an econometric regression model to analyze data from domestic flights between city pairs in the Brazilian civil aviation market. We chose to use a regression model in this paper due to its extensive use in the air transport literature to make inferences and analyze correlations between several variables in the industry. Moreover, the use of a regression model in this paper also enables us to compare our results with previous studies that analyzed the effects of baggage fees in the airline industry.

Regarding the estimation strategy, this study uses a log-log specification to estimate the elasticity of the variables. To correct the possible endogeneity problems with the standard regression model, and to also account for individual characteristics that do not vary over time, our estimation models use the Fixed-Effects (FE) method. This research also tested the Random-Effects model and run a Hausman test to verify the appropriateness of using the FE model. The Hausman test rejected the null hypothesis, thus using the Fixed-Effect model is appropriate in this study.

Table 3 presents a summary of the variables we used in our model and our expectations regarding their effects on passenger demand. All of our variables are at the city pair level, and we choose our variables based on studies of Scotti & Dresner (2015) and Yazdi et al. (2017). As they have previously investigated the effects of baggage fees on demand, we found it appropriate to use similar variables for a better comparison with their results.

The dataset we used in the estimation consists of panel data of domestic directional city pairs in Brazil. The period considered in the analysis was from January 2016 to December 2018, totaling 24,965 observations. All data we used in this paper is publicly available on Brazilian national agencies' websites. Our main data source for the airline industry data was the National Civil Aviation Agency (ANAC), while we extracted the data related to GDP per capita from the Brazilian Institute of Geography and Statistics (IBGE). Lastly, we extracted the passenger profile data – such as the ratio of passengers that have previously traveled a route by car or bus – from a survey taken by the Institute of Economic Research Foundation (FIPE).

Table 3 Description of the variables

Variables	*Description*	*Expectation*
Demand	Total revenue passengers	N.A.
Frequency	Total flights between city pairs	+
Price	Average airfare between city pairs	-
Distance	Distance between city pairs	-
Hub	Presence of a hub in the city pair	+
Slot	Presence of a slot-restricted airport in the city pair	+
HHI	Herfindahl-Hirschman Index at the city pair level	-
Income	Average GDP per capita between city pairs	+
Bag	Implementation of baggage fee	-
Tourism	Share of passengers flying for leisure purposes	-
Business	Share of passengers flying for business purposes	0
Car	Share of passengers who have previously traveled by car between city pairs	-
Bus	Share of passengers who have previously traveled by bus between city pairs	-

4. ESTIMATION RESULTS

First, we present the estimation results for the model used to investigate the general effect of baggage fee introduction on passenger demand in the Brazilian civil aviation industry. Table 4 presents the baseline models' results.

Our variable *Frequency* presents a positive effect on demand, which is the result we were expecting. Previous passenger demand studies in the literature have intensively examined the positive relationship between the number of flights on a route and the total number of revenue passengers, and our result further confirms this correlation. Furthermore, our result for the *Price* variable also confirms the results found in the literature, showing that passenger demand increases as ticket price decreases.

Table 4 Baseline models

lnDemand	***(1)***	***(2)***
lnFrequency	0.8591***	0.8588***
lnPrice	-0.0654***	-0.0662***
lnDistance	0.5436*	0.5413*
Hub	0.0408	0.0416
Slot	0.0123†	0.0087
lnHHI	-0.1618***	-0.1608***
lnIncome	0.3511*	0.3383*
Trend	0.0008**	0.0003
Bag	0.0162**	-0.2117†
Bag_Trend	-	0.0010†
R^2_adj	0.6422	0.6230
RMSE	0.2546	0.2546
N_obs	19,869	19,869

†<0.25, *<0.10, **<0.05, ***<0.01

Regarding the *Distance* variable, our estimations show an unexpectedly positive effect on demand. While studies such as Yazdi et al. (2017) show that passenger demand usually concentrates on short and medium-haul routes, upon further investigation, we understand that we cannot make the same inference for the Brazilian civil aviation market. Although a large number of flights demand are indeed concentrated in short and medium-haul routes in the Southeast region of Brazil, we also have to acknowledge that a significant number of flight demand originates from interregional flights as well. In other words, while a large portion of economic activities is concentrated in the Southeast region, there are still loci of economic activities in the South, Central-West, and Northeast regions. And because of the continental dimension of Brazil, the long-haul flights between these regions generate enough demand for flights, as shown by the positive effect of *Distance* on demand in our model. Thus, future studies that may use the findings of this research should consider the dimension and the average distance between the city pairs in Brazil and other countries.

Hub and *Slot* did not present statistically significant results, suggesting that they are not an important determinant for flight demand. This initial inference goes against results found in the literature, for example, Yazdi et al. (2017). Upon careful investigation we can attribute the result we found to (i) the small number of time in our dataset, which only covers the period from January 2016 to December 2018, and (ii) that hub and slot-restricted airports in Brazil were almost at full capacity in that period, thus no increase in demand was observed due to the infrastructure limitation.

HHI presented a negative effect on demand, which is the result we expected. This result shows that dominant airlines may abuse their market power to increase ticket prices or offer a low-quality service, which can induce passengers to seek an adjacent route or travel by other means.

Income shows a positive sign, thus the higher the GDP per capita between city pairs, the more passengers fly on that route, which is a result that agrees with other studies in the literature such as Scotti & Dresner (2015). Our *Trend* variable presents a positive sign for model (1), but a statistically not significant coefficient for model (2), thus the results suggest that there is not a clear effect of time on demand. Similar to *Hub* and *Slot*, this unexpected result may also be due to the small number of time in our dataset. Another reason that we may think of is that our analysis encompasses the period when Brazil was in recession in 2016, as well as its slow economic recovery in 2017-2018.

Finally, we analyze our bag variables. In model (1) there is a positive sign for *Bag*, which suggests that there was an unexpected increase in passenger demand after the implementation of baggage fees in the Brazilian civil aviation industry. But when we add our interacted variable *Bag_Trend* in a slightly more robust model, such as presented in column (2), the results show that the implementation of baggage fees (i.e., the variable *Bag*) has had a negative effect in the immediate period after its implementation, while it presented a long term positive effect on demand (i.e., *Bag_Trend*). Thus, our results suggest that the implementation of baggage fees does have a negative effect during its initial period of implementation, which we could attribute to the lack of acceptability of such fees as investigated by Tuzovic et al. (2014). But as time passes, passengers may seem to better accept baggage fees in the airline industry, as suggested by O'Connell & Warnock-Smith (2017) and Warnock-Smith et al. (2017). Although our inferences on baggage fees and their effects on demand may make sense if we compare them to previous studies in the literature, it is also important to note that, at least for our baseline models, both *Bag* and *Bag_Trend* presented a high p-value (<0.25). Thus, we need to further investigate these variables to make any assertive inference. Next, we challenge our baseline models and investigate different aspects of demand that may be affected by baggage fees.

Our second model builds upon our baseline model. Specifically, we now investigate the relationship between baggage fees and demand depending on the travel purpose of the passenger. Our goal with this model is to investigate if and how baggage fees affect passengers that are traveling for leisure or business purposes. Table 5 presents the results that investigate the relationship between baggage fees and the purpose of travel.

Table 5 Travel purpose models

lnDemand	***(3)***	***(4)***	***(5)***
lnFrequency	0.8588***	0.8588***	0.8588***
lnPrice	-0.0668***	-0.0666***	-0.0668***
lnDistance	0.5484*	0.5456*	0.5502*
Hub	0.0420	0.0420	0.0420
Slot	0.0088	0.0088	0.0088
lnHHI	-0.1608***	-0.1608***	-0.1608***
lnIncome	0.3507*	0.3481*	0.3494*
Trend	0.0003	0.0003	0.0003
Bag	-0.2061†	-0.2169†	-0.1877
Bag_Trend	0.0010†	0.0010†	0.0010†
Bag_Tourism	-0.0134	-	-0.0330
Bag_Business	-	0.0104	-0.0205
R^2_adj	0.6230	0.6230	0.6230
RMSE	0.2546	0.2546	0.2546
N_obs	19,869	19,869	19,869

†<0.25, *<0.10, **<0.05, ***<0.01

Our base variables (*Frequency*, *Price*, *Distance*, etc.) presented similar results as shown in Table 4, thus we do not repeat our inferences about those variables. Instead, we

focus on analyzing the variable *Bag* and its interactions. *Bag* itself presented a similar result as the previous results for our specifications (3) and (4), but it lost its statistical significance at <0.25 for specification (5). This result suggests that the implementation of baggage fees does not seem to have an immediate effect on demand. *Bag_Trend* showed a positive sign again, thus suggesting that, over time, passengers seem to accept baggage fees in the airline industry.

Regarding the interacted variable *Bag_Tourism*, we expected it to present a negative sign, which would mean that leisure passengers are driven away by baggage fees as they usually carry more baggage than business travelers and they are more price-sensitive. Despite our expectations, our models (3) and (5) suggest otherwise that leisure passengers are not affected at all by the implementation of baggage fees. These results suggest that, while leisure passengers may find baggage fees inconvenient, it is not enough of a reason to quit flying. As for *Bag_Business*, another interacted variable, we expected it not to be a significant factor on demand, as confirmed in our models (4) and (5).

The results from Table 5 suggest that, while baggage fees may affect a portion of passengers in the airline industry, as pointed out by the variable *Bag*, we can attribute this effect to neither leisure nor business passengers exclusively. Thus, to investigate which type of passenger baggage fees affect, we investigate next another segment of passengers: the ones that have previously used an alternative transport mode, such as bus or car, to travel between city pairs.

Our next, and last model, investigate our last segmentation of passengers, which are the ones that used an alternative transport mode to travel between city pairs in the past. Our goal here is to investigate whether the introduction of baggage fees in the airline industry may have forced passengers to use buses or cars to travel instead of taking an airplane. Table 6 presents the results for models that investigate whether the introduction of baggage fees caused transport mode substitution in the airline industry.

As shown in Table 6, our base variables presented similar results to our previous specifications. *Bag* in these models has recovered their statistical significance, albeit at <0.25, showing that the implementation of baggage fees has had a negative effect on overall passenger demand. *Bag_Trend* also follows our previous results, presenting a positive sign and statistical significance at <0.25.

Table 6 Substitution effect models

lnDemand	***(6)***	***(7)***	***(8)***
lnFrequency	0.8586***	0.8590***	0.8589***
lnPrice	-0.0635***	-0.0666***	-0.0638***
lnDistance	0.5338*	0.5123†	0.4944†
Hub	0.0397	0.0410	0.0387
Slot	0.0074	0.0088	0.0073
lnHHI	-0.1596***	-0.1608***	-0.1594***
lnIncome	0.3360*	0.3246*	0.3175*
Trend	0.0003	0.0003	0.0003
Bag	-0.2096†	-0.2158†	-0.2150†
Bag_Trend	0.0011†	0.0010†	0.0011†
Bag_Car	-0.1058***	-	-0.1123***
Bag_Bus	-	0.0980†	0.1318**
R^2_adj	0.6234	0.6231	0.6235
RMSE	0.2545	0.2546	0.2545
N_obs	19,869	19,869	19,869

†<0.25, *<0.10, **<0.05, ***<0.01

As for our substitution effect analysis, the interacted variables *Bag_Car* and *Bag_Bus* presented interesting results. *Bag_Car* had a negative result for our models (6) and (8), with statistical significance at <0.01, showing that there was a decrease in demand in those routes where a significant part of passengers have already traveled by car. This result suggests a substitution effect caused by the introduction of baggage fees in the Brazilian airline industry, as passengers have given up on using air transport in favor of car travel in the period immediately after the implementation of baggage fees.

On the other hand, the variable *Bag_Bus* shows the opposite result. With a positive sign and a statistical significance of <0.25 for specification (7) and <0.05 for specification (8), this result shows that the implementation of baggage fees is not enough to cause a substitution effect from air travel to bus travel. Not only that, but the positive sign also indicates that the demand for air travel increased on such routes. Thus, our results suggest that the implementation of baggage

fees has caused a substitution effect, but in this case, bus travelers became air transport passengers. One argument that we can think of is that, in general, bus travelers are more price-sensitive than car travelers, thus they are positively affected by policies to reduce airfares such as baggage fees. Another explanation is that bus passengers are more price-sensitive to ticket prices alone, whereas car passengers are more price-sensitive to total prices (ticket price + checked baggage fee), given that the latter can choose to accommodate their baggage in the car depending on the distance between the city-pairs.

These results indicate that the introduction of baggage fees affects the segment of passengers that have previously traveled between city pairs using other transport modes, such as cars or buses. Furthermore, our results suggest that baggage fees do indeed cause a substitution effect in the transport sector. Passengers that have previously traveled on that route by car in the past seem to stop flying and travel behind wheels. Moreover, the implementation of baggage fees also affects previous bus travelers, but not the way we expected. Our results suggest that, surprisingly, bus travelers are more inclined to fly after the implementation of baggage fees in the airline industry. We believe that this reverse substitution effect is due to bus travelers being more price-sensitive than car travelers, and thus can better enjoy the benefits of a policy such as baggage fees in the airline industry.

5. CONCLUSIONS

In a competitive industry such as civil aviation, airlines have to increasingly seek greater efficiency to survive in the market. In recent years, the unbundling strategy has become increasingly popular for airlines to achieve greater efficiency. Unbundling, or debundling, in the context of civil aviation is the act of dividing the fundamental transportation service from ancillary services, such as checked baggage. This strategy has proven successful in the industry as it allows airlines to keep airfares in check to attract price-sensitive passengers who would not make use of ancillary services. Moreover, with the unbundling strategy airlines have a new source of income from the sale of services such as checked baggage, pre-assigned seats, in-flight entertainment, internet access, and food & beverage. While airlines are extremely satisfied with the unbundling trend in the industry, several studies show that passengers are unhappy with the growing adoption of this strategy by airlines.

In this context, this paper investigated the effects of the baggage fee policy implementation on passenger demand by analyzing the case of the Brazilian airline industry, which implemented such a policy in 2017. We developed an econometric model to analyze data from 2016-2018 to examine if and how the baggage fee policy has affected the demand for domestic flights in Brazil. Our results indicate that this policy has caused a short-term decrease in overall passenger demand. On the other hand, when we analyze the long-term effects of that policy, the results suggest an increase in the number of passengers over time. We believe that these results are a reflection that, in the initial period, passengers do not accept baggage fees, as observed from previous studies in the literature. But over time, price-sensitive passengers begin to see the benefits of this policy in reducing the base ticket price, which would boost the demand for flights.

Our general contribution to the literature with this paper was to further study the effects of baggage fees on passenger demand. Specifically, one of our contributions was to analyze if either leisure or business passengers are affected by baggage fees, which would help us to better explain how this policy affects a certain segment of passengers. Despite our initial expectations, the estimation results show that the baggage fee policy has not explicitly affected either leisure or business passengers.

Another contribution of our paper is to investigate the baggage fee effects on an alternative segmentation of passengers and analyze those who have previously traveled by car or bus between city pairs. By doing so, we can look for pieces of evidence that baggage fees can cause a substitution effect in

the transport sector, with passengers deciding to stop flying and take the road to their destination. Our results show a clear decrease in passenger demand on those routes with a higher share of passengers who have previously traveled by car. We believe this result to be evidence of a substitution effect in the transport sector, with passengers opting to drive to their destinations instead of taking a flight after the baggage fee implementation. On the other hand, our results also suggest a reverse substitution effect for previous bus travelers. According to our estimations, the demand for flights increases on those routes with a higher share of passengers who have previously traveled by bus. We believe that this segment of travelers is more price-sensitive than car travelers, thus they benefit more from baggage fees.

The general results found in this paper show that baggage fee policies may negatively affect passenger demand in short term, which indicates an initial rejection of such policies by passengers. Still, when we expand our analysis period we see that baggage fees have a positive effect over time, which indicates a later acceptance of this policy. The managerial implication of our results for airlines in markets that will soon introduce baggage fees is that they should be prepared for a short-term reduction in their number of passengers. Although studies and business reports indicate greater financial efficiency for airlines after the implementation of baggage fees, they should consider a momentary reduction in the number of passengers until the latter eventually start accepting baggage fees.

One of the limitations of this paper is that it only considers the case of domestic flights in Brazil, thus results for a similar study in another context may differ according to that region's civil aviation industry. Another limitation of this study is that we use cross-sectional survey data to act as a proxy for passenger segments (tourism, business, car, and bus), thus we can only infer, and not directly observe the substitution effect in the transport sector.

To build on this paper's limitation, we suggest that future studies should analyze the effects of baggage fees in another context, such as analyzing a different market than Brazil. Another suggestion is to cross-analyze data from road transportation agencies and to check whether there was a noticeable increase in car or bus travel in the period immediate to the implementation of baggage fees in the airline industry. This way it is possible to directly observe, and not only infer, the effects of baggage fees in the transport sector regarding the substitution effect.

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