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**The airline industry in the U.S, do airlines choose to price their airfare off their own model
being “bag fee” or “non-bag-fee” or are prices decided by the market?**

By: Phineas de Sola

This thesis is submitted in partial fulfilment of the requirements for the course Senior Seminar
(EC 375) during the spring semester of 2024

While writing this thesis, I have not witnessed any wrongdoing, nor have I personally violated
any conditions of the Skidmore College Honor Code.

Thesis advisor: Smriti Tiwari

Special thanks to Patrick Reilly and Monica Das

Skidmore College Economics Department

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Abstract:

In this thesis, we primarily study the years of 2017, 2020, and 2023 determining if there is a potential relationship between baggage fee charging airlines, non-baggage fee airlines and market level airfare prices in the U.S domestic commercial airline industry. We study these years to see how market fares have changed before, during and after the Covid-19 pandemic. Previous literature has studied the question of if baggage fees have a relationship with market level fares, but none investigate the data from 2020 and how market level fares have changed since then. The data used for this study came from the U.S Bureau of Transportation Statistics, and displayed information about the market level airfare prices crucial to this study. The econometric specification of this study held market level airfare prices as it's dependent variable and if airlines charged baggage fees or not as it's main independent variable. Other control variables were used within the econometric specification to see other potential relationships with market fares. The main tests used for this study were a linear regression for the econometric model and a specifying descriptive statistics table for all variables. The overall result of this study had found that there is a positive correlation between market level airfare prices and if airlines charge baggage fees. The other result found was that the Covid-19 pandemic did impact the market level fares as they were higher in 2017, lower in 2020, and highest in 2023. Indicating that the airline industry had fallen in 2020 and recovered in 2023.

Introduction:

Incentivized by the lure of attracting passengers, U.S commercial airlines have changed their airfare price levels to maximize individual profits since their inception. But when other airlines see adjacent airlines editing prices frequently, new ideas enter the mind space of the competition. Since 2008, the advent of baggage fees and add-on pricing has overwhelmed the U.S airline market. Further, before, during and after the Covid-19 pandemic, baggage fees have stuck to the commercial airline industry like glue, and the airline industry today is well and alive despite this. Or is it because of this? If this is true, it can lead one to wonder how baggage fees impact the overall airline industry in the U.S. But since baggage fees have stayed within the industry, one can also be led to believe that baggage fees are now an integral part of the industry.

During the Covid 19 pandemic, many industries lost significant amounts of revenue because there were less passengers traveling. Transportation, especially at the beginning of the pandemic, experienced a huge loss of their consumers using transportation services. One of these forms of transportation systems that lost many passengers during the Covid 19 pandemic and economy shock, was the airline industry. During the pandemic, the airline industry lost many consumers, and their average baggage fee airline price went down as well, from a mean average price of overall market fares of \$223.20 to \$219.55 (DB1B, Table 1) (2020). The prices of tickets for individual airlines also went down because of the shock to the market of the Covid 19 pandemic (DB1B, 2020). During this time, the airline industry may not have tried to raise prices because the demand for transportation was lower than in a normal fiscal year. Especially during the first quarter of 2020 (January up to March), the demand for all transportation systems fell significantly in the U.S. It is important to note that the time when Covid-19 was most impactful was during 2020 in the first fiscal quarter (DB1B, 2023). This means the U.S domestic airline

industry was clearly affected by the pandemic and shock to the market. Baggage fees in the context of the U.S airline industry are any fee added on to passenger airfare prices that charge for additional checked luggage with added fees to a commercial passenger flight.

The purpose of this thesis is to determine whether airlines choosing to charge a baggage fee or not charge a baggage fee has a relationship with market level airfare prices changing in the domestic U.S commercial airline industry. In this thesis we analyze the years 2017, 2020, and 2023 to determine how much the market level airfare of airlines has changed before, during and after the Covid 19 pandemic. Proving the novelty of this question could allow insight to how market prices not only in the airline industry change but what add-on pricing can do to overall market prices in the industries and markets other than the airline industry. For example, ticket prices could have add-on pricing strategies in many other markets as well other than the airline market, like concert tickets for example. Using and compiling data from the U.S federal bureau of transportation, my goal is to answer if airlines decide to charge an add-on fee between bag fee charged by “bag fee” airlines and between “non-bag fee” airlines (and vice versa) does this have a relationship with market level airfare prices within the US airline market? In this study we want to test whether the fluctuations in baggage fee charging airlines and non-baggage fee charging airlines within the airline industry before, within, and after the covid pandemic, has a relationship with the market level prices within the airline industry and see how this has changed since the Covid-19 pandemic. If this is the case, then the dependent variable is the market level airfare prices (Y) and independent variable is if airlines charge baggage fees or not (Y). If this is the case, and the data suggests that airlines regardless of if they charge bag fees or not, and they do respond to price changes in the market, then the saying “no such thing as a free lunch” is applicable. This is because for example if a baggage fee airline raises their overall airfare, and in

response a non-baggage fee airline also raises their airfares, the non-baggage fee airline is now just as expensive as the baggage fee airline. Thus, negating the no add-on pricing strategy for passengers because both airfares are now the same price. Consequently, the market airfare price rise. This would prove the previous literature correct, assuming the competing airlines change their overall passenger airfare prices in response to prices of competing airlines, then the “non-baggage fee” option for airlines such as Southwest (a non-baggage fee charging airline in the U.S market) are seemingly unreal because the prices of airfares are responding entirely to the competition of raising or lowering overall airfares. So, in this scenario the supposed “non-baggage fee” is not real because the overall market level airfare price for passengers rises or falls to accommodate individual airlines changing price. Because at that point airlines are basing how they price their tickets on the market and not creating prices individually. If this were the case it would be interesting to think about if the “free” bag service is actually free, or if it’s only determined by the market of airfare tickets in the U.S airline industry. And passengers will have to pay a similar fare regardless of if they choose to fly on an airline that charges baggage fees or not. This topic has been studied before and the general conclusion that the literature has concluded is that the market level prices in the airline industry can determine price levels for airlines. It has also been proven that baggage fees have a relationship with market fares.

The primary reasoning behind why we chose to write about the airline industry was because of the previous literature surrounding the question of whether baggage fees in the U.S had potential relationships with market fares. There is previous literature surrounding a relationship between add-on pricing baggage fees and a changing market price (Zou et al., 2017; Brueckner et al., 2013; Woohyun et al., 2018; Mumbower et al., 2023). There is literature that looks at baggage fees and a potential relationship with passenger demand on U.S air routes

(Scotti et al., 2015; Dresner et al., 2015). There is literature that investigates unbundling baggage fees on airfares, and how this changes competition in the market (Fiore et al., 2015). There is also literature that looks at add-on pricing fees on other goods and services outside of the airline industry and commodity bundling (Adams et al., 1976; Marco et al., 2009; Scott et al., 1998; Hess et al., 1987; Morrison et al., 2001). There are also studies that look at commodity bundling by single product monopolies (Schmalalensee et al., 1982). There is literature that looks strictly at models of add-on pricing (Ellison et al., 2005; Fruchter et al., 2011). There is literature surrounding the passenger characteristics within airline types in the U.S airline industry (Woohyun et al. 2018). The most similar study to this is the study asking if the additional “no bag fee” policy that was recent at the time, adds revenue benefits for JetBlue and Southwest airlines (Baggage fee charging airlines and non-baggage fee charging airlines respectively). It is important to note that Southwest airlines are one of the only airlines to not charge a carry-on baggage fee in the U.S airline market during and after the writing of their paper (Zou et al., 2017). Their paper primarily compares Southwest airlines to JetBlue airlines to answer the question of whether added baggage fee adds to the revenue and traffic volume of passengers of airlines in the domestic U.S market receive. They had determined that because of the added baggage fee for commercial airlines like JetBlue and other added baggage fee charging airlines, if Southwest airlines were the only airline in the market to not charge a baggage fee, then Southwest would ultimately gain more revenue and traffic volume from passengers. And they had determined that changes in airfares between airlines that charge baggage fees versus those who do not charge baggage fees would occur after studying the results of comparing JetBlue and Southwest airlines. I would consider their results to be true ex post, or after analyzing previous data and coming to a specific conclusion. Because they primarily studied the first quarters of the

years 2009, 2011, and 2013. They had answered this question that was recent at the time, but the information and data they had been using is now outdated, especially after the shock of Covid 19 to the airline market and entire economy occurred. Now there is recent, more relevant data to answer the similar question that this thesis provides. At the time of that paper's publication and many other papers written around the same time, add-on pricing was relatively new in the airline industry. Add-on baggage fees had only just become prevalent in 2008. So, predicting how baggage fees would work out was a bit difficult. However, the authors of the previous paper hypothesized that passengers would be willing to pay higher prices to "non-bag fee" airlines and LCC's. An LCC or "low-cost carrier" is an airline that charges a much lower initial airline fare than the rest of the other airlines in the market but has other auxiliary fees that add-on to the overall ticket fare, these fares may or may not include baggage fees (Zou et al., 2017). Southwest airlines were and still are today an airline that doesn't charge baggage fees. JetBlue at the time of the author's paper were a low-cost carrier airline and still are today in the domestic U.S airline market (Zou et al., 2017). It is important to note that the first carry-on baggage fee that was introduced into the airline market was in 2008 by the commercial airline American airlines, so at the time of their paper, carry-on baggage fees were relatively new. They therefore also hypothesized that there would be a higher price charged by "non-bag fee" airlines, so "bag fee" airlines would try to balance their prices to match their prices to "non-bag fee" airlines. Essentially raising the market price. The authors of that paper are the primary reason for me choosing the topic of this thesis, but what we think we can add to the literature is how much this has changed before, during and after the shock of the Covid 19 pandemic, based on the new data that was compiled from the U.S federal bureau of transportation for this thesis. So based on the previous literature, and more studies like these, it is fair to say that there have been multiple

studies within the market level pricing structure of bag fee airlines compared to non-bag fee airlines having a relationship with market level prices, along with many studies about commodity bundling and add-on pricing structures. However, none of these studies have investigated what the effect of the Covid-19 shock had on market fares in the airline industry or used the most recent data on the subject. As well as whether the prices of non-bag fee charging airlines and baggage fee charging airlines raise or lower the market fare within the U.S domestic airline market. To account for this, in our model we use data from the U.S bureau of transportation statistics compiled from 2017, 2020, and 2023 to investigate what was happening to market prices before, during and after the Covid-19 pandemic.

Our question is important and novel to answer, because within the U.S, the airline industry is commonly used by the public and is one of the most important transportation systems in the country. On average, the number of flights that occur within one day is around 45,000 (DB1B, 2023). When Covid-19 initially occurred, during the first quarter of 2020, the public was instructed to stay home to stop the spread of the Covid-19 virus. Coincidentally or not, this was also the quarter within the U.S airline industry with the lowest market fares by the airline industry, at least compared to since 2017 and after 2020 into 2023, at 219.55 dollars (DB1B, 2020). This has some policy relevance in the fact that if we could predict another shock to the economy or pandemic like the Covid-19 pandemic, we may also be able to predict how the airline industry, regardless of if airlines are a “bag fee” or “non-bag fee” carrier, can change their pricing in the market to reduce potential losses in these kinds of situations. The data we compiled came from the U.S federal bureau of transportation, and it was both free and publicly accessible. We used one primary database, that being the DB1B for a ten percent look into revenues received by airlines and prices of airfare tickets within the U.S. The data was a population

dataset. The purpose of this study is to determine whether the market fare of airline ticket prices has a relationship with the prices of baggage fee charging airlines and non-bag fee charging airlines. We want to determine if baggage fee charging airlines and non-bag fee charging airlines and their changing prices also changes the overall average market level airline fare within the U.S domestic market. This study could prove to be useful in the future, to show future policy makers and researchers of the airline industry that researching the correlation of baggage fee and non-baggage fee airlines in competition on the market airfare prices. It could show how to reduce or increase competition if the market is failing. And if there is another shock to the economy like Covid-19, It could at least show that continuous research on the domestic U.S airline industry market, could prove to be more useful than short spontaneous bursts of research at different times. In section two, the next section, we discuss the conceptual framework of this thesis describing how my independent and dependent variables are affected by each other. The third section of this thesis looks at the context of Covid-19 and the airline industry. The fourth section takes a closer look into the data used for this study. The fifth section covers the econometric specification for this study. The sixth section of this study looks into the results of this study. And the seventh and final section covers the conclusion of this thesis. The next section of this thesis investigates the conceptual framework of this thesis.

Conceptual Framework:

The conceptual framework of this study's purpose is to analyze a relationship between the main independent variable of if an airline is charging baggage fees or not (X) With this study's main dependent variable of the overall market airfare price of tickets in the U.S domestic airline industry (Y). The main theoretical concept in the background of this study is the theory of price, which explains how prices change in free markets. It states that prices of goods and services in free markets are determined by supply and demand, production costs, and competition among sellers. In the context of this thesis, those sellers being airlines within the U.S domestic Airline industry.

Much of the previous literature documents the characteristics of how charging baggage fees for specific airlines may or may not benefit specific airlines. For example, once again, there is literature that questions to see if the baggage fee really does add to the revenue of JetBlue, as they primarily compare JetBlue airlines and Southwest airlines in the years before 2017 (Zou et al., 2017). Other previous literature looks into commodity bundling and add-on features not just within the airline industry, but also in a general sense. For example, (Adams et. Al., 1976; Marco et. Al., 2009). However, the literature has not focused on how the Covid-19 pandemic may or may not have changed market prices between airlines that charge baggage fees and airlines that do not. One could argue that passengers will demand the lower airfare price of one airline, so in response to this demand, airlines regardless of whether they charge baggage fees or not will change their prices according to the demand for a specific price of an airfare regardless of whether that airfare includes baggage fees or not. Our aim with this study is to determine whether the added baggage fees of some commercial airlines and the competition between those airlines as well as airlines within the U.S domestic airline industry that don't charge baggage fees

do or do not change the overall passenger market airfare prices within the industry. And this study aims to see how market prices have changed before, during and after the Covid-19 pandemic within the domestic U.S commercial airline industry (Hence the reason for why we are studying 2017, 2020, and 2023). The main independent variable of this study is if an airline is charging baggage fees or not within the U.S domestic airline industry (X). The main dependent variable of this study is the overall market fare price of airline tickets within the U.S domestic airline industry (Y). The previous literature of found that the added “non-bag fee” for JetBlue and Southwest, turned out to not be profitable because the prices of airfares were determined based on the market level prices (Zou et al., 2017). Similar literature also found that the price level of airfares was also somewhat determined by the market level price (Brueckner et al., 2013). So, this conclusion seems not to be so new either.

There are also airlines called Low-cost carriers (LCC’s), which have low initial airfares for passengers, but add on auxiliary fees that add-on to the original airfare prices. The existence of these kinds of airlines may or may not also influence market fare. To specify though, we are not investigating the effect of LCC’s but we are discussing them as they are an important part of the health and for demand of airlines within the U.S airline industry market. For example, a popular low-cost carrier airline (LCC) is Spirit airlines. Spirit airlines can use low base ticket fees to persuade passengers to have more demand for their airlines, so they could influence market levels of price levels because their airfare shifts demand for their airline, and so other airlines will adapt to the new pricing strategies. If enough passengers were going to Spirit airlines, then it is possible that the other airlines would lower their prices to match Spirit airlines. In this thesis, we focus on market level changes in overall market price level because of the changes in prices of “non-bag fee” and “bag fee” airlines tickets. Ultimately, we think that the

change in airfares mostly comes from individual airlines in the market adapting to their competition's pricing strategies. In the case of Covid-19 all fares of airfare tickets fell. The U.S domestic airline industry is a competition. So, when an airline sees another potentially lower their prices, that airline may decide to lower their overall airfare now as well to try to gain more passengers.

Specifying for bag fees in this thesis, that is any added charge or auxiliary fee for checked luggage for airlines. We are not discussing any other specific auxiliary fees charged by airlines other than the add-on pricing of checked baggage fees in this study. The auxiliary fees that LCC's charge are tailored to get passengers to move away from the general airfare market. Ultra-low-cost carriers (ULCC's) are like LCC's in how they generate revenue, But they tend to have even lower initial airline fares. And with the added auxiliary fees charged by these ULCC's and LCC's, the overall ticket pricing is like the prices of airlines within the U.S domestic commercial airline market. So, these kinds of LCC's and ULCC's do affect market competition. It is important to note that ULCC's and LCC's are characterized by incredibly low initial ticket prices. They are usually around 50% of the cost of a commercial airline ticket cost within the U.S domestic airline industry, so if JetBlue charges an \$100 ticket for an economy seat, a ULCC outside of the commercial market, like Spirit Airlines would charge a ticket around \$50. The prices listed above are not actual airline ticket prices, but just hypothetical prices to prove the way that LCC's and ULCC's work. We include such a detailed discussion of LCC's and ULCC's in the contextual framework even though they are not part of our model in this thesis, because LCC's and ULCC's have a potential to change the market price of airfare tickets overall, and are most likely one of if not the biggest contributing factor to changing the market level airfare prices.

With all this said our hypotheses about a potential relationship between baggage fees and market fare are here as follows:

Hypothesis 1. We hypothesize that whether airlines charge baggage fees between the two types of airlines: baggage fee airlines and non-baggage fee airlines (X) has a relationship with the overall market airfare prices (Y). **Hypothesis 2.** We hypothesize that the Covid-19 shock decreased the market level airfare prices. **Hypothesis 3.** We hypothesize that the passenger market airfares have risen since the Covid-19 pandemic, and the airline industry has recovered from the shock. Because of this, the market airfare prices have risen back to their pre pandemic levels, or they have risen to higher airfare prices than before.

Hypothesis 1 may be correct because the previous literature has supposed the idea that there is a relationship between whether airlines decide to be baggage fee charging airlines or non-baggage fee charging airlines and market level airfares. Hypothesis 2 may be true because during the time of Covid-19, there were less people using air transportation. The second reason why this may be true is because during this time, inflation was rising. So passengers would be less incentivized to fly. Not only would this hold true for market fares falling, but also, baggage fees may have fallen as well, to attempt to increase demand for the airline industry. Hypothesis 3 may be correct because since the Covid-19 pandemic, the U.S inflation has decreased, and many other markets have begun to recover from the Covid-19 shock to the economy. It may be correct to assume that it is possible for the airline industry to have recovered since the Covid-19 pandemic. And because of this, conceptually airlines may have increased business and started raising airfare prices once again.

We argue for these hypotheses because they are either directly related to our independent and dependent variables or they are related to the time component of this study, that being the

years before, during and after the Covid-19 shock (those being 2017, 2020, and 2023). We feel as though these hypotheses allow us to test whether baggage fees or no baggage fees influence the market airfare prices in the overall industry. And the relationship between how these prices differed before, during and after the Covid-19 pandemic can show the markets response to changes in demand as well as the potential skewing of the market to change airfare prices overall. We believe that with these hypotheses we may add information to the previous literature and can suggest future policy changes that may or may not add to the management of the domestic U.S airline industry.

This thesis may have a potential issue of endogeneity. Specifically, it may have the problem of omitted variable bias. To account for this, this thesis will include a dummy variable within our model which account for those lost variables key to this exploration. That dummy variable is the “baggage fee” variable that describes whether an airline charges a baggage fee or does not charge one. Another potential issue with this study is collinearity, because of the way the dummy variable for baggage fee was set up, there could be issues in determining whether the baggage fee variable itself was linear or not. We cannot fully incorporate using all the variables that may have relationships with market level airfares, but we included the ones available to us we thought would most likely have relationships with them. As if we were to include all relevant variables in the market, this could make seeing the correlation between baggage fees and market airline prices difficult, as so many other variables would be in the way of seeing the relationship between baggage fees and market fares we are seeking in this thesis. In the next section of this thesis, we discuss the context of the time of the Covid-19 shock.

Context:

The time-period for which Covid-19 occurred is vital when thinking about the market prices of airfare tickets changing so drastically for this study. Within the airline industry during this time and within the U.S domestic airline market, some small carriers had to leave the market entirely because they were not making enough of a profit to stay within the market. So, prices for the airline industry did fall during this time because there was less labor to support the industry and less demand on not just air travel, but also transportation as well. We think that conceptually for the context of this study that the overall market fare for airlines did fall during the Covid-19 pandemic. So, it is odd to think that airfare prices changed as much as they had from pre pandemic levels to during pandemic levels, and then to have the prices bounce back up post pandemic. There could be multiple reasons at play for why airfare prices would change so much, but it's important to note that when the Covid-19 pandemic first occurred, people were instructed to stay home for the first couple of months and to not leave unless necessary in the U.S. Many industries began to fail during the first quarter of 2020 because there was a lack of workers in the labor force for the first couple of months within the Covid-19 pandemic. This is important in the context of the airline industry, because like many other industries within the first quarter of 2020, there was a massive loss of workers in the labor force, as well as a major loss of passengers using air travel because of the lockdown placed for U.S citizens to slow the spread of the Covid-19 virus. Because the labor force was healthier before the Covid-19 pandemic, the pre-covid level market fares should've been higher than during the pandemic. So, the 2017 first quarter would have a higher market airfare price than the market airfare price in 2020. Following this, and consequently after the market had recovered, the market airfare price in 2023 would also be

higher than 2020, because the labor force had recovered and there would be passengers again as well. So, we think that the airline industry did recover from this shock to the economy.

It's also important to note when bag fees first started within domestic U.S airlines, and how they became prevalent in the airline market. In 2008, the first "bag fee" was issued by the commercial airline American airlines (DB1B, 2013). They were the first of many airlines that would start charging checked baggage fees. In 2010, Spirit airlines imposed a carryon bag fee. And in 2016 and 2017, American airlines and United airlines began their basic economy fares in which passengers would check bags and pay for them, but at a discounted price (DB1B 2023). It's also very important to remember that in 2017, Southwest airlines was the only airline to continue not to have bag fees in the U.S airline industry with a policy of free carry-on luggage and two free checked bags. And this is why there was a study that mainly compared Southwest airlines and JetBlue airlines, because of how recently Southwest airlines had decided not to charge an added "bag fee" to their airfare, whereas many other airlines had (Zou et al., 2017). Today Southwest is still one of the only airlines in the U.S that does not charge a baggage fee. Since 2017, American airlines, JetBlue airlines, Alaska Airlines, United airlines, Delta airlines, Alaska airlines, Republic airways, American eagle airlines, Silver wings airlines, and more domestic U.S airlines have increased their baggage fees within the U.S airline market and industry. It's interesting to see though, that with most of these airlines, the baggage fees are priced relatively similarly, with about a thirty-dollar charge for the first checked bag and about a forty-to-fifty-dollar charge for the second added bag fee. In the next section we will be discussing the data compiled for this thesis and the market level fees of airlines.

Data:

The data for this thesis is compiled from the U.S Bureau of transportation statistics. We used the database looking into a 10% look into the market fares and distances planes flew, so we could see the airfare levels across commercial airlines and how that related to bag fees within the market, this database was called the DB1B. This database investigates how much a specific airline monetarily receives per fiscal quarter, as well as it gives information on the flights that occur. For example, it states how far a plane travels at the market level, or also some of the per individual airline prices. It can also show the individual receiving amounts of U.S dollars an airline receives per ticket. This data set is population and time series. It is time series because it has different information for each fiscal quarter of the year for every flight that occurs. We've used three terms for the purposes of this study from the DB1B: 2017 fiscal quarter 1, 2020 fiscal quarter 1, and 2023 fiscal quarter 1. We've used these terms to get a wide grasp on how much the market airfare has changed throughout the years before, during and after the Covid-19 pandemic and tried to make the distance in time between 2020's first fiscal quarter equal to each other. It is important to note that during 2020 fiscal quarter 1, is when the initial lockdown in the U.S occurred, and labor force for the airline industry went down.

We include a "bagfee" dummy variable in the econometric specification section of this paper as well. This variable is displayed as either 0 or 1 and what this represents is if an airline charges a baggage fee or doesn't. 0 represents airlines that do not charge baggage fees for checked luggage, and 1 represents airlines that do charge baggage fees. We have a run T-test to see if there is a significant difference in means between the baggage fee variable and the overall market fare means. We have done this because of our two main variables. Market airline fare prices as our dependent (Y) variable and if an airline charges a baggage fee or not as our (X)

variable. We are describing this “bagfee” variable here because it was used in a table used for this section of the thesis.

A T-test was run for the dummy variable bag fee determined by the year, testing for difference of means between non-bagfee airlines (0) and bagfee (1) in table 1. The bag fee variable 0 represents all airlines in the domestic U.S airline market that don’t charge baggage fees, as opposed to the bag fee variable 1 that represents all the airlines in the domestic U.S market that do charge baggage fees. The table is presented with all years (2017, 2020, and 2023), and underneath the non-baggage fee and baggage fee group variables, within each cell moving down vertically, the first value that is presented is the mean of that variable for a specific year, the variable underneath that is the standard error in parentheses. The diff or difference variable in the third vertical column’s first value is the difference of means of the two groups, or group 0 minus group 1 means, underneath that value for each given year is the p-value to show if there is a significant relationship between the dependent variable market fare and the independent variable baggage fee, split into the groups of bag fee and non-bag fee. It is important to note that the smaller a p-value is, the more significant the potential relationship between variables may be. In general, if a p-value is less than 0.01 or a 99% confidence interval, that shows the greatest significance, if a p-value is less than 0.05 or a 95% confidence interval, that shows a significant relationship, and if the p-value is less than 0.1 or a 90% confidence interval, that shows some significance. For the first two cell columns of the table describing non-bagfee (0) and bagfee (1) have standard errors underneath their mean values. In general, a lower standard error is a more reliable than a higher one because it shows lower variability in coefficient value if one were to replicate this study or any study, the coefficient variability within a set of population data, like how this one pulled and compiled coefficients from population data. Table 1 will not be

considered as part of the results of this thesis however and is only part of the data section of this study.

The data shown from the DB1B for table1 in this section were from a population sample. So, the sample size was quite large because the data showed every commercial flight within the U.S during a given quarter. The number of observations in the table was 104,858, The reason this data was used was because it showed the market fares changing throughout a large sample size, and because it showed the change in the population of airline observations throughout multiple years. The biggest flaw with this dataset was that it didn't describe which airlines charged bag fees or didn't charge bag fees automatically. This would not be as big of a problem if all airlines stayed the same, either charging bag fees or not. And hence the creation of the dummy variable for the presence of baggage fees in this thesis's model. However, the airlines sometimes changed from charging bag fees to not charging bag fees. The only airline that did not charge a baggage fee in this dataset was Southwest, which was consistent with what the previous literature had found. However, finding a specific airline's overall fare and baggage fee would not prove challenging, for the purposes of compiling data for this study. This was not a major flaw with the dataset. The largest flaw of this data was the potential effect of endogeneity and collinearity of the dummy baggage fee variable, because as shown in table 1, the determination for if an airline charged a baggage fee or not was displayed as either 0 or 1 representing whether airlines were baggage fee airlines or non-bag fee airlines. Each airline within the DB1B was represented through their IATA code, or (International Air Transport Association) code represented by two letters next to each other or one letter and one number next to each other. For example, the IATA code for JetBlue was displayed as B6 within the dataset. Another example of an IATA code would be Southwest with the code WN.

As seen in table 1, The p-values are all either displayed as 0.00 or 0.01 correlating a significant relationship between baggage fees and market fares. Diff or difference in the table is the means difference between the group 0 minus group 1 or non-baggage fee group minus the baggage fee group means. Mean prices between baggage fee charging airlines and non-baggage fee charging airlines changed between 2017 fiscal quarter 1, 2020 fiscal quarter 1, and 2023 fiscal quarter 1. The difference of means for all three years was significant. The next section of this thesis will discuss the econometric specification and models that were used to analyze the data compiled from the U.S bureau of transportation statistics.

Econometric Specification:

To fully analyze the data for this thesis, we show a linear regression model with the dependent variable being the airline industry's market fare prices (Y) and main independent variable being whether or not an airline charges baggage fees (X):

$$\text{Market fare}_i = \beta_0 + \beta_1 \text{Market miles flown}_i + \beta_2 \text{Bulk fare}_i + \beta_3 \text{Nonstop miles}_i + \beta_4 \text{Year}_i + \beta_5 \text{Dummy for presence of bagfee}_i + \varepsilon_i.$$

Within this regression model, the dependent variable is defined as the market fare variable, that is why it is listed first, and then all other independent variables are described afterwards. The first variable is the market fare of the overall airline prices combined with both bag fees and no bag fees added to the airline fare of the total price for airline tickets. Market fare is also the dependent variable (Y) in this model and study. The market miles flown variable is the average distance a flight goes on a typical domestic flight in the U.S. Bulk fare is the overall prices of airfares for specific airlines with added baggage fees or any other auxiliary fees already put into the fare of a passenger ticket. Nonstop miles are the number of miles a typical flight takes without making any layovers at different airports within U.S flights. The year variable represents the year of the DB1B data, and from what year the observations and data are coming from (specific to this study: 2017, 2020, and 2023). We estimated the model for the three years separately, one at a time. There is also a dummy variable added to this equation called "bagfee presence" this variable represents whether each of the sixty-three airline carriers within the U.S airline market charge baggage fees or not, within the data as said before, this was represented as either 0 or 1 to determine if airlines charged baggage fees or were non-baggage fee charging carriers.

We believe this model works best for this study because it includes major variables that can determine how well an airline is doing in the market, as well as the distances that commercial airlines travel for each fiscal quarter of the year. With these variables we can compare other airlines to each other both “bag fee” and “non-bag fee” to see what effects, if any, they can have on each other and any relationship with market fare they may have. We believe that this model also lets us see if there is any correlation between the main independent and dependent variables.

The airlines we included within this model were either displayed by a dummy variable titled “bagfee” and displayed to either have or not have bag fees with the numbers 0 and 1. 0 representing airlines that did not charge a bag fee, and 1 representing airlines that did charge a bag fee. The next section will overview the results and main findings of this thesis used by analyzing the data.

Results

As seen in table 2, the descriptive statistics table, the market airfare price did rise from 2017 to 2023. The lowest point that it had been at was in 2020 in the peak of the Covid 19 pandemic at \$219.55 (DB1B, 2020). The passenger demand for air travel was down, and therefore, the market level price of airfares would need to fall to try to attract passengers by using lower prices. Consequently, independent airline airfares would also fall. As the market would recover from the Covid-19 shock, the price of airfares would rise once again. The rising prices could also be a result of “bag fee” and “non-bag fee” airlines and a relationship with market fares, because at the point of 2023 fiscal quarter 1, the market had recovered, so they are changing their prices to balance out the price level with demand levels.

Table 2 is a summary of the descriptive statistics for this thesis. It includes the dependent variable market fare, the main independent variable bagfee and the other control variables included within the econometric model. Those being market miles flown, bulk fare, and nonstop miles. Year is accounted was accounted for in the data analyzed in this study. The table shows the standard deviation and means of each variable for each given year. The mean coefficients for the market fare variable and the bulk fare variable are comparable to real U.S dollar amounts. For example, a correlation for a market fare of 223 is equivalent to the real U.S dollar amount of \$223. It is important to note and clarify that within table 2, the values represented for market fare are overall average means of the market level price of airfare tickets. This is a different kind of value represented than what is shown in table 3, which is a service fee for market fare.

Table 3 displays the results of the linear regression for the years 2017, 2020, and 2023. It is incredibly important to note that for table 3, market fare is simply defined as a service fee, it is

not the means of all ticket prices of airlines like in table 2. Table 3 shows coefficient values with standard error values underneath. Standard errors are used to represent the standard deviation of a sampling distribution. It is often used to estimate variability of sample statistics, like mean or variability of regression coefficients, comparing from one sample to another. Standard errors are crucial not only to this study, but also all studies to determine reliability and significance of statistical estimates. In the context of this table, a lower standard error represents a more reliable coefficient value and is precisely determined within a regression equation. If the standard error is higher, this means that the coefficient value may vary significantly and if one were to replicate the study with another sample from the population, the coefficient value could vary substantially. A * symbol shows significance in relation to the dependent variable market fare. *** symbolizes the greatest significance, ** symbolizes a significant relationship, and * symbolizes some significance between variables.

The linear regression contains all independent variables and control variables in relation to market fare, so that includes bagfee, market miles flown, bulk fare, and nonstop miles. There is significance between bulk fare, market miles flown, and nonstop miles for 2017 and 2020 related to market fares. Bulk fare may have significance for 2023. For these control variables, they have positive correlations with market fares. Bulk fare being correlated with market fare is in line with previous literature as well, as bulk fare includes added fees and have commodity bundling shown (Adams et. Al., 1976; Marco et. Al., 2009). The main independent variable, bagfee was significant for all three years, showing there is a correlation between bagfee (x) and market fare (y). Along with this main relationship, based on the data shown in the linear regression results in table 3, the coefficient values show that baggage fees aligned with baggage fee airlines were higher in 2017 than 2020 with a mean baggage fee coefficient of 50.88 in 2017.

In 2020, the baggage fee coefficient was 36.99, and in 2023, after the Covid-19 pandemic, the baggage fee coefficient had rose to 75.51. The coefficients can be translated to real U.S dollars. Displaying a relationship between baggage fees and the market fares with significance identifies a positive correlation between the two. This result is in line with what the previous literature had found (Zou et al., 2017; Brueckner et al., 2013; Woohyun et al., 2018; Mumbower et al., 2023).

This result aligns with the first hypothesis of this thesis arguing that there is a relationship between baggage fees and market fare, and it aligns with what the previous literature had found. Baggage fees having a relationship with market fares (Zou et al., 2017; Brueckner et al., 2013; Woohyun et al., 2018; Mumbower et al., 2023). And this study continues to follow the path of finding that baggage fees and market fares are indeed correlated. It also correlates with the first hypothesis of this study claiming that there is a relationship between baggage fees and market level airfare prices. So, if baggage fees were to change in the U.S market, so would market fares. The results of this study also align with the second and third hypotheses stating that market fares were higher in 2017 and 2023 than in 2020, meaning that the airline industry had fallen during the Covid-19 pandemic, and in 2023, it had recovered. Because literature hasn't spoken on this, comparing the results of this study speaking on the second and third hypotheses to something else proves challenging.

The model and tables of this thesis include whether an airline is a "bag fee" charging airline or "non-bag fee" charging airline. Within these results, there seems to be a positive relationship between market fare and baggage fee. The next section of this thesis discuss the conclusion of this study overall.

Conclusion

The goal of this thesis was to determine whether there was a relationship between the market airfare prices and “bag fee” charging airlines or “non-bag fee” charging airlines. As shown by the results of this thesis, it is correct to say that the Covid-19 pandemic and shock to the economy clearly impacted the airline industry. Studying the difference between baggage fee and non-baggage fee charging airlines and its relationship with market fares, was affected by the Covid-19 pandemic. Based on table 2 and looking at means, this can be identified. Based on the results, it seems that the first hypothesis was correct in assuming there was a correlation between both types of airlines baggage fee and non-baggage fee changing in their individual prices and a change in the market level price. The second hypothesis was also true in assuming the market fare price fell during the Covid-19 pandemic. This can be seen in table 2 as well. Also, by looking at table 2, we can see that the third hypothesis of this thesis is also true, and the market fare has risen to \$283.33 (DB1B, 2023). As seen by the results of this study, baggage fee is correlated with market fares. Baggage fees may be related to market fares because when one airline changes prices, other airlines will see this and change their own individual prices to adapt to the new pricing strategies of others. This back and forth of individual airlines changing their prices with or without baggage fees consequently will also change the overall market level airfare price as a result. Covid-19 also changed the market fares. This could be because of the labor force changing in the first fiscal quarter of 2020, and the fact that less passengers were using air transportation in the U.S at this time.

In terms of policy changes within the airline industry, this could look like markets setting a more even price point to hold for both “bag fee” airlines and “non-bag fee” airlines, however that could be difficult to put into place because individual airlines can change their prices

according to how they see fit. So, there is not a real solution in sight. It may be the case however that these add-on pricing schemes could be regulated in other markets, and policy makers could set a more direct and even price in say the music concert ticket industry and their add-on pricing strategies or other markets that are similar. Add-on pricing could be regulated to not surpass a certain limit, to regulate ticket pricing. If policy makers were to do this, this could increase the demand for ticket prices in the concert market or other markets.

We understand that this study is not without its faults and more factors could have been included to see how the market fare responds to other things that occur within the airline industry. For example, many airlines have rewards programs that allow passengers to fly on specific flights for reduced prices if they have been supporting the company by participating in a rewards program that is advertised by the airline. For example, some airlines issue special credit cards that take a fee from the person using it, but also give points to allow that person to fly their airline for reduced fares and gain other benefits like first class seats and lounging areas to wait for flights. Another flaw of this study is that it did not include whether passengers flew on private flights. This study assumes that the passengers who are flying in the U.S domestic commercial airline market are only flying on airlines within that market. Private airlines seem to be in a difficult position to include here because the passengers they attract are usually incredibly wealthy and are not in need of trying to fly on a commercial airline unless absolutely necessary. Another flaw in this study could be because this was looking only at airlines within the U.S, there could be competition between other forms of transportation like driving from one state to another instead of flying. This could be something that could have occurred quite often during the Covid-19 pandemic. As if people really wanted to travel, driving alone or with their families would be a safer option than flying with strangers on a commercial plane. This could be one of

many reasons as to why the cost of airfare tickets fell during the Covid-19 pandemic. Another potential fault with this study could be the scope, as this study only looked at airlines within the U.S domestic market. Including airlines that operated internationally at an even more macroeconomic scale could have proven that there are other things and potential variables within the world airline international market that change the market price not only in the U.S, but also the world level market price. This could be part of a bigger discussion that includes whether baggage fees change the market level price of airfares for not only the U.S but also for the world level market prices of airfares. But the most important fault in this study, is not including some way to measure LCC's and ULCC's. It is important to note how LCC's and ULCC's can also change the market fare price quite a bit as well. The market price responds to price changes in commercial airline prices when charging baggage fees or not charging baggage fees. LCC's and ULCC's can potentially skew the market in order to attract more passengers, because the initial ticket price that they provide is usually much less expensive than the prices of commercial airlines in the U.S domestic airline market. One thing that future research may be able to accomplish is how much LCC's and ULCC's change the market airfare price within the U.S, as they attract many passengers to fly with their companies. This clearly has a large effect on the market price changing, but how much change is a mystery. This study only focused on what airlines that charged baggage fees or did not charge, did to change the market airfare price of tickets in the U.S domestic airline industry. Including LCC's and ULCC's in future research could prove beneficial in the context of this topic. The results of future studies may say otherwise though, and LCC's and ULCC's may not have the impact on the market that we are guessing that they do. We think that more relevant and new literature on this topic could prove fruitful. It is quite clear that ULCC's and LCC's have a large effect on how much the overall

market fare of the U.S airline industry can change. Ultimately many things can change the market level airfare price and more research should be published to fully investigate this phenomenon.

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Figures and Tables:

Table 1.

T-test for significance levels of baggage fee. Test for difference of means.

	Non-bagfee (0)	Bagfee (1)	diff
2017	182.2885 (.74501)	232.051 (1.319188)	-49.76252 (0.000)
2020	185.329 (.7822731)	226.314 (.6417118)	-40.98502 (0.000)
2023	210.492 (.8226379)	301.0218 (11.11748)	-90.52978 (.001)

Note: Means are presented as well as standard error in each baggage fee descriptive area, and underneath diff is the mean of both baggage fee and non-baggage fee or group 0 – group 1, as well as p-value underneath this difference of means in this descriptive area. Standard errors and P-values are presented in parentheses.

Table 2.*Descriptive statistics*

	2017		2020		2023	
	Mean	SD	Mean	SD	Mean	SD
Market fare	223.203	354.344	219.554	179.128	283.337	289.7457
Bagfee	.822	.382	.835	.371	.805	.396
Market Miles Flown	948.76	578.617	963.748	624.41	1323.278	828.635
Bulk fare	219.601	90.696	220.68	43.082	291.612	916.085
Nonstop miles	949.205	578.419	964.057	624.298	1241.92	784.18
Observations (n)	104858		104858		104858	

Note: In the Descriptive statistics table, each cell holds the standard deviation, the mean and the number of observations for each variable.

Table 3.*Linear regression for years 2017, 2020, 2023*

Market fare	2017	2020	2023
Bagfee (only added price)	50.882*** (2.837)	36.99*** (1.435)	75.514** (22.696)
Market miles flown	.185*** (.044)	.178*** (.025)	.039 (.05)
Bulk fare	219.601** (90.696)	220.68*** (43.082)	-291.612 (916.085)
Nonstop miles	.032** (.044)	-.104*** (.025)	.032 (.052)
R²	0.018	0.075	0.001
Observations (N)	104858	104858	104858
	(N)	(N)	(N)

Note: In the linear regression table, each cell holds standard errors underneath coefficient values. Standard errors are presented in parentheses.