Solution 8 (3C) - Revise Fuel Excise Tax Exemptions

In-depth Analysis of Key Challenges

Introduction

After receiving input from the advisory committee, the study team reached out to the state legislature to gain their insight and perspective. **A select group of legislators asked for clarification on solution 8 (3C), Revise Fuel Excise Tax Exemptions.**

The Legislators were interested in learning what evidence supported certain key challenges under the solution that revised fuel excise tax exemptions on airlines (Solution 8 (3c)):

- The proposed solution could lead to increased air fares
- The proposed solution could lead to less revenue to state and local government, reduced tourism, and less economic growth
- The proposed solution could lead to reductions or elimination of air service, leading to reduced travel and trade

The Legislators sought empirical data to support the challenges.

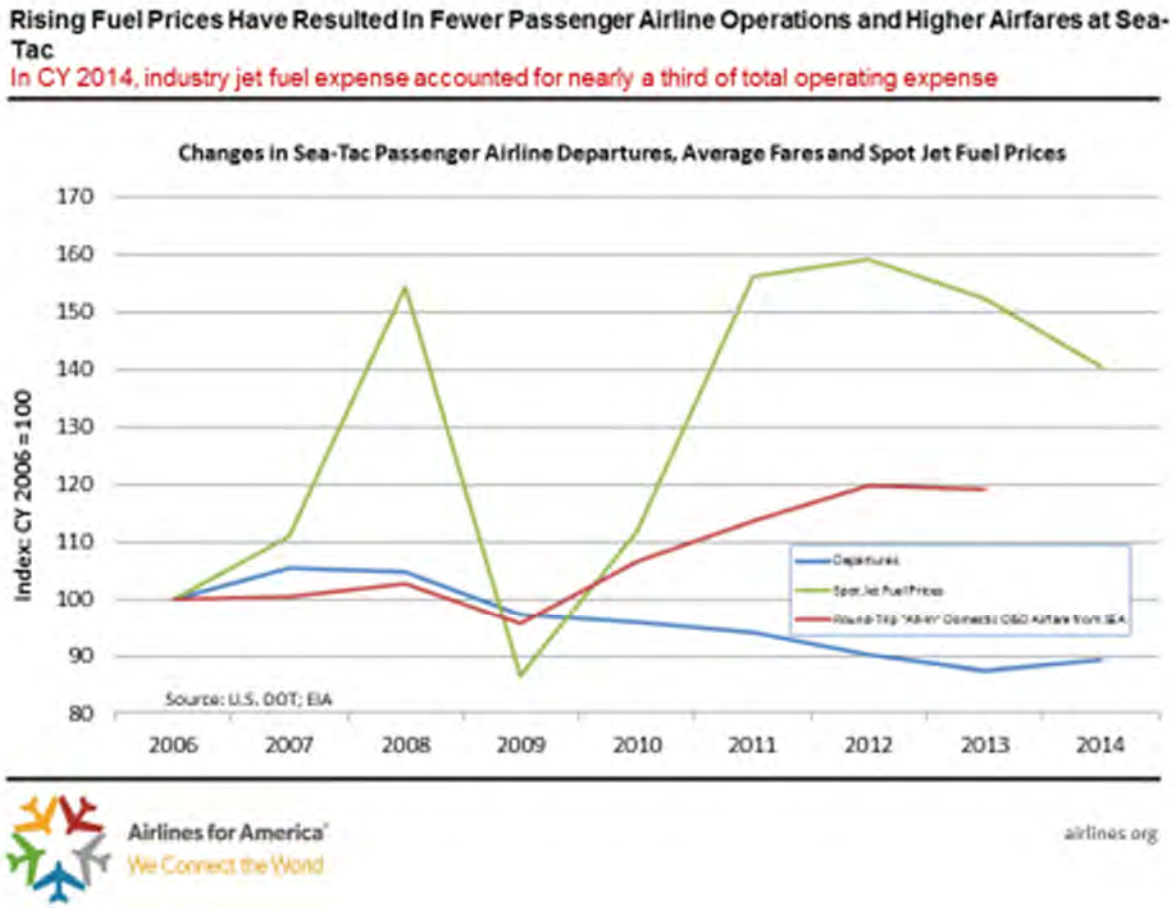
Analysis

The airline industry provided information to support the assertion that higher costs could result in increased air fares yielding reduced tourism, travel, trade, economic growth, state and federal revenues, and reductions or elimination of air service.

Figure 1 shows changes in average airfares at Seattle-Tacoma International Airport (SEA), annual departures from SEA, and the unit price of jet fuel. The airlines provided this figure to show that as jet fuel prices go up, fares go up and departures go down.

In very basic economic terms, it is true that as the cost of a good or service increases, the demand for that good or service decreases. This law of supply and demand is a fundamental principle of economics. However, other factors can overshadow this basic principle of economics, especially in an industry as complicated as aviation.

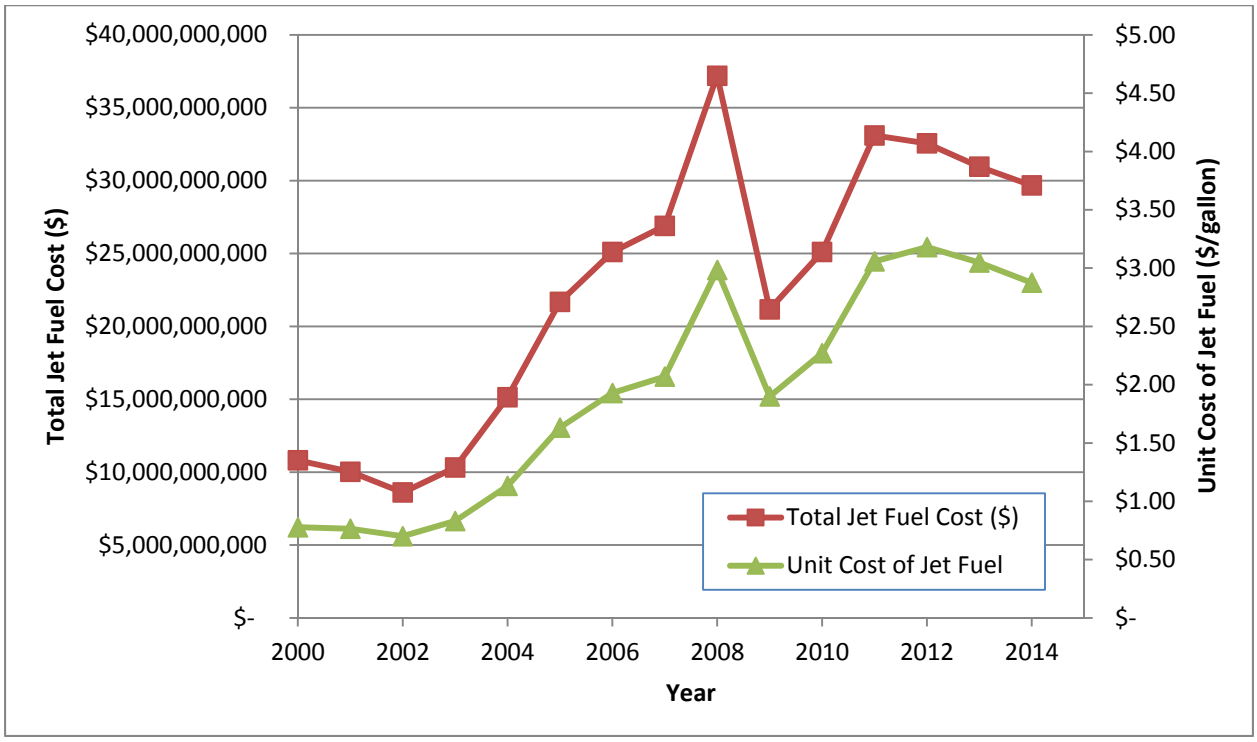
Figure 1: Airlines Data



The analysis begins by examining the idea that increased airline costs lead to increased airfares. When an airline is faced with increased costs, it has two choices in terms of airfares. One option is to pass along some or all of those costs to the passenger through higher airfares. Alternatively, the airline can choose to absorb the additional cost without increasing airfares, resulting in lower profits. There are several reasons why an airline might want to absorb additional costs instead of maintaining its profits. One example is that the airline may forego short-term profits in order to avoid losing market share to a competitor, thereby preserving long-term profits. In cases where an airline absorbs the extra costs, the passenger does not see an increase in airfare and there is no adverse response in demand. **This raises the question of which behavior is the airline more likely to follow?** One way to answer this question is to look at how airlines have responded historically to changes in jet fuel prices.

From 2000 to 2014, jet fuel consumption for U.S. domestic airlines declined slightly, thanks to more fuel efficient aircraft. However, during that same time period, the cost of fuel for airlines rose, as shown in **Figure 2**. Also shown is the unit cost of jet fuel, in dollars per gallon.

Figure 2: Total Jet Fuel Cost and Unit Jet Fuel Cost over Time

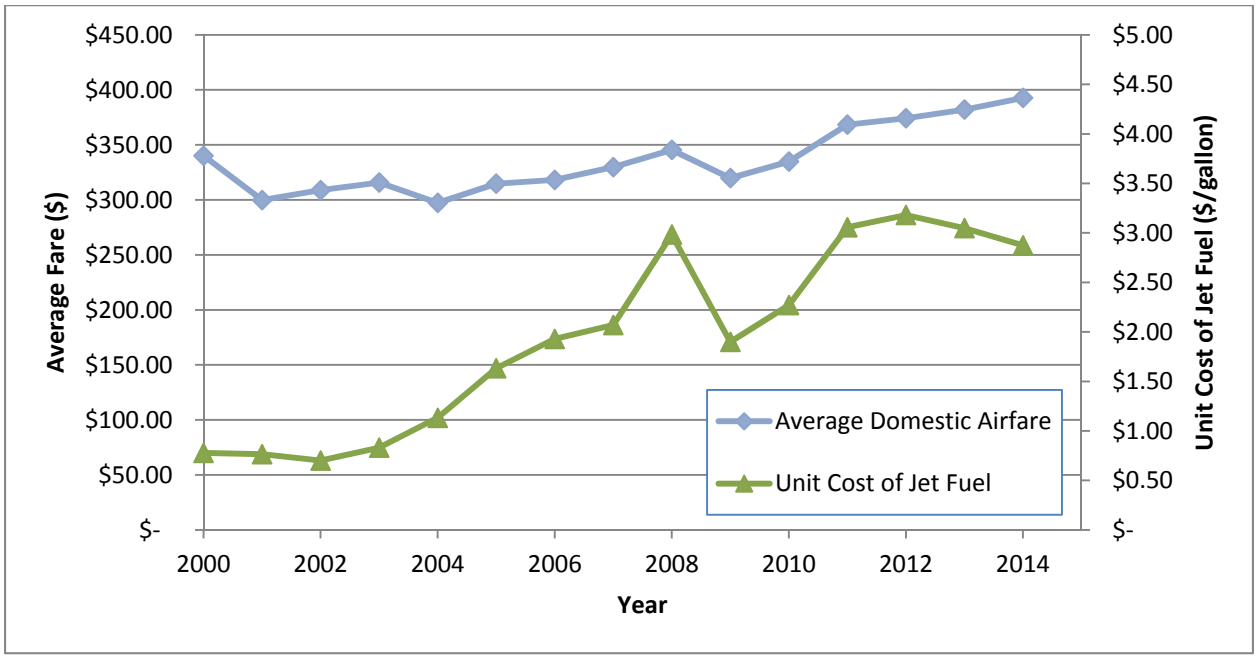


Source: Bureau of Transportation Statistics, US DOT. Prepared May 2015.

The two lines in Figure 2 appear to follow each other fairly closely. The degree to which they move in unison can be characterized mathematically by a correlation coefficient, which is a value from negative one to positive one. A correlation coefficient of positive one means that if one line increases, the other line increases by the exact same proportion. A negative value indicates a negative correlation, meaning that when one line goes up, the other goes down. **It is important to remember that correlation does not mean causation – a change in one variable does not necessarily make the other variable change. There could be a third unknown variable that is causing both variables to change.** Correlation simply indicates that there is a relationship between the two variables being measured. In general, any correlation coefficient greater than 0.8 is regarded as a strong relationship between the two data sets.

In the case of total jet fuel cost and the cost of jet fuel per gallon, the correlation coefficient is 0.97, indicating a very strong positive relationship between the two. Since we know that total fuel consumption declined during this period, it is reasonable to assume that the higher cost per gallon of jet fuel is what generally drove total fuel costs up over time. Having established that rising per gallon fuel costs imposed greater costs on airlines, let's examine how airfares behaved over that same time period to see if airlines absorbed those costs or passed them along to consumers.

Figure 3: Average Domestic Airfare and Unit Jet Fuel Cost over Time

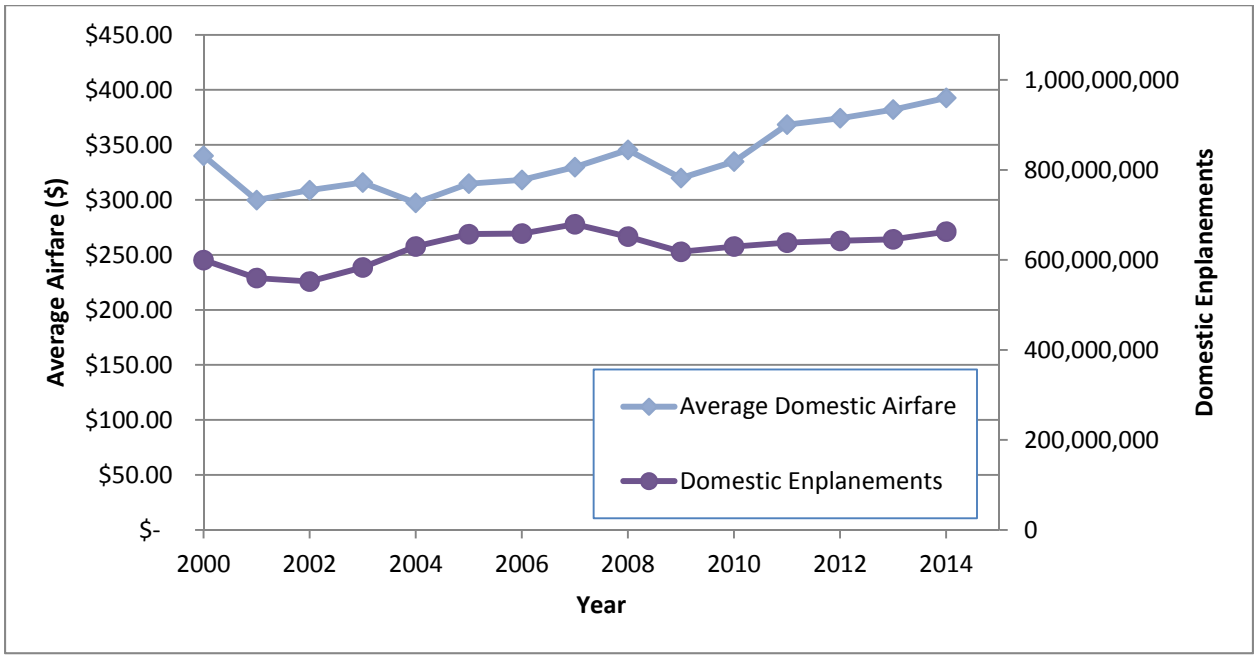


Source: Bureau of Transportation Statistics, US DOT. Prepared May 2015.

Figure 3 shows how average airfares for US domestic airlines changed in relation to the unit cost of jet fuel. Again, the two data sets trend upward, and seem to follow each other to a certain degree. The correlation coefficient of 0.82 confirms that there is a strong positive correlation between the two variables. This says that, historically, when the cost of jet fuel goes up, the cost of an airline ticket generally rises as well. This supports the assertion that when airlines experience increased costs, they increase airfares, passing along some or possibly all of the cost to consumers. Our next step is to examine how air travel demand reacts to changes in airfares. **The number of aircraft operations (departures or arrivals) is generally not a good indication of air travel demand since the number of passengers an aircraft can carry varies.** Airlines take advantage of this fact by moving aircraft around their network to optimize profit and passenger service. For example, an airline that has two daily departures from SEA to San Francisco using small regional jets that can carry 50 passengers each might opt to replace those two departures with a single larger jet capable of carrying more than 100 passengers. These types of decisions are influenced not just by passenger demand, but by profitability of other routes within an airline's network, competition with other carriers, and a host of other complicated factors. In this case, the number of departures has declined, but more travelers can be accommodated. For this reason, **air travel demand is measured through passenger use of airline service.**

Now, let's look at how passenger demand changed with changes in airfares. **Figure 4** shows domestic enplanements – the number of air travelers that boarded scheduled airline flights each year – and the average airfares of US domestic airlines. The correlation between the two data sets is only 0.48. What is notable is not that the correlation is weak, but that it is positive. The fundamental economic principles of supply and demand suggest that as airfares increase, the number of air travelers should decrease (a negative correlation), but the correlation, even though weak, indicates the opposite.

Figure 4: Average Domestic Airfare and Domestic Enplanements over Time

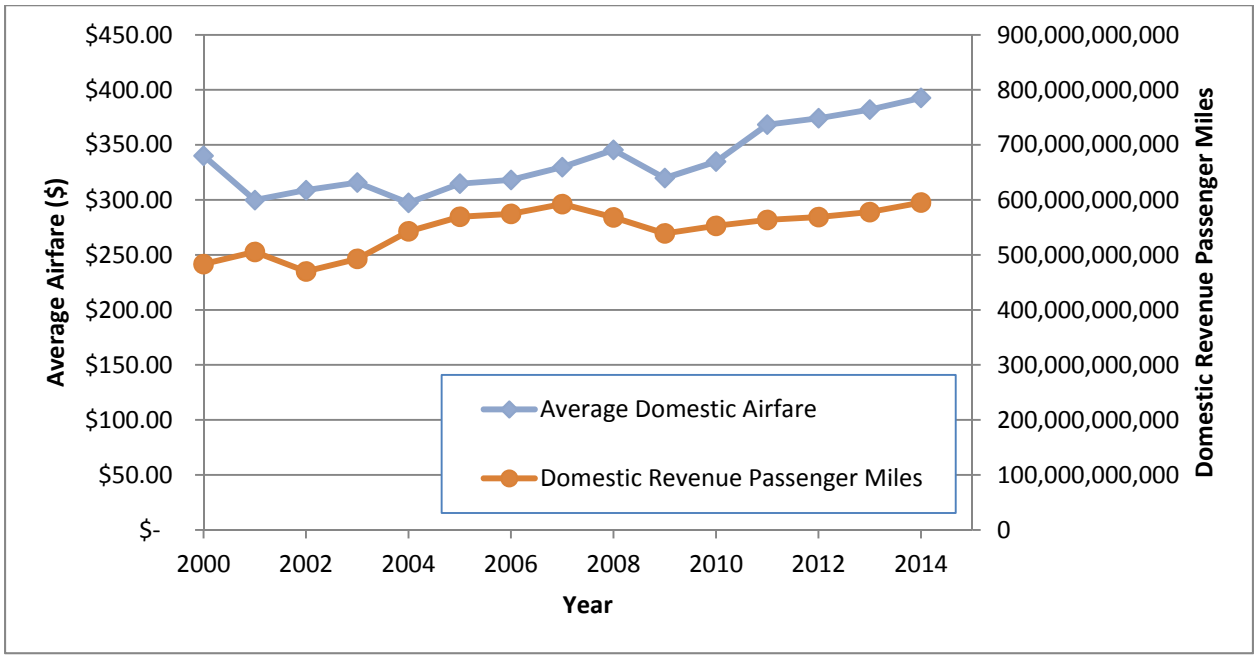


Source: Bureau of Transportation Statistics, US DOT. Prepared May 2015.

The measure mentioned above, passenger use, is not necessarily measured by the number of travelers. In fact, the number of air travelers isn't the best measure of air travel demand, since it doesn't take into account how far the passenger is traveling. It's conceivable that, while the number of air travelers has a positive correlation with airfare, their distance traveled could have a negative correlation with airfare (i.e., they take shorter trips when airfares increase and longer trips when airfares decrease). A metric termed *revenue passenger miles* multiples the number of revenue-producing passengers (as opposed to those flying on free tickets) by their distance travelled. If 10 paying passengers fly 100 miles, they generate 1,000 revenue passenger miles. If those same 10 passengers fly 500 miles, they generate 5,000 revenue passenger miles.

Figure 5 shows that when trip length is taken into account, there appears to be no difference in our conclusion. In fact, revenue passenger miles have a more positive correlation with average airfare at 0.54 than does passenger enplanements. This contradicts the assertion that higher airfares result in reduced travel, at least at the national level as shown by this data. But is this relationship also true at the local level? To find out, let's examine the correlation between airfare and air travel demand specifically at SEA over the years, reflected in **Figure 6**.

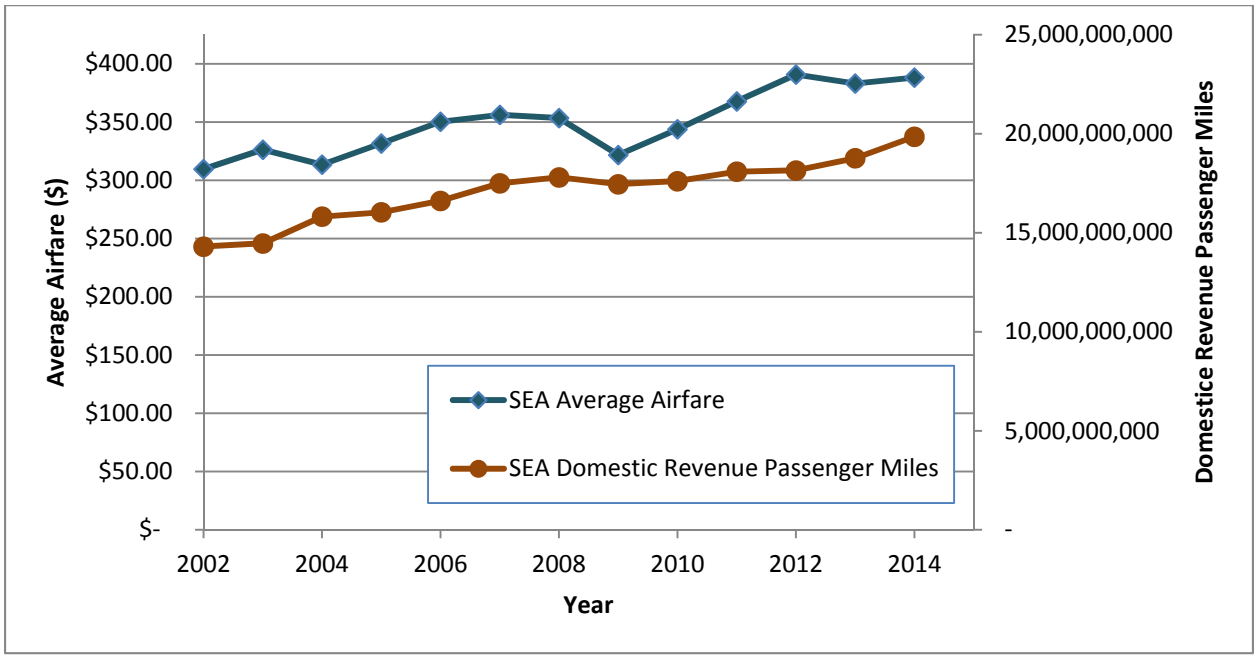
Figure 5: Average Domestic Airfare and Domestic Revenue Passenger Miles over Time



Source: Bureau of Transportation Statistics, US DOT. Prepared May 2015.

Figure 6 shows the relationship between domestic revenue passenger miles and average airfare at SEA. The correlation between these data sets is 0.84, strongly indicating that other factors are driving air travel demand beyond the ticket price.

Figure 6: SEA Average Domestic Airfare and Domestic Revenue Passenger Miles over Time



Source: Bureau of Transportation Statistics, US DOT. Prepared May 2015.

Without detailed analysis, those other factors cannot be identified with certainty, but such an analysis could look at whether an improving economy caused both airfares and travel demand to rise. Another possibility could stem from the numerous airline mergers over the past 10 years. The consolidation of these airline networks could have resulted in a smaller supply of flights, which could lead to higher airfares.

Summary

This analysis shows that:

1. There is a strong positive correlation between airfares and jet fuel price. As the price of jet fuel increases, airfares increase. When the cost of jet fuel declines, airfares decrease. This supports the assertion that changes in airline costs are reflected in similar changes in ticket price.
2. Having established that airfares and fuel prices tend to move in concert, we checked to see if airfares and air travel demand follow the basic economic principles of supply and demand. We found that historical data at both the national level and at SEA do not support this contention. This is not to say that fundamental principles of economic do not apply – only that other factors, possibly an expanding economy, are more dominant than the negative influence higher ticket prices have on air travel demand.
3. Since it has been shown that air travel demand has historically increased in the face of rising ticket prices, the study cannot support the assertion that things tied to air travel, such as tourism, travel, trade, and economic growth, would be detrimentally affected by rising ticket prices, assuming historical trends continue.
4. Decisions regarding flight schedule reductions or eliminations are complicated issues that are under the control of individual airlines. While increased costs are one factor in determining flight schedules, they are not the only one. Other factors that are often weighed in airline scheduling decisions include competition from other airlines, and the profitability of a route in comparison to other routes in the airline's network.

This in-depth analysis of historical data has illustrated how higher fuel costs for airlines signal higher average airfares, but those higher average airfares have not resulted in lower travel demand. This makes it hard to support the suggestion that a small fuel excise tax increase would drive down air travel demand when rising fuel costs, which comprise a larger share of an airline's overall cost structure than the fuel excise tax, have not done so.