Using Resale or Refunds to Solve Inefficiencies in the Airline Industry

Maxwell Nicholson

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Supervised by Dr. Pascal Courty

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Dr. Elisabeth Gugl, Honours Co-Advisor

Dr. Martin Farnham, Honours Co-Advisor

Abstract

Economists generally agree that resale increases efficiency by channelling tickets to consumers who value them the most. However, since resale would limit an airline's ability to price-discriminate, the industry has restricted it. These restrictions cause inefficiencies in the market. In this paper, I describe these inefficiencies and show using a simplified producer theory model that resale or refunds would increase social surplus over the status quo. This motivates the need for a full discussion on the impact of policy intervention to correct this market failure.

Keywords: Resale, refunds, airline, revenue management

I. Introduction

Economists generally agree that resale increases efficiency by channelling tickets to consumers who value them the most (Courty, 2003). This concept, that there are gains from trade, has been fundamental to economics since the publication of Adam Smith's *Wealth of Nations* in 1776. However, since 1978 ticket resale in the airline industry has been strictly prohibited.

Leslie & Sorenson (2009) demonstrate that restricting ticket transferability causes inefficiency in the entertainment industry, but the inefficiencies they identify arise mostly due to underpricing. The inefficiencies caused by underpricing confound with the inefficiencies caused by non-transferability alone. In contrast to the entertainment industry, the airline industry does not engage in underpricing. On the contrary, airlines use revenue management techniques with the goal of extracting as much revenue from consumers as possible. To effectively employ these revenue management techniques, airlines restrict resale and refunds. These restrictions alone, while potentially profit maximizing, are inefficient.

In this paper I document the inefficiencies caused by these restrictions, and show why a market with resale or refundability would be superior. After identifying the inefficiencies, I present a simplified producer theory model to explain the effects of resale or refunds on the market. This model demonstrates that corrective policy mandating resale or refunds would increase social surplus under some assumptions. By rough estimates, such a policy has the potential to increase total surplus by up to 30%.

The current discussion around ticket-transferability in the airline industry is extremely limited. While ticket resale is ubiquitous in sports and entertainment, consumers take for granted the prohibition of airline ticket resale. However, arguments for this status-quo have not been well articulated. The only official statement available from the industry is a one-page brief from the International Air Transportation Association (IATA), published in 2012. In summary, IATA supports non-transferability. The briefing mentions three key reasons for this stance:

1. Ticket transferability would inhibit security protocols.
2. Full refundability or partial refundability already allows consumers to recover the value of a ticket.
3. Ticket transferability may cause a significant secondary market to develop, with serious scope for fraud and ticket touting.

I address the last two reasons in my analysis in Section 3, but I will address the first immediately. From the government's perspective, security protocols are malleable. The only requirement is for the passenger's identification to match the ticket on the day of travel (CNTraveler, 2014). The Transportation Security Administration (TSA) uses a system called Secure Flight to screen airline passengers and, according to the agency, this system is capable of handling checks almost instantly. In other words, if airlines relaxed their rules on transferability, the TSA would have no trouble accommodating them (USA Today, 2013).

Although these are the only three reasons listed by IATA, there is likely a fourth, simple reason: transferability restrictions are profit maximizing. To evaluate this hypothesis, I will examine how transferability restrictions fit within the suite of revenue management tools that airlines employ.

II. Revenue Management

The current design of Revenue Management (RM) systems results in inefficient outcomes for the market. To understand these inefficiencies, it is important to first understand the current systems.

Estimating Aggregate Demand

Revenue management refers to an airline's methods to maximize revenue given its unique challenges and constraints. Since airlines face negligible marginal costs, revenue management is analogous to profit maximization. There are three main challenges that airlines face: perishability, fixed capacity and uncertain demand (Weatherford & Bodily, 1992). Perishability refers to the fact that the product or service is available at one date, and after this date it is no longer available or useful. Fixed capacity refers to the fact that airlines cannot easily increase supply in response to demand. These factors are coupled with volatile and stochastic demand (Ryzin & McGill, 2000). Fundamentally, RM systems attempt to estimate demand with the goal to sell every seat at the highest price possible.

Estimating demand accurately is of great importance to the airline industry. The more accurately they can predict demand, the more revenue they can earn. For example, American Airlines has credited RM systems with providing revenue increases of $500 million per year, and Delta Airlines has credited RM systems with providing revenue increases of $300 million per year (TTS, 2015). However, despite improvements, no model has been successful in solving all of the RM problems, and the systems have many imperfections (Ryzin & McGill, 2000).

Even if the airline could accurately predict demand in aggregate, RM systems would still make mistakes in estimating demand for individual flights. This is because each flight has a different demand distribution. Researchers have proposed both Gamma and Normal distributions for the demand distribution of flights with standard deviations much greater than zero (Swan, 2002). Due to this statistical variation, the RM system will inevitably make errors.

The imperfections of airlines' revenue management techniques are easy to observe empirically. If revenue management techniques were perfect, one would expect load factors of 100%. In reality, load factors are much lower. From 2002 to 2018, US load factors have ranged from approximately 70% to 85% (See Figure 1). This demonstrates that RM systems have improved over time, but more importantly it demonstrates that there are still significant imperfections.

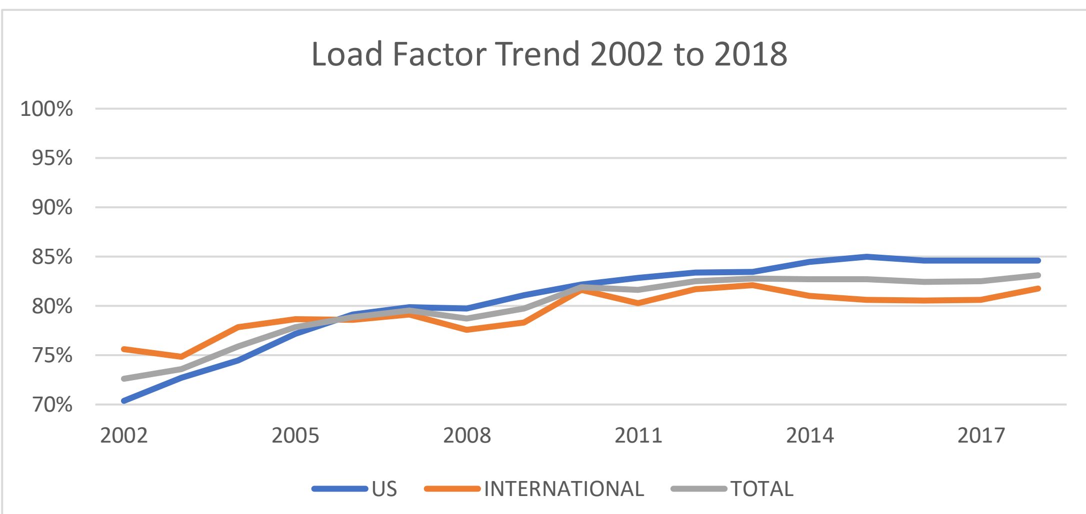

Figure 1: Graph of load factor trend 2002 to 2018. Data from Bureau of Transportation Statistics.

Estimating No-Shows

Passengers who do not show up to a flight further complicate these estimates. The number of these 'no-shows' is significant, estimated to be 10-15% of final pre-departure boardings in the US (Belobaba, 2009). Rothstein (1985) estimated a similar figure of 10% in 1985. No-shows leave seats on flights empty, and if these seats are flown empty, they represent potential revenue lost, known as spoilage. Overbooking is the airline's strategy to solve this problem. If the airline can accurately estimate the number of no-shows, it can fill the would-be empty seats with paying passengers. Since no-shows increase the uncertainty about future demand, they complicate aggregate demand estimates and increase the likelihood of errors.

Segmentation techniques

Demand estimation is concerned with filling every available seat. However, airlines also seek to fill these seats with the passengers willing to pay the most. To achieve this goal, airlines develop a schedule of fare classes with distinct features that appeal to different consumers. Airlines employ a variety of price discrimination tactics to segment the market into these classes.

Fare classes are a mixture of price discrimination and product differentiation, known in economics as menu pricing. As competition has increased in the airline industry since the early 20th century, much of the airlines ability to price discriminate (with techniques such as Saturday night minimum stay) has been challenged by low cost carriers. However, certain techniques such as advance purchase discounts and change/cancellation fees have remained prevalent. Figure 2 shows an example of fare classes for an American Airline flight from Boston to Seattle on October 1, 2001.

Round-trip Fare ($)	Cls	Advance Purchase	Minimum Stay	Change Fee?	Comment
458	N	21 days	Sat. Night	Yes	Tue/Wed/Sat
707	M	21 days	Sat. Night	Yes	Tue/Wed
760	M	21 days	Sat. Night	Yes	Thu-Mon
927	H	14 days	Sat. Night	Yes	Tue/Wed
1001	H	14 days	Sat. Night	Yes	Thu-Mon
2083	B	3 days	None	No	2 X OW Fare
2262	Y	None	None	No	2 X OW Fare
2783	F	None	None	No	First Class

Figure 2: Boston-Seattle fares - American Airline, October 1, 2001. Reprinted from the Global Airline Industry by Belobaba et. al., 2009. Page 83.

Advance purchase requirements are one of the most common techniques still used by airlines to divide fare classes. Advance purchase requirements segment the market based on a consumer's ability to plan and commit in advance to a flight (Belobaba, 2009). This is an application of price discrimination. The strategy assumes that business travelers, with higher willingness to pay, are unwilling to book a flight too far in advance due to the risk of a schedule change or due to not knowing in advance whether they will want to fly. The airline can therefore extract more revenue from business travelers by charging a higher price closer to the flight.

While segmentation techniques are often no longer explicitly stated in fare schedules, as they were in the American Airline fare structure in Figure 2, empirical evidence shows that ticket prices increase as the departure date grows closer (Li et al. 2014). This evidence shows that revenue management systems are still effectively employing advance purchase discounts.

Advance purchase discounts are often coupled with cancellation and change fees to increase the inconvenience of such fare classes to business travelers who demand flexible schedules. Cancellation fees are the fees levied to cancel a flight. Change fees are the fees levied to change to a different flight. Without a change or cancellation fee, a business traveler could purchase a ticket with an advance purchase discount and later cancel it in the event of a schedule change, severely limiting airline's ability to use advance purchase discounts to segment the market. For likely the same reason, airlines have prohibited resale, as resale would also allow a business traveler to purchase a ticket with an advance purchase discount and later sell it in the event of a schedule change. This method of price discrimination is consistent with the profit maximization hypothesis for refundability restrictions and transferability restrictions.

Indeed, cancellation and change fees are common practice in the industry. Of the top 11 airlines in Canada and the United States, only Southwest does not charge a change/cancellation fee. The weighted average[1] of change fees in 2019 for the top 11 carriers was $129, with fees ranging from Southwest's $0 to Delta, United, and American Airlines' $200 change/cancellation fee for a domestic flight (see Figure 3). In 2016, US airlines collected over $2.9 billion in fees, accounting for 2.36% of operating revenues. (Fortune, 2017). Cancellation and change fees, as well as other ancillary revenue such as baggage fees, are becoming an increasingly important revenue sources for airlines. For low-cost carriers, such as Spirit and Allegiant, they can represent over 25% of total revenue (Inkpen, 2017). In addition to these restrictions, there remain many basic fares (i.e Basic Economy on Delta), where changes and cancellation are prohibited altogether.

[1] The average change fee was weighted by the number of passengers carried by each airline.

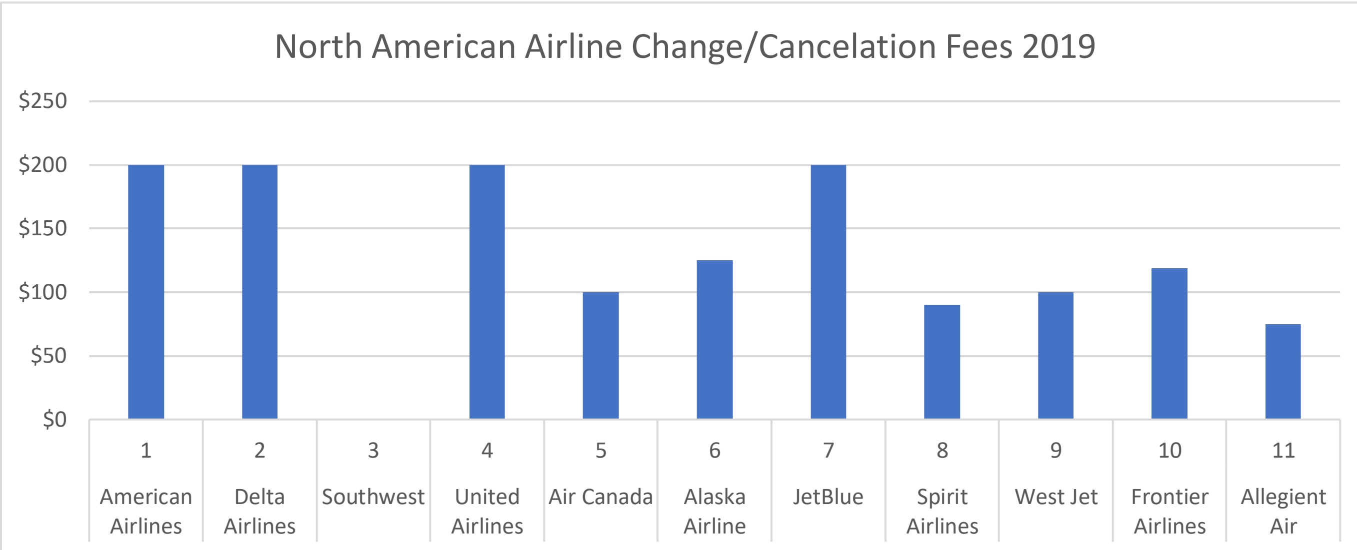

Figure 3: Change/Cancellation Fees for the largest airlines in North America. Data collected from airline websites and customer service lines.

The airline's goal to fill seats with the highest-paying passengers is complicated by its' fixed capacity. Every seat an airline sells in a low-priced fare class is a seat it can no longer sell in a high-priced fare class. Since leisure travelers tend to book before business travelers, there is a risk that leisure travelers will fill the fixed capacity before the high paying business travelers arrive to the market. RM systems therefore must estimate how many seats to protect for later booking, high willingness to pay passengers.[2] The tendency for low willingness to pay passengers to book earlier than high willingness to pay passengers further complicates the aggregate demand estimates and creates additional distortions in the market.

Segmentation, a zero-sum game

This discussion only scratches the surface of revenue management practices. For a more comprehensive look at the systems and their complexities, see Chiang *et al.*, (2007).

[2] In RM literature this practice is called yield management.

Evidently, efforts to segment the market through revenue management are costly for airlines (Chiang *et al.*, 2007). However, these systems provide little value to the market. Rather, they represent costly efforts by airlines to capture additional surplus from consumers and market share from competitors. In this sense, expenditure on revenue management can be likened to a prisoner's dilemma, similar to those found in advertising (Corfman & Lehmann, 2013).

III. Inefficiencies in the Airline Industry

Before discussing the three sources of inefficiency, it is important to define what efficiency means for the airline industry. My analysis will consider three efficiency criteria. The first criteria is that every seat on the flight is filled. The second criteria is that each passenger on the plane has a higher valuation for the flight than any other potential consumer. The third criteria is that search costs and behavioral costs are minimized.

Currently, the airline industry fails to meet these criteria. Each failure can be traced to specific aspects of revenue management. For ease of discussion, I have classified these failures as 'effects.' I refer to the failure to meet the first criteria as the 'spoilage effect', to the failure to meet the second criteria as the 'misallocation effect,' and to the failure to meet the third criteria as the 'irreversible decision effect.'

Inefficiency #1: *The Spoilage Effect*

The spoilage effect occurs when a plane takes off with empty seats. Empty seats result when an airline's revenue management system incorrectly estimates aggregate demand. These errors can be the result of imperfect RM systems, or the result of the standard errors that occur when estimating a distribution.

The spoilage effect occurs due to imperfect information regarding future demand. Therefore, any factor that limits the amount of information available to the RM system increases the likelihood of errors. No-shows are one such factor. No-shows occur due to changing consumer valuations. When a passenger purchases a ticket, they must be willing to pay at least as much as the ticket price. However, the value of a ticket to a consumer can change over time. If this value falls below the recoverable value of the ticket then the passenger will choose not to fly. The passenger could make this choice well in advance of the flight. For example, if a passenger was planning to fly to another city to attend a conference, but this conference is cancelled two weeks before the date, the passenger may decide immediately not to fly. If a ticket is fully non-refundable and non-transferable, the consumer has no incentive to inform the airline when they have chosen not to fly. This deprives the airline of useful information that would increase the accuracy of its demand estimates, resulting in more errors and therefore more empty seats.

In reality, most tickets are not fully non-refundable or non-transferable, but are partially-refundable or partially-transferable due to cancellation and change fees. In either case, the inefficiency will remain. In the case of a partial refund, the passenger can receive a refund less the cancellation fee.[3] This provides the passenger an incentive to inform the airline in cases where their refundable ticket price is greater than the fee. However, with cancellation fees of up to $200, there are many cases where the fee can be higher than the refundable value. For example, Delta Airlines changes a $200 change fee, meaning any passengers with tickets that cost less than $200 will have no incentive to inform the

[3] Whether a ticket is fully non-refundable is often ambiguous. For example, some tickets listed as non-refundable, such as Delta Airline’s Basic fare can be refunded for a $200 cancellation fee.

airline.[4] Furthermore, a passenger is only required to cancel the flight before take-off, meaning even if a passenger knows they cannot fly two weeks in advance they can wait until two days before the flight to inform the airline. Since delaying cancellation has no costs to the consumer, and cancellation is an irreversible decision, a consumer is likely to delay (Davidson & Hudson, 1988). These factors decrease the information available to the airline, and again result in inefficient outcomes. This counters IATA's second argument that partial refunds are sufficient to solve inefficiencies.

Inefficiency #2: *The Misallocation Effect*

The misallocation effect occurs when there are passengers on a flight with lower valuations than other potential consumers. This effect occurs because individuals' preferences change. Non-transferability prohibits the free market from correcting this inefficiency.

The first way misallocation can occur is when a consumer's valuation increases. To illustrate this, consider a simple case (illustrated in Table 1) in which the airline has only one seat on a flight and sells this seat in the early market to the highest paying consumer. In this market Consumer A is willing to pay $500 and Consumer B is willing to pay $450. The profit-maximizing airline sells the ticket to Consumer A. However, after this sale takes place, Consumer B's preferences change, and they become willing to pay $650. The result of this change in preferences is misallocation, because Consumer B is unable to get a seat, even though they are willing to pay $150 more than the consumer who ultimately flies.

[4] As a reference, the average airfare out of Las Vegas in 2018 was only $231 (Bureau of Transportation, 2018).

Period 1	**Period 2**
Consumer A: Valuation of $500 Consumer B: Valuation of $450 Airline sells ticket to **Consumer A.**	Consumer A: Valuation of $500 Consumer B: Valuation of $650 Consumer A holds ticket. **Deadweight Loss of $150**

Table 1: Example of Misallocation Effect when Valuations Increase.

Airlines have an incentive to minimize this instance of misallocation, as this problem represents lost revenue for the airline. This misallocation represents a case in which the airline inefficiently sets aside capacity for high certainty, low valuation passengers, preventing high-valuation consumers from accessing the supply (Dana, 1998). In the example given, the airline misses out on $150 in potential revenue. To avoid such errors, RM systems must estimate how many seats to protect for later booking, high willingness to pay passengers. However, due to imperfect information, these estimates are prone to errors. Whether due to an error in the RM system or the standard errors prevalent in estimating a distribution, these errors cause inefficiency.

The second way misallocation can occur is when a consumer's valuation decreases. Consider the same example in which the airline sells one seat in the early market to the highest paying passenger. Again, Consumer A is willing to pay $500 and Consumer B is willing to pay $450. The airline sells the ticket to Consumer A. Consider now a case (illustrated in Table 2) in which Consumer A's valuation falls, and they become willing to pay only $400. Again, the result is misallocation, because Consumer B is unable to get a seat, even though they are now willing to pay $50 more than Consumer A.

Period 1	**Period 2**
Consumer A: Valuation of $500 Consumer B: Valuation of $450 Airline sells ticket to **Consumer A.**	Consumer A: Valuation of $400 Consumer B: Valuation of $450 Consumer A holds ticket. **Deadweight Loss of $50**

Table 2: Example of Misallocation Effect when Valuations Decrease.

Airlines do not have an incentive to minimize this instance of misallocation. In the example given, the airline sells the ticket for $500. If the airline had waited to sell the ticket, they could only sell it for $450. Because tickets are non-transferable, there is no mechanism for the market to correct misallocation.

Inefficiency #3: *The Irreversible Decision Effect*

The irreversible decision effect occurs when search costs and behavioral costs are not minimized. Non-transferability, or high cancellation and change fees, make purchasing an airline ticket an irreversible decision. The fact that consumers behave differently when faced with irreversible decisions (as opposed to reversible) is well documented in decision literature (Frey, 1981). This has efficiency implications because irreversible decisions increase the amount of pre-purchase information seeking by consumers, and increase consumers' susceptibility to purchase regret.

Consumers spend more time making irreversible decisions than similar reversible ones. A study by Davidson & Hudson (1988) shows that this is true from a young age. The authors find that children spend 15% - 40% more time making an irreversible decision than a reversible one. This behavioral fact has important implications for efficiency. In the airline industry, the time consumers spend searching for flight information and deciding on a purchase is a form of transaction cost. Since non-transferability increases this cost, it increases inefficiency.

Consumers are also more susceptible to purchase regret when making irreversible decisions. As Nasiry & Popescu (2012) explain, consumers often experience purchase regret when they feel they have made the wrong choice (even when this choice was strategically wise[5]). Nasiry & Popescu categorize these consequences into action regret ("I should have waited") and inaction regret ("I should have bought"). This negative cognitive emotion is especially prevalent when the decision is irreversible.

There is also evidence that irreversible decisions magnify irrational consumer behavior. One example of this is the market for flight insurance. A purely rational consumer would not purchase flight insurance unless they were extremely risk adverse. Given the implied level of risk aversion, consumers who purchase flight insurance would also turn down a bet in which they stand to lose $2,000, but stand to gain an infinite amount (Rabin, 2000). This myopic loss aversion may be a result of the increased risk of purchase regret identified by Nasiry & Popescu (2012).

[5] A consumer can still feel regret even when they have made a strategically wise choice. For example, if there is a 60% chance the price will drop next week, but it happens to rise, a consumer will likely regret their rational decision to delay their purchase.

IV. Solutions

The efficiency problems and their solutions are summarized in Table 3, more details on each solution follows.

Inefficiency	Status Quo	Refundability	Resale
1. Spoilage Effect There are empty seats on the flight.	***Partially resolved.*** No-shows will request refunds if valuation falls below the purchase price less cancellation fee.	***Partially resolved.*** No-shows will request refunds if valuation falls below purchase price. No incentive to refund immediately.	***Resolved***. No-shows will resell their tickets.
2. Misallocation Effect There are passengers on the flight with lower valuations than other potential consumers.	***Not resolved.***	***Partially resolved.*** Passengers whose valuations fall will refund tickets, allowing the airline to re-allocate the tickets to the consumers with the highest valuations.	***Resolved***. Consumers with highest valuations will purchase tickets from ticket holders.
3. Irreversible Decision Effect Search costs and behavioral costs are not minimized.	***Not resolved.***	***Resolved.*** Makes decision reversible.	***Resolved.*** Makes decision reversible.
Case Studies	Current model.	Proven feasibility by Southwest Airlines.	No proven model in the airline industry. Successful models in sports.

Table 3: Summary of inefficiencies and solutions.

Refundability

Ticket refundability partially solves the spoilage effect and misallocation effect, and solves the irreversible decision effect.

Ticket refundability partially solves the spoilage effect. As described in Section 2, the spoilage effect occurs when a flight takes off with empty seats. Recall that any factor which decreases the airline's information set increases estimation errors and magnifies this inefficiency. One such factor is no-shows. Because of non-refundability, no-shows have no incentive to inform the airline. Ticket refundability provides an incentive for the consumer to inform the airline. If a consumer can receive a full refund for a flight they cannot make, they will cancel their flight. By taking this action, the consumer provides the airline with useful information, increasing the accuracy of its estimates and reducing inefficiency due to the spoilage effect. However, because consumers can still wait until last-minute to cancel, and are likely to do so since cancellation is irreversible (see the Section 2 discussion on partial refunds), the airline will still be operating based on imperfect information. Therefore, refunds only partially correct the spoilage effect.

Ticket refundability also partially solves the misallocation effect. As described in Section 2, the misallocation effect occurs when there are passengers on the plane with lower valuations than other potential consumers. In the first instance of misallocation, misallocation occurs because the RM system inaccurately estimates the number of consumers whose valuations will increase. Refundability provides no new information to the RM system and therefore does not decrease the likelihood of errors. Unlike with resale, the market will not correct these errors. In the example given, when Consumer B's valuation rises to $650, as long as Consumer A's valuation does not change, Consumer A will have no incentive to refund their ticket. Therefore, the misallocation will not be corrected. In the second instance of misallocation, misallocation occurs because a consumer's valuation falls. This misallocation will be corrected by refunds. In the example given, if Consumer A's valuation falls from $500 to $400, and they can receive a full refund for $500, they will refund their ticket. This will allow the airline to resell the ticket to the highest paying consumer (Consumer B), solving this instance of misallocation.

Finally, ticket refundability solves the irreversible decision effect. As described in Section 2, the irreversible decision effect occurs when search costs and behavior costs are not minimized. The irreversibility of the purchase decision substantially increases both of these costs. Refunds correct this inefficiency by making the purchase decision reversible. When a decision is reversible the time spent searching for information and making a purchase decision decrease. Since this time is a transaction cost, this reduction increases efficiency. Refund policies also reduce purchase regret by insuring consumers against the downside of their decisions (Nasiry & Popescu, 2012).

Refund Case Study: Southwest Airlines

Full refundability has been tested successfully in the airline industry by Southwest Airlines. Southwest prides itself on having charged no cancellation or change fees for its 45-year existence, meaning its fares have always been fully refundable. Despite missing out on this revenue stream, it reported its 45th consecutive year of profitability in 2018, weathering energy crises, the 2001 terrorist attacks, and the 2008-09 recession. The company has had impressive stock performance, performing well above the Dow Jones U.S. Airline Index (See Figure 4). While refundability likely plays a role in Southwest's #1 rank in customer satisfaction, it is not the only reason for their success (Forbes, 2018).

Southwest also benefits from "extremely efficient operations, a deep focus on customer experience, low-cost pricing and logistics solutions, active forward thinking, and a motivated team of employees" (Investopedia, 2015). While it is unclear whether refundability has contributed to their success, Southwest' success is evidence that an airline can certainly remain profitable with such a model.

Figure 4: Southwest Airlines stock performance 2013 - 2018. Reprinted from Seeking Alpha. Retreived from https://seekingalpha.com/article/4112873-southwest-airlines-strong-earnings-growth-strong-balance-sheet-great-investment.

Resale

Ticket resale solves the spoilage effect, the misallocation effect, and the irreversible decision effect.

Ticket resale fully solves the spoilage effect. Again, this inefficiency arises because no-shows have no incentive to inform the airline, resulting in estimation errors and empty seats. If a passenger can resell their ticket, the seat is guaranteed to be full (assuming no market frictions) because if a passenger cannot make a flight, they will sell their ticket to a consumer that can. The airline therefore no longer needs to estimate no-shows, as any consumer who would otherwise be a no-show will re-sell their ticket. In this manner, the free market ensures that every seat is filled on the day of the flight.

Ticket resale also fully solves both instances of the misallocation effect. While ticket resale does not provide any new information to the airline, it will correct any errors made by the airline RM system. In addition, resale can fully account for consumer's changing preferences. Under a resale model, any consumer with a valuation greater than a ticket holder can purchase directly from the ticket holder. In both cases presented, Consumer B will purchase the ticket from Consumer A. In this manner, the free market will ensure that on the day of the flight, the passengers with the highest valuations fill the seats.

Finally, ticket resale solves the irreversible decision effect. Just like refund policies, ticket resale makes the purchase decision reversible. Since a consumer can sell their ticket if they cannot use it, they will spend less time searching for information and less time making a purchase decision. Again, like refunds, resale reduces purchase regret by insuring consumers against the downside of their decisions (Nasiry & Popescu, 2012).

Resale Case Study: Sports and Entertainment

A resale model is yet unproven in the airline industry. However, the model has been tested successfully in sports. The success of a resale model in the sports industry proves that a resale model is feasible on a large scale.

Up until the early 21st century, ticket resale, or scalping, was frowned upon. It was closely regulated to protect the public against fraud, extortion, exorbitant rates, and more (Gold v. DiCarlo, 1964). In the early 21st century a shift in attitude began as ticket resale moved online, reducing the concerns about fraud and counterfeit (Courty, 2017). The secondary ticket market became increasingly legitimized when all four major sporting leagues entered into exclusive ticketing agreements with secondary ticket providers (Moore, 2009). While some states hold out with restrictions, ticket resale is now freely permitted in all but a handful of states (Moore, 2009). New York even mandates that restrictions on resale are prohibited (ACAL, § 25.30).

Ticket scalping can reduce welfare under certain conditions. Leslie and Sorenson (2009) document this in the entertainment industry, explaining that resale creates a profit motive for ticket buyers, and stimulates costly rent-seeking behavior that can reduce overall social welfare. This welfare loss is endogenous to the degree of resale activity. However, the welfare loss that Leslie and Sorenson identified would have a far smaller impact in the airline industry than it has had in entertainment. This is because the core driver of this rent-seeking behavior is underpricing in the primary market. This underpricing effect is a recurring theme in ticket literature (Happel & Jennings, 1995). Courty (2017) names this effect the "fair price ticketing curse," which is when event organizers sell tickets for prices lower than a consumer's willingness to pay. Many reasons have been put forward to explain this practice, including the positive externalities of a bigger audience (Becker, 1991), and customers' desire for fairness (Kahneman *et al.*, 1986). None of these reasons are applicable to the airline industry. As discussed in Section 2, airlines do not underprice their tickets. This means that the airline industry stands to benefit from the efficiencies of resale, without suffering the consequences of costly rent-seeking behavior. This addresses IATA's third and final argument for non-transferability.

Overall ticket resale has proven successful in sports. The biggest downsides from resale in entertainment are mainly driven by underpricing which does not occur in the airline industry. There is therefore reason to believe that a ticket resale model could be successfully implemented in the airline industry.

V. Aggregate Effects

The effects of resale and refunds can be represented in a standard producer theory model. According to my analysis, resale or refunds would cause two major changes:

1. Spoilage, allocation and behavioral inefficiencies would be reduced, increasing demand.
2. Costly efforts by airlines to price discriminate through revenue management would be eliminated, decreasing average costs.

These effects would increase social surplus and invoke entry into the market.

In this model I assume a perfectly competitive market and firms with identical cost functions. In reality, the market more closely resembles monopolistic competition, and the move to resale would likely shift the industry structure to perfect competition. These distinctions have important implications for distributional consequences (which are outside the scope of this paper), but would not affect the following analysis of aggregate social surplus. Data from the Airlines for America (2014) supports the underlying zero-profit assumption, showing that the cumulative net margin in the industry from 1979 - 2014 was negative 1%.

The model shown in Figure 5 is a typical perfect competition producer theory model in which the decisions of a single firm are dictated by the prevailing market price. Since the market is perfectly competitive and firms have identical cost functions, supply is elastic. With the initial supply and demand, the market has an output of Q* and each firm supplies q* to the market. Resale or refunds would cause two major changes. First, demand would rise. As identified in Section 3, the current market has a number of inefficiencies that result from resale and refund restrictions. Correcting these inefficiencies lowers behavioral costs and increases total surplus, which can be represented by an increase in demand, shown in Figure 5 as Shift #1. Second, average costs would fall. As identified in Section 2, revenue management efforts to price discriminate are a zero-sum game. Refunds and resale restrictions would eliminate an airlines' ability to engage in costly segmentation efforts, decreasing the average cost curve. It is likely that resale and refundability would impose some additional costs, such as the transaction costs associated with facilitating a resale market, increasing the average cost curve. In this model I have assumed the cost savings outweigh these additional costs. The resulting decrease in the average cost curve is shown in Figure 5 as Shift #2.

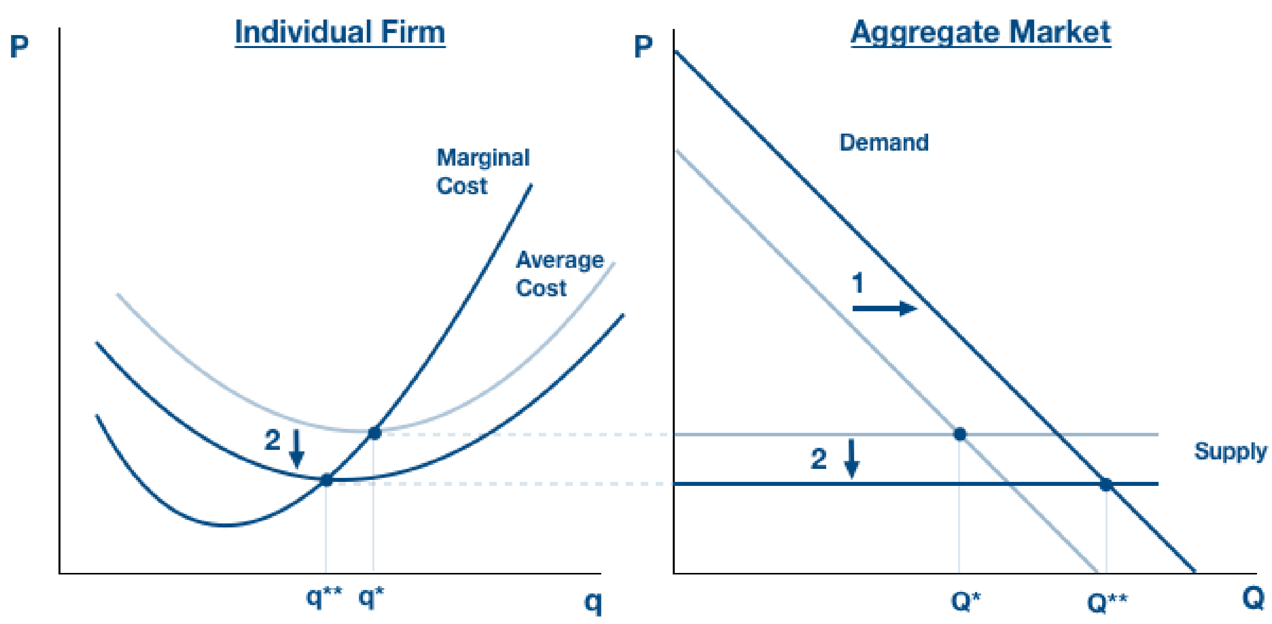

Figure 5: Producer Theory Representation of Resale and Refund Effects

These changes bring the market to a new equilibrium and increase social surplus. Shift 1 increases demand, increasing surplus by area A. Shift 2 decreases costs, increasing surplus by area B. Both Shift 1 and Shift 2 cause entry into the market, increasing output from Q* to Q** and increasing surplus by area C. Again, this analysis has the underlying assumption that airlines would not change their behavior (for example by reducing capacity sold) in the new market.

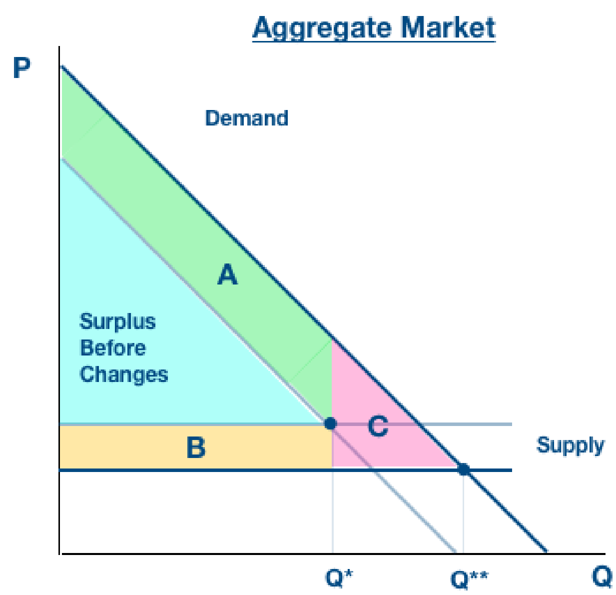

Figure 6: Welfare Effects of Resale and Refunds

The model presented has many simplifying assumptions. Nevertheless, it serves as a useful starting point. This model summarizes the prior analysis and demonstrates that under some assumptions, resale and refund markets increase efficiency.

VI. Quantifying Impact

Although quantifying the exact impact of resale or refundability is out of the scope of this paper, I will provide some evidence that the impact is non-trivial. If the spoilage effect is addressed, and all seats are filled, load factor would theoretically increase from 85% to 100%, representing an approximate 17.6% increase in total social surplus (the distributional effects are unclear and beyond the scope of this paper). If the misallocation effect is addressed through resale, based on estimates from Leslie and Sorenson (2009) in the entertainment industry, surplus would increase by up to 11.7%[6]. Based on estimates from Sabre (2017), consumers spend an average of 3.5 hours searching for the perfect flight. In 2017 in North America, approximately 941.8 million passengers flew on scheduled airline services (Forbes, 2017). This represents an approximate 3.3 billion hours spent researching flights. This means based on evidence by Davidson & Hudson (1988) that individuals spend 15% - 40% more time making an irreversible decision, consumers would save between 430 million - 942 million hours. Converting these time savings to surplus gains, each consumer will save between 0.5 hours and 1.4 hours per flight. Using the US federal minimum wage of US $7.25, this represents cost savings between $3.75 and $10.15 per flight. Using the 2018 average flight price of $350 (Bureau of Transportation Statistics, 2018), this represents a surplus gain of 1% - 3%. Based on these estimates, resale could increase total surplus by up to 30%. There are certainly many factors that may mitigate these surplus gains (such as time spent searching for cheaper

[6] Note that some proportion of these gains in entertainment are from the correction of underpricing; therefore, the increase in surplus for airlines would be less than 11.7%

tickets on resale markets). Nevertheless, these estimates show that the potential efficiency gains from resale or refunds are non-trivial.

VII. Policy Implications

In this paper, I have clearly demonstrated the benefits of resale and refundability in the airline industry. Resale and refund restrictions represent a market failure that could be corrected through policy. However, in order to determine whether policy would be desirable, more research is needed to determine the distributional effects of resale and refundability. This research should consider how consumers and airlines would be impacted by such a policy, as well as consider how different classes of consumers would be affected (such as leisure vs business).

The easiest way for the government to implement such a policy would be to impose restrictions on the conditions of carriage, the contract drafted by the airline that a consumer agrees to when purchasing an airline ticket. Currently in Canada the only guidelines on this contract are that terms and conditions cannot be “unreasonable and unduly discriminatory” (CTA 67.2). The US has similar guidelines. These guidelines could be extended to prohibit airlines from restricting resale or refunds.

VIII. Conclusion

This paper has demonstrated a well-known economic truth: that trade increases efficiency. Despite the seemingly trivial nature of this result, it has important implications. Because the airline industry currently restricts ticket transferability and refundability, inefficiencies are present in the market. Since these restrictions are profit maximizing for the airline, the market will not self-correct and there is a market failure. Under the assumptions presented, government intervention mandating a resale or refund model would increase efficiency.

The model presented serves as a starting point for future research and as a foundation for policy discussions. Although more research is necessary to fully quantify the impact and consider distributional consequences, this paper takes the first step to establish arguments in favor of resale and refunds in the airline industry.

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