

Pay-as-you-weigh pricing of an air ticket

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Abstract

This paper discusses the pay-as-you-weigh approach to airline charging, which adopts passenger's weight as a major determinant of a fare. It specifically investigates the economic justification of the model, discusses strength and weaknesses, evaluates various comments, and points out some potential options for implementation. The model rewards passengers who weight less than average and/or when they reduce weight, providing financial saving and improved health benefits.

Keywords: Pay-as-you-weight air fares; Weight based air fares; Airline passenger' weights; Pricing

1. Introduction

'You see things; and you say, "Why?" But I dream thing that never were; and I say, "Why not?'"

George Bernard Shaw

Appropriate pricing of a good or service in a market is a powerful tool to move toward greater efficiency, fairness and environmental sustainability. This applies to pricing an air ticket as to anything else. Most airlines fare setting employs yield management to generate revenue on a multiplicity of criterion, but does not normally include a passenger's weight. Everything else being equal, a 120 kg person pays the same fare as a 40 kg person. A reduction of 1 kg in the weight of a plane, however, is estimated to save \$3000 of fuel worth annually with commensurate reductions in CO₂ emissions (The Economist, 2011). Most low cost carriers now charge for checked in baggage, and some, most notably Southwest Airlines, require a passenger who cannot fit in one seat to book a second¹. These examples point out the critical importance of weight in a flight and how an airline is desperate to reduce weight.

The operating margins of airlines have averaged zero over the past 30 years despite continued and rapid growth in demand for air travel. To more closely reflect airline costs, and particularly that of fuel consumption, it has been argued that fare should more closely reflect the overall weight that passengers contribute to a plane's payload, including passenger's body weight². This paper investigates whether a fare based on a passenger's weight, termed as pay-as-you-weigh (PAYW) pricing model, can be a viable and efficient way of charging.

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¹When a passenger cannot lower the armrests on a single seat, Southwest Airlines (2011) requires the passenger to purchase another seat regardless of the person's weight. If the flight does not oversell, the airline will refund the price of the second seat.

²One of the earliest cases of an airline weighing passengers was in 1985, when Lufthansa asked its passengers to get weighed in order to obtain up to date information on passenger's weights to help refine safety standards, but not to charge them accordingly.

2. Whether the PAYW model?

Many airlines have adopted dynamic pricing policies, generally called yield management, with the aim of maximizing revenue. This strategy involves discriminating fares using a combination of methods regarding such things as when a seat is booked, whether the ticket is refundable, whether frequent flier miles are used, the class of seat and so on aimed at obtaining the highest possible fare whilst minimizing empty seats. As McAfee and te Velde (2006) point out, dynamic pricing adjusts fares based on the option value of the future sales that varies with time and the seats available.

Charging by weight needs to be set in a wider context. Price differences can be attributed to differences in cost as well as to differences in preferences. Yield management, the dynamic price discrimination introduced by American Airlines in the 1980s, is an economic approach to pricing that focuses on converting consumer surplus into airline revenue by charging what a customer will pay for a seat. In the context of airlines that have decreasing cost structures, this is necessary for full cost recovery. Charging only according to cost is not a form of dynamic pricing in that sense, but it does reflect the additional costs imposed by carrying an extra unit of passenger's body weight ensuring that passengers at last cover their variable costs. This cost may be seen as relevant in determining the base upon which fares should be set; it is the base price above which price discrimination or some other pricing regime to recover fixed costs begin. There is another way of looking at pricing. If pricing is properly applied, it allocates scarce space, indicates where there are capacity shortages, and provides finance for investments in additional capacity. Payment by weight does not fulfill the main purpose of pricing, resources allocation, but can, appropriately applied, assist in the other two functions.

2.1. *Variations in price due to cost differences*

Weight and space are usually critical binding constraints in air transportation. Logic thus suggests that air travel charges should at least to some extent be based on the weight and space taken by a passenger. Charging according to weight is standard in transporting of goods by most modes, but not for people. The more weight in a plane, the more fuel it costs to fly; as a result it is justifiable to say that a passenger should contribute to the cost of flying the plane. The average fare that the passenger pay does not correctly reflect the cost of these two major constraints. If high fuel costs are going to result in higher fares, then going after the excess weight makes sense to offset the increase. Weight being in general a binding constraint has a shadow price in a constrained maximization of profit of an airline.

Unless subsidized, an airline cannot operate if it cannot cover its costs. Because in the long run, fares need to cover both the fixed and operation costs associated with provision of air travel services including normal profits, good categorization of costs facilitates investment valuation or the adoption of pricing policies. The decomposition of costs associated with air travel service is also helpful to identify those that vary according to the number or weight of passenger; in the latter case, some of costs vary directly with passengers' weight while others, such as landing fees, relate to the weight of an aircraft, and hence indirectly with passenger's weight.

Many costs associated with sales, ticketing, promotion and the handling of passengers are related to the number of passenger rather than weight of an aircraft or a passenger. This is true with flight crew salaries and other related expenses, costs of reservation, ticketing and handling of both passengers and their baggage at the airport. It is also frequently true for airport charges for passenger

when paid by airlines. Airlines fuel and oil consumption vary in their importance according to the world market price. Similarly flight equipment insurance and rental of such equipment vary indirectly depend on passengers' weight, as do maintenance and overhaul costs. Fixed costs that are associated largely with an aircraft purchase or lease indirectly depend on passengers' weight. Non-operating costs associated with provision of air travels service, which can account for 50% of airlines overall costs, are also affected by passengers' weight.

2.2. *Strengths and weaknesses of the PAYW approach*

The PAYW approach can make fares more accurately reflect the unit cost of operating a flight than the status quo whereby the same fares is charged to each passenger, other things being equal, irrespective of weight. Weight-based policy may also lead to lower fares especially in developing countries where average weights are lower³. Airline may, however, lose revenue if only lighter people fly; this will ultimately depend upon the slopes of the demand curves for heavier and lighter travelers and the ability of the airlines to discriminate prices between them. Lighter passengers also currently pay for the excess weight of heavier passenger. But with the PAYW model, heavier passenger pay at least the costs that they impose on airlines thus distributing costs of provision of air travel service more efficiency among passengers.

The PAYW model also gives a passenger an incentive to "lose weight" because passengers pay less for their travel if they weigh less. Although this effect is likely to be minuscule in terms of body weight, there are far greater social pressures producing obesity than air fare structures⁴, it is likely to affect the baggage they take. "Lighter passengers" lead to reduced weight in a plane and thus potentially to the increased ability to carry more passengers for a given pay load. This leads to an outward shift in the supply curve of seats that in turn can result in lower fares and increased passenger numbers⁵.

The use of the PAYW model is also subject to problems; some institutional and other practical. Current legal provisions in many countries may not allow airlines to charge passengers according to their body weight. It requires regulatory reforms, administrative procedures and new rate structures. To the extent that passengers bear these costs, PAYW options may increase transaction costs. It also takes time to gain general acceptance of new concepts; and this allows opposition to organize; there will inevitably be complaints about treating passengers as goods and discrimination against heavier people. Added to this, passengers and airlines would not know fares and revenues until they actually arrive at the check-in under some options. Finally, as with any change, the PAYW model will lead to some unforeseen effects for passengers and revenues to airlines and people tend to be risk averse when it comes to change.

³ In developing countries, lower income people tend to be lighter than in high income countries. Thus the model might worsen affordability in high-income countries as opposed to low income countries.

⁴ If people physically lose weight, they could enjoy improved health and consequently reduce health expenses. To the degree that passengers do this and therefore reduce fares, the saving that result are net benefit to the passengers and society at large, not just economic transfer. One cannot, though, see this as being a major effect.

⁵ It is unclear who finally gains from this. If the airline can exercise perfect price discriminations through its yield management, then it will take the gain in profits, but to the extent this is not possible, there will be increased consumer surplus.

3. Media comments on weight-based fare

The formal and informal media directly or indirectly regularly comments on charging air travelers according to their body weight (e.g. www.consumertravel.com, www.smartertravel.com and www.boomberg.com) and particularly about an extra charge for overweight baggage, and complaints against overweight passenger who intrude on the space of their fellow passengers in a plane.

Because heavier people have to pay an additional charge for their excess weight under the PAYW model, many comments relate to discrimination against heavier people. Other comments are that this type of pricing would be new and passengers would not accept the change. Some commentators argue that they would sue under discrimination laws if the weight-based fares were implemented. Several warn that some heavier people may choose not to fly because they do not want to be judged or it would be too expensive for them. Some consider that charging air travelers according to their body weight is not appropriate because it treats human beings as goods.

Alternatively, some commentators counter by arguing that charging according to weight is not discriminatory; an often quoted argument being that postal services charge more to ship heavier items. Others point to the fact that under most PAYW proposals, heavier people would avoid the extra fare if the excess weight is really due to medical reasons and unavoidable⁶.

Many commentaries are related to increased transaction costs and practical problems associated with implementing the weight based pricing. It increases administrative costs to airlines that will ultimately be passed on to passengers. They also opine that it is difficult to implement the model. Some also suggest that passenger's weight is less important because airlines are dominated by fixed costs, not incremental costs, and ask whether it is cost effective to spend time in checking and weighing passengers to extract premiums from a few people who are overweight. Their main point is that weight of flights is caused by overweight of a plane not overweight of passengers and the impact of each passenger's weight on fuel consumption is fairly negligible.

Many people, especially larger and heavier individuals, point out that overweight and larger passengers are entitled to additional space if they pay according to their weight. This issue can be addressed by making seats of different sizes, e.g., smaller seats for children and smaller people with weight up to say 75 kg, large seats for heavier and larger people weighing more than say 125 kg, and medium seats for typical passengers weighing 76 kg to 125 kg. Airlines may be expected to reconfigure seating arrangement in planes to allot additional space for larger and heavier passengers in the long run, although optimizing this is challenging given inevitable temporal variations in demands by the various groups. If the numbers of airline passenger are roughly one third in each group according to their body weight as pointed above, airlines need to reconfigure two thirds of the seats because it is not necessary to change the medium-sized seats. If an airline takes 4 inches width and 2 inches leg room from each current-sized seats resulting in smaller seats and extra space to large seats, reconfiguration does not add to the airline's costs because there will be the same number of seats before and after reconfiguring the seating arrangements in the same space⁷. The problem comes

⁶ At one extreme, most people with excess weight do not want to get a disabled certificate from their doctor. At another extreme or the worst case, all heavier people would produce a disable permit alleging that the weight gain is not a personal choice, but due to some medical reason which cannot be avoided

⁷ This estimate is based on the present size of airlines seats, generally 17 inches wide. It is also assumed that the current seats are appropriate for an average passenger.

in allocating aircraft space to different seat categories and devising a fare structure that maximizes revenue from these seats in the face of stochastic demand functions.

There has also been considerable media attention regarding charging for “overweight” baggage, but not overweight passengers. They comment that weight of a passenger should logically be taken into account if an airline charges for overweight baggage. In this case the argument is for charging a person over a predefined weight form, as with a bag. It deferrers from strict weight charges because there is no benefit for a person being under-weight, just as there is no discount for having a bag lighter than the baggage allowance.

4. Options for implementing the PAYW model

There are a number of options for implementing the PAYW model. Among them, three are discussed:

- Fare according to actual weight. This assumes that fares entirely depend on how much passengers and their belongings weigh. Passengers and human right activities may criticize for treating a passenger as freight; although air cargo space is largely auctioned off and the rates are not strictly weight based. Implementing this option may also incur high transaction costs. It is unlikely to be optimal to base fares entirely on passengers’ weight from an economic efficiency perspective.
- “Base fare” minus or plus an extra charge. This option includes charging a fixed “base fare” for average weight passengers to cover fixed costs of a trip that do not depend on the incremental weight of a passenger, and then add a premium reflecting passengers’ weight induced costs. It may not be appropriate to base a fare entirely on passengers’ weight because there are costs that do not vary with this. For example, those associated with handling of passengers are largely the same for each individual. The fixing of a base fare and rate for an extra charge is however complex. Every passenger can have different fares according to this option.
- Fare based on a passenger having an average weight of $\pm 25\%$ of a set limit, but an extra charge for any excess beyond and discount for passengers weighing below the limit. All passengers in the same group will have the same fare. This option does not base fare exclusively on passenger’s weight, and can easily be made revenue neutral across the range of passengers.

These alternatives, and others, can be implemented either through self-declaration of weight by passengers or weighing of passengers by airlines. In self-declaration, passengers can declare their weight at the time of booking/purchase of an air ticket with the fare begin automatically calculated. Presumably they would have to wear the same clothing as they are going to fly in. A sample of passenger may be randomly selected and weighted at the counter to avoid false declaration. This option is likely to incur the least transaction costs; weighing every passenger is inevitably time consuming. Weight may also include that of checked-in and carry-on baggage, or it may only include passenger’s weight given the present system of a “free allowance” of baggage that some airlines allow⁸.

There are also some wider possible gains from the PAYW model. Security checks and air travel safety could perhaps be the most important implication of the PAYW model. The hassle of going through security screening gets worse as passengers carry more carry-on baggage onto the plane. The advantage of the PAYW model is that passengers have an inventive to minimize what they take on board unlike current pricing regime where charging for checked bags incentivizes carrying-on.

⁸ There are many different allowance schemes practiced by airlines, and any additional PAYW scheme would need to be tailored to that of each individual carrier.

5. Conclusions

Under the current charging policy of airlines, fares are set regardless of weight and size of passengers. Marginal cost theory implies that the average fare seldom reflects the actual cost of flying a passenger because it does not take into account a passenger's weight or the space taken up. Fares based on PAYW principles may be more efficient because passengers pay according to the fuel they use and the space they take up in a plane. Charging according to weight and space is a widely accepted principle in many other industries, but has met with public opposition in the context of air travel.

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