



# PRICE DISCRIMINATION IN THE AIRLINE INDUSTRY



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## Abstract:

The purpose of this report is to discuss the welfare effects of different kinds of price discrimination schedules that are used in the airline industry. We distinguish between versioning, discount to large consumers, and frequent flyer programs. It is argued that versioning is probably welfare improving, especially in a competitive setting. Furthermore, it is argued that discounts to large firm has an ambiguous effect on welfare in monopoly, while it is likely that it is detrimental to welfare in a competitive setting or in a setting with a dominant carrier threatened by entry. Finally, we argue that frequent flyer programs have anticompetitive effects in an oligopoly, and especially in a setting where an established is threatened by entry, so that such programs are expected to be detrimental to welfare.

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## 1. INTRODUCTION

Price discrimination is observed in most industries. It implies that firms are charging different prices from different consumers, and that the price difference cannot be explained by cost differences. It is well known that the airline industry has practiced price discrimination for many years. We all know that on each flight the passengers have paid different prices, and that in some cases we can observe that the highest price is as much as five times the lowest price.

Is price discrimination a good or bad thing for the airline passengers and the society? To answer such a question, we must focus on the price discrimination that is most common in this particular industry.

A casual observation would be that there are numerous different versions of an airline ticket to choose among. You can buy an expensive, flexible ticket. Then you are allowed to reschedule the flight or even cancel it without any costs. Or you can buy a cheap ticket, with many restrictions. For example, a Saturday night stay-over is required and so is advance-purchase. Since each and every passenger can choose between different versions of an air ticket, it is natural to consider the theory of versioning when analyzing the price discrimination in this particular industry.

Another common characteristics in many national markets is that large firms that demands airline tickets write a contract with an airline, where the firms' employees receives a certain discount on each airline ticket. This kind of price discrimination, where different groups are charged different prices, is therefore also a type of price discrimination that we will analyse and discuss the effect of for the industry in question.

Finally, frequent flyers programs are important in the airline industry. It implies that those who are members of such a program can earn member points for each flight and later use the points to claim a free bonus flight. It can be seen as a kind of discount, and in that respect it is a kind of price discrimination. Therefore, we will also consider the welfare effects of frequent flyer programs.

Based on the characteristics of this industry, we have chosen to discuss three different kinds of price discrimination: (i) versioning, (ii) discounts to large consumers, and (iii) frequent flyer programs. In Section 2 we present a theoretical analysis of the

various kinds of price discrimination. In Section 3 we relate the results from the theoretical discussion to the airline industry. Our findings are summarized in Section 4.

## 2. THEORY OF PRICE DISCRIMINATION

As illustrated in the introduction, price discrimination can take various forms. In the literature it is common to distinguish between three different kinds of price discrimination. According to Varian (1989), we have the following definitions:

- *First degree*: The seller charges a different price for each unit, so that the price of each unit equals maximum willingness to pay.
- *Second degree*: Each consumer faces the same price schedule, but the schedule involves different prices for different amounts of the good purchased.
- *Third degree*: Different consumers are charged different prices, but each consumer pays a constant price for each unit of the good bought.

How does the three forms of price discrimination we described – versioning, discount to large consumers, and frequent flyer programs – fit into this definition? *Versioning* implies that all consumers are facing the same price schedule. They can choose to buy an expensive, high quality version or a cheap, low quality version. Technically, this is an example of second degree price discrimination. The consumers pay different prices for different amount of quality of the good purchased. *Discounts to large consumers* is obviously an example of third degree price discrimination. Finally, a *frequent flyer program* is an example of second degree price discrimination. The consumers are rewarded for large purchases, and they receive a special kind of quantity discount.

The theory of price discrimination is primarily concerned with a situation with a monopoly firm. Let us therefore start out by explaining the theory of versioning in a monopoly setting (section 2.1) and then discuss the welfare effect of versioning in such a setting (section 2.2).<sup>1</sup> Then we discuss how the conclusion drawn in a monopoly model may change when we have an oligopolistic market (section 2.3). Finally, we relate our discussion to two more special arrangements in the airline industry: selective discounts to large consumers (section 2.4) and frequent flyer programs (section 2.5). In both those

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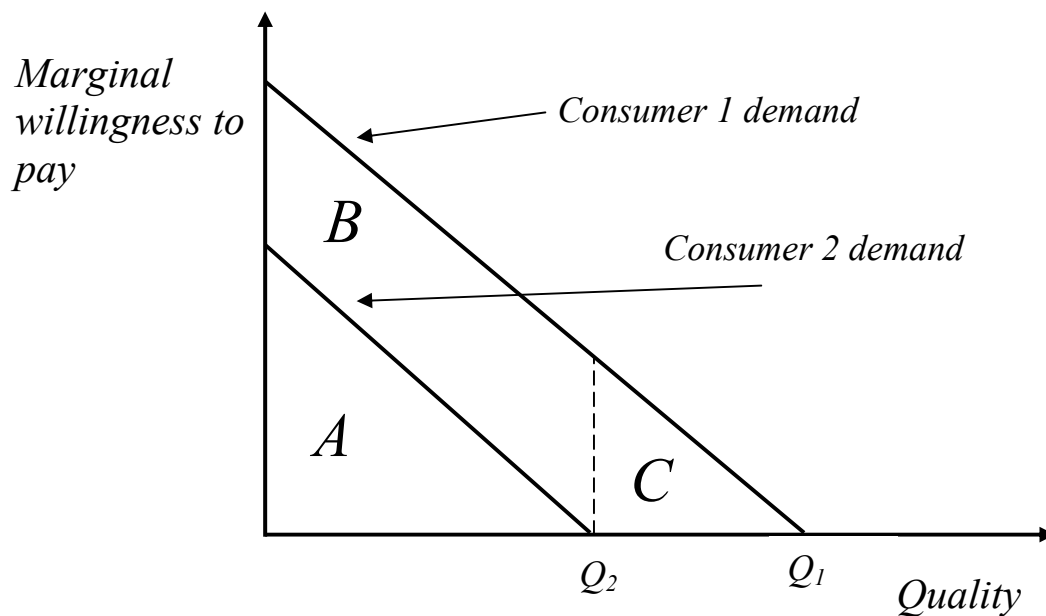
<sup>1</sup>The notion ‘versioning’ was introduced in Shapiro and Varian (1998).

cases we start out by discussing monopoly, and then we extend the analysis to an oligopolistic setting.

## 2.1 The motives for versioning<sup>2</sup>

Let us for the moment consider a situation with only one firm. To simplify further, we assume that there are only two consumers. Each of them demands one unit. The willingness to pay for each of them for this unit depends on the quality of the good. To relate the setting to the airline industry, we may denote consumer 1 a business passenger and consumer 2 a leisure passenger. In Figure 1 we have illustrated the marginal willingness to pay for each of the consumers for different levels of the quality of the good.

**Figure 1** Quality versus marginal willingness to pay



The area below the marginal-willingness-to-pay curve denotes the total willingness to pay. If quality is  $Q_1$  (or higher), then consumer 1 is willing to pay  $A+B+C$  for the good.

<sup>2</sup>The model we present here draws heavily on Varian (2000). For other models of versioning, see Deneckere and McAfee (1996) and Foros, Jensen and Sand (2001).

If the quality of the good equals  $Q_2$ , then consumer 1 is willing to pay  $A+B$  while consumer 2 is willing to pay  $A$ .

We assume that it is not more costly to produce a high quality than a low quality product. As we will explain later, typically the low quality version is a damaged version of the high quality version (called *damaging product*). If so, it is not obvious that the high quality version is the most costly one to produce.

If we assume that there are no costs associated with producing a high quality instead of a low quality version, what then would the firm do? It would then produce a version with high quality, which in Figure 1 is quality  $Q_1$ , and sell it at a price of  $A$  to consumer 2 and  $A+B+C$  to consumer 1. Then the firm would extract all potential consumer surplus, and it would earn  $2A+B+C$ .

But it is obvious that this is unrealistic. If the consumers can choose, then both consumers would of course buy the low price version. Then the firm would earn only  $2A$ .

As argued, the consumer supposed to buy the high price product buys the low price product. The low price product cannibalizes the earnings from the most valuable market segment. How could the firm avoid such a cannibalization? One possible solution is, as indicated above, product damaging. Let us assume that the high quality version (quality  $Q_1$ ) is still produced. Furthermore, let us assume that the quality of the second version equals  $Q_2$ , and thus can be considered as a damaged product. This implies that consumer 2 still has a willingness to pay equal to  $A$  for the damaged version. Consumer 1, on the other hand, has a higher willingness to pay for quality. He is willing to pay  $A+B$  for the damaged version.

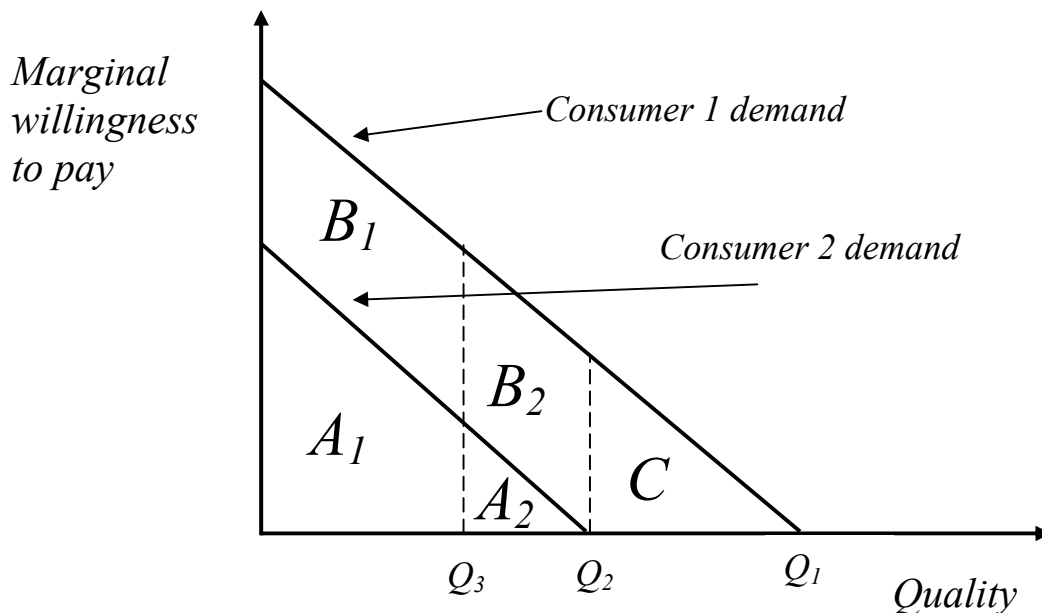
What if the firm now sets price  $A$  on the damaged good? Then it extracts all potential consumer surplus from consumer 2. If so, which price should it set on the high quality version? Consumer 1 has a high willingness to pay, so the firm would prefer that he buys the high quality version. But what is the maximum price the firm can charge on the high quality version? If consumer 1 buys the damaged product, it pays  $A$  and receives a consumer surplus equal to  $B$ . Then the firm must set a price on the high quality product so that consumer 1 receives at least  $B$  in consumer surplus. We see from Figure 1 that the firm can charge (slightly less than)  $A+C$  for the high quality product, and consumer 1 will

then choose the ‘right’ version. If so, the firm earns  $2A + C$ . By damaging one version of the product the firm has increased its earning with  $C$ .

Why has such a strategy been profitable for the firm? It does not earn more from the consumer with a low willingness to pay, despite the fact that the damaged version is meant for that particular consumer. The point is that the consumer with the high willingness to pay has a less attractive alternative. It implies that the firm can charge a higher price on the high quality version, and still be sure that consumer 1 buys the high quality version.

However, the firm can earn even more. We know that the consumer with a high total willingness to pay would value a marginal increase in quality higher than what is the case for the consumer with the low total willingness to pay for the product. This is illustrated in Figure 1 with the fact that the marginal willingness to pay curve for consumer 1 is to the North East of the marginal willingness to pay curve for consumer 2. The firm can exploit this by damaging the product even further. This is illustrated in Figure 2.

**Figure 2 Damaging product no. 2**



As shown in Figure 3, the quality on the damaged version equals  $Q_3$ . It implies that consumer 2 is willing to pay  $A_1$  for the damaged product. If the firm decides to offer such a damaged product, it would lose revenues equal to  $A_2$  from the sale to consumer 2. On the other hand, the damaged product is now less valuable for consumer 1. The alternative to the high quality version is thus less attractive. The firm can therefore increase the price of the high quality version and still be sure that consumer 1 chooses to buy the high quality version. It can easily be seen that the firm sets the price (slightly less than)  $A_1 + A_2 + B_2 + C$ . Consumer 1 will still choose the ‘right’ version.

The total revenue for the firm is now  $2A_1 + A_2 + B_2 + C$ . Comparing with Figure 1, we see that the firm is better off if  $B_2 > A_2$ , *i.e.*, the increase in revenue from consumer 1 outweighs the loss of revenue from consumer 2. This is true Figure 2. It can then easily be shown that it will always be profitable for the firm to set quality below  $Q_2$  for the damaged product. How much product damaging that is profitable will depend on (i) the difference in willingness to pay for quality for consumer 1 and 2, and (ii) the number of consumer sin each group. The latter effect is not taken into account in our model, since we assume that there is only one consumer of each type. However, it can easily be shown that the degree of product damaging will increase in the number of consumers of type 1 (the consumer with the high willingness to pay for quality).

The analysis is very stylized, but it illustrates a firm’s incentives to damage a product. Note that the reason for damaging the product is not to tailor the quality to the consumer with a low willingness to pay. The crucial point is that the consumer with high willingness to pay has a less attractive alternative. The firm would choose to damage the product to such a degree than even the consumer with the low willingness to pay for quality is hurt. In such a perspective the product damaging can be regarded as severe.

## 2.2 The welfare effects of versioning

As shown in the previous Section, versioning implies that one version of the product is damaged. The consumer with a low willingness to pay is offered an inferior version. At first sight this may seem detrimental to welfare. As we will see, this may not be true. The crucial question is: what is the alternative to versioning?

The alternative to versioning is no versioning. In our setting no versioning implies that one instead of two versions is supplied. Since there are two different consumers, the firm may either serve only one of them or serve both.

If the firm serves only one of them, it is obvious that it would serve consumer 1 – the one with the highest willingness to pay. Then it would set quality equal to  $Q_1$  and set a price equal to  $A+B+C$ . The firm would extract all potential consumer surplus and earn  $A+B+C$ , which equals total welfare in this regime. If we compare with versioning, it is obvious that versioning would improve welfare. Consumer 1 will still be served, and the high quality version generates welfare (consumer surplus plus profits) equal to  $A+B+C$ , as is the case with no versioning. But, in addition, the consumer with the low willingness to pay buys the damaged product at a price  $A_1$ . This adds to the welfare generated by the high quality product, and versioning will therefore always increase welfare.

If the firm serves both consumers in the case with no versioning, the welfare effect of versioning is more complicated. To illustrate this, let us take into account that the number of consumers can differ between segments. So far we have only considered two consumers, consumer 1 and 2. Let us now assume that there are several consumers of type 1 and several of type 2. In particular, we assume that a fraction  $\gamma$  of the consumers are of type 1 (and thereby a fraction  $(1-\gamma)$  is of type 2).

Which quality would the firm choose if it sells only one version and serves both types of consumers? As argued in association with Figure 1, there is no additional revenue it can earn if it sets quality higher than  $Q_2$ . As long as the cost of quality is positive, even if it is infinitesimal small, the firm sets quality  $Q_2$ . If so, the total surplus with no versioning equals  $A + \gamma B$ , where the firm earns  $A$  and the type 1 consumers has a consumers surplus equal to  $\gamma B$ . Then we must compare this total surplus with the total surplus generated with versioning. We have that versioning will increase welfare if:

$$(1 - \gamma)A_1 + \gamma(A_1 + A_2 + B_2 + C) + \gamma B_1 > A + \gamma B$$

The first and second expressions on the left hand side are the profits earned on consumer types 2 and 1, respectively, while the third expression on the left hand side is type 1



consumers' consumer surplus. Rearranging, we have that versioning will increase welfare if:

$$\gamma C > (1 - \gamma)A_2$$

The left hand side is the additional surplus generated by offering a high quality version ( $Q_1$  instead of  $Q_2$ ), while the right hand side is the loss of consumer surplus for the type 2 consumers.

From the above expression we can see what would be of importance for whether versioning is welfare improving or not. There are three factors that may lead to welfare improving versioning: (i) the fraction of the consumers with high willingness to pay (consumers of type 1) is large, (ii) their valuation of extra quality is high, and (iii) the other group's valuation of quality degradation is limited.

Although one could get a rough indication of the magnitude of these three factors in a particular market, how could one decide whether versioning is welfare improving or not? Following Varian (1996), we should focus on whether versioning leads to an increase in total output. If versioning implies that some groups are served that else would not have been served, versioning is expected to lead to higher welfare.

### 2.3 Versioning and competition

So far we have only considered a monopoly situation. What if there is more than one firm in the market? It is difficult to give a general answer to such a question, because it depends on the toughness of price competition. In the literature it has been shown that price discrimination may collapse in such a setting.<sup>3</sup> Each firm has incentive to undercut the rival's price schedule. If so, this may lead to price equal to marginal costs and what is labeled the Bertrand paradox in the literature. It is a paradox, because we seldom experience that kind of fierce competition on prices that theory predicts. Casual observation indicates that in the airline industry we do not observe price equal to marginal costs. On the other hand, we do observe that each airline offers different versions of its air ticket even in a setting where airlines compete. This clearly shows that

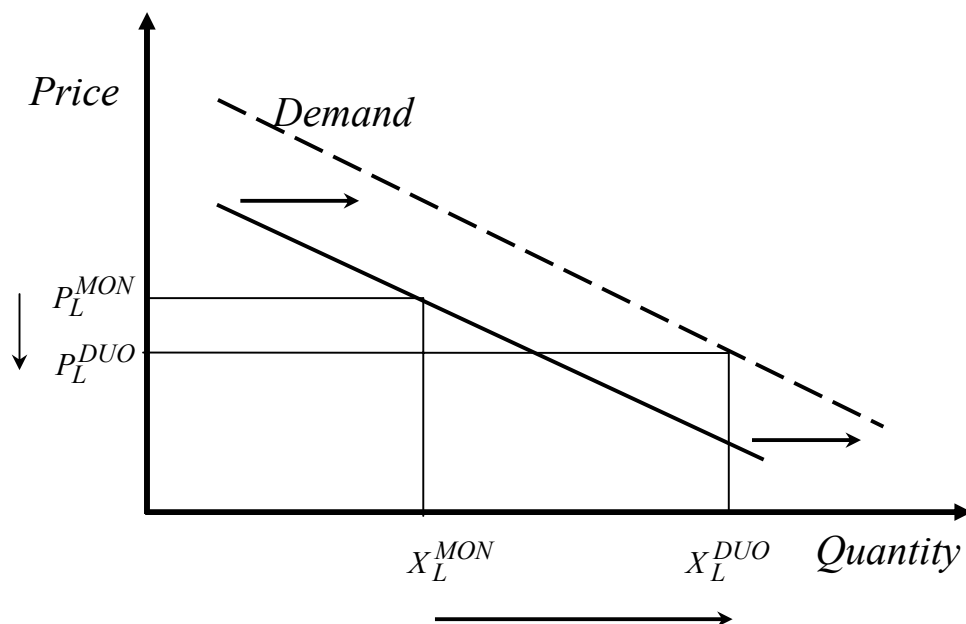
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<sup>3</sup>See, for example, Mandy (1992).

in the airline industry versioning is of importance also in a competitive setting, so that price discrimination is viable in this particular industry even in a competitive setting.

To illustrate how competition may affect the degree of versioning, let us extend the setting we discussed above. Let us assume that competition leads to more available capacity. To avoid idle capacity, the firms can respond in different ways. One way is to lower prices. Another way would be to extend the sale of the damaged product. In the airline industry, the latter would imply that the firms increase the number of restricted tickets or that each restrictive ticket becomes less restrictive. To illustrate the effects of this, let us distinguish between the business segment and the leisure segment. The effect of a shift from monopoly to competition in the leisure segment is illustrated in Figure 3.

**Figure 3 The effect in the leisure segment of competition**

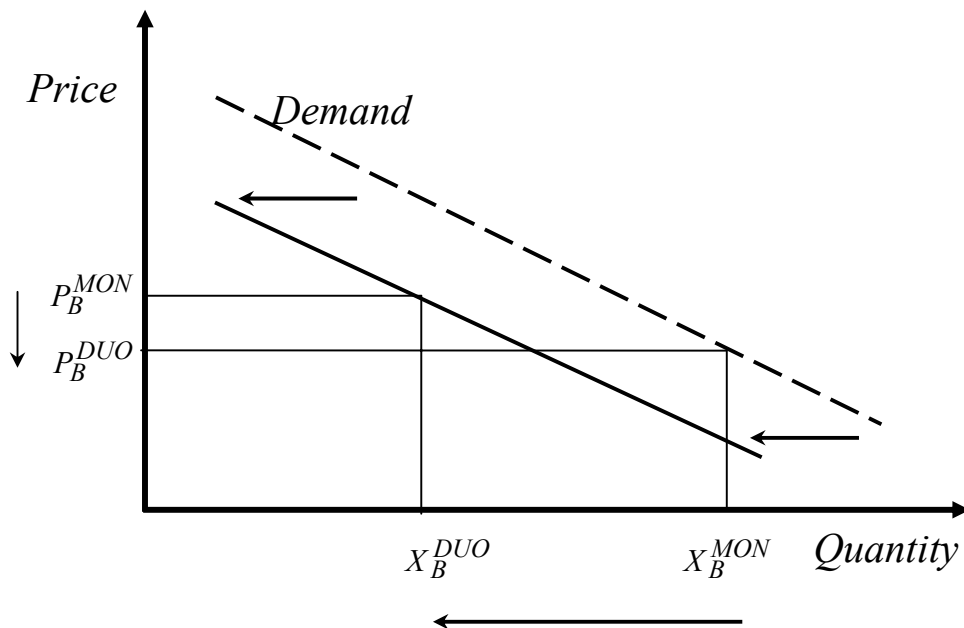


In Figure 3 we have illustrated the effect of lower prices, see the arrow shown on the vertical axis. In addition, we have illustrated the effect of less severe product damaging or a larger number of damaged products by the outward shift in the demand curve. Firms compete on low quality products, both by lowering the price on such a good and increasing the number of damaged products or reducing the product damaging on such

products. This would lead to an increase in demand for low quality products because (i) some of those demanding a high quality product shifts to buying a low quality product and (ii) new consumers start buying the low quality product (market expansion).

Given such an effect of competition in the leisure segment, what happens in the business segment? As already mentioned, a larger amount of low quality products available at a lower price would imply that some of the consumers in the business segment shifts to buy a low quality product. Consequently, we will expect an inward shift in the demand in the business segment. Moreover, we expect that the prices in the business segment also drops. This is due to competition on prices, as well as a wish to limit the number of business consumers that shifts to buying a low quality product. These effects are illustrated in Figure 4.

**Figure 4 The effect in the business segment of competition**



In the previous Section, we concluded that it is plausible that versioning improves welfare if the total output increases. One possible conclusion we may draw from this Section is that an increase in total output from versioning is even more likely in a competitive setting than in a monopoly situation. The reason is that versioning can lead to

a large supply of the low-quality version, and thereby lead to an increase in total supply. If this is correct, we should be even more liberal concerning such price discrimination in a competitive setting than in a setting with only one dominant firm.

So far we have not said anything about whether the price reduction is largest in the high quality or the low quality segment. This is mainly an empirical question. However, those few theoretical studies that raise this issue indicate that price discrimination may increase as the market become more competitive.<sup>4</sup> If so, this further strengthen our conclusion that versioning in a competitive setting is especially important for the consumers with a low willingness to pay, since they will gain from low prices in such a setting.

## **2.4 Discounts to large firms**

In some of the airline markets we observe special arrangements for large consumers. One example is ‘storkundeavtaler’ (‘agreements with large firms’) in the Norwegian airline industry. Many firms that demand airline tickets write a contract with an airline company. It typically implies that all the employees in that particular firm are given a specific discount on each airline ticket they purchase.

These kinds of agreements are examples of third degree price discrimination.<sup>5</sup> Let us first discuss the effect of third degree price discrimination in a monopoly setting, and then comment on the case with competition.

In a monopoly, the firm will be better off by practicing third degree price discrimination. It enables the firm to exploit the group of consumers with a price inelastic demand by charging them a high price, and then set a rather low price to the group of consumers with a price elastic demand and spur their demand. For society at large, though, this may reduce welfare. The reason is that the loss of consumer surplus for the group with a price inelastic demand may outweigh the gain in consumer surplus for the group of consumers with a price elastic demand. This is illustrated in Figure 5.

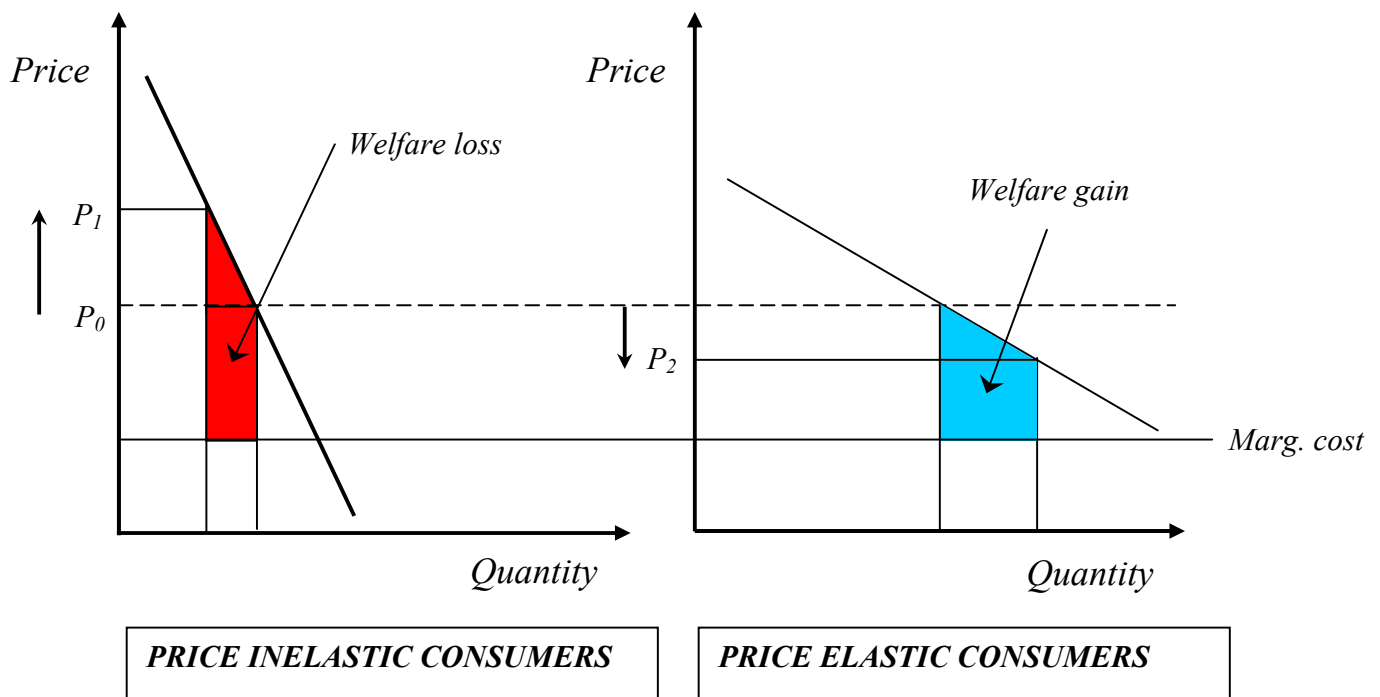
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<sup>4</sup>See Borenstein (1985), Holmes (1989), and Gale (1993). In the latter model, for example, there is more price discrimination in duopoly than in monopoly.

<sup>5</sup>According to the definition in Varian (1989), third degree price discrimination means that different consumers are charged different prices, but each consumer pays a constant amount for each unit of the good bought.

A price increase for the group with price inelastic demand results in an increase in the dead weight loss, marked with the red (dark) shaded area, while the price decrease for the other group of consumers results in a reduction in the dead weight loss, marked with the blue (light) shaded area. In the literature it has been shown that a *necessary* condition for welfare to increase is that total output increase.<sup>6</sup> However, in many cases the sufficiency condition for welfare improvement is not met. For example, with linear demand functions third degree price discrimination is *not* welfare improving (see Varian, 1989, Section 2.4.1).

**Figure 5 Welfare effects of third degree price discrimination in monopoly**



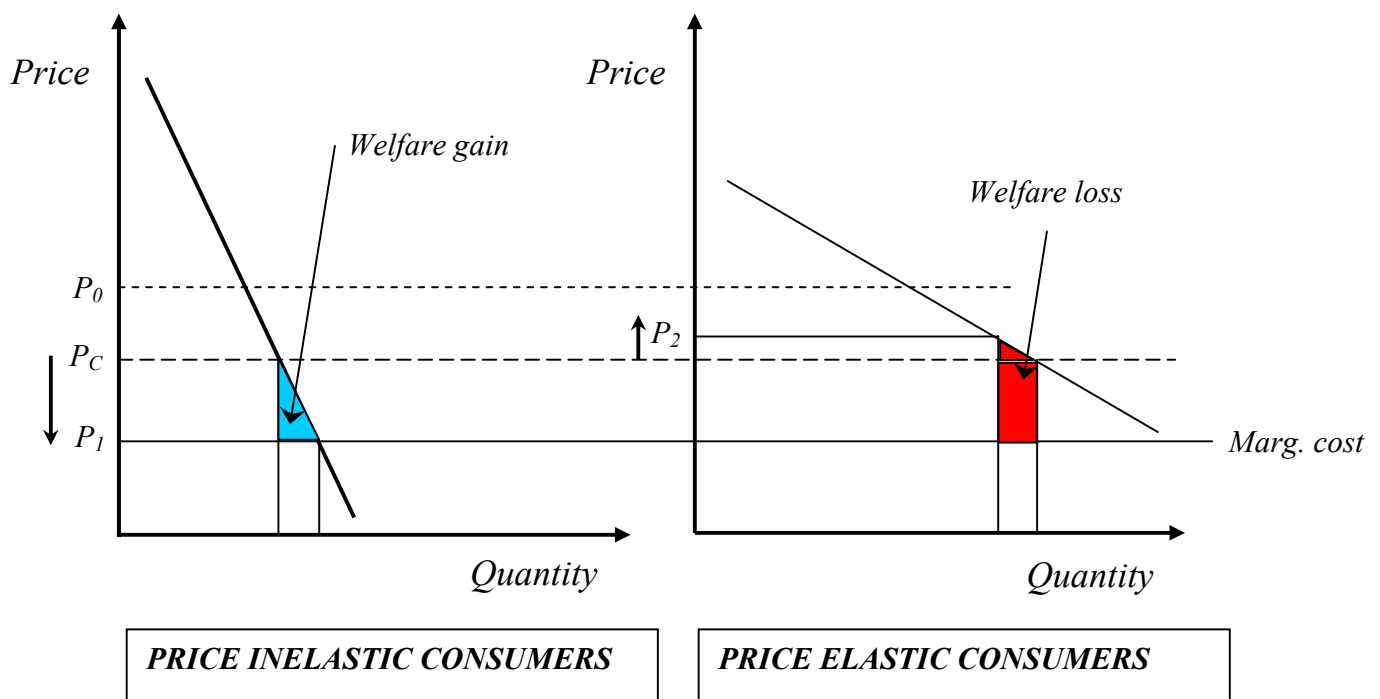
The crucial question, then, is whether third degree price discrimination implies that some new groups of consumers are being served. For example, a group of price elastic consumers may not be served at all in a regime with one uniform price. The monopoly firm may find it more profitable to serve only the price inelastic consumers. If price

<sup>6</sup>See Varian (1989), Section 2.4.1. It is shown that the *sufficient* condition for a welfare improvement is that the sum of the weighted output changes is positive, with the weights being given by the price-cost margin.

discrimination in such a way opens new markets, it is plausible that it leads to increased output and therefore improves welfare.

What if we have competition rather than monopoly? This may overturn our results reported so far. It all depends on how competition evolves. There are reasons to believe that price competition will be more intense in some market segments than others. For example, private and public firms that are large consumers can exploit buying power by triggering competition between the producers for an exclusive contract. In other segments there might be no such buying power present. If so, by allowing for third degree price discrimination one may trigger intense price rivalry in some market segments. A substantial price reduction in some segments suggests that the output in those segment increases by a substantial amount. On the other hand, as shown above it may also imply that prices increase in other market segments.

**Figure 6 Welfare effects of third degree price discrimination with competition**



Even if third degree price discrimination triggers intense price rivalry in some segments, it might be detrimental to welfare. In Figure 6 we have replicated Figure 5. Now the price we will have without price discrimination is lower than in the case with a monopoly firm, labeled  $P_C$  in Figure 6. Let us assume that third degree price discrimination triggers intense rivalry on prices in the price inelastic market segment. In the Figure we assume that price equals marginal costs in that segment. The price setting in the other segment is then no longer constrained by the competition for the price inelastic consumers. Then the firms may respond by increasing the price in the price elastic segment. As we see, even a limited price increase in the other market segment will lead to a welfare loss that outweighs the welfare gain in the segment with intense price rivalry.

The example shown in Figure 6 illustrates a case where third degree price discrimination leads to large price reductions in one segment and only a limited price increase in another segment. But even then it can be detrimental to welfare. It illustrates that the crucial point is to investigate the characteristics of the segments and how third degree price discrimination affects different segments. In particular, is demand price elastic in the segment where third degree price discrimination triggers tough price competition? If not, a large price reduction has only a limited effect on output in that segment. In such a case a limited price increase in the price elastic segment may lead to an output reduction that is large enough to outweigh the output increase in the other segment.

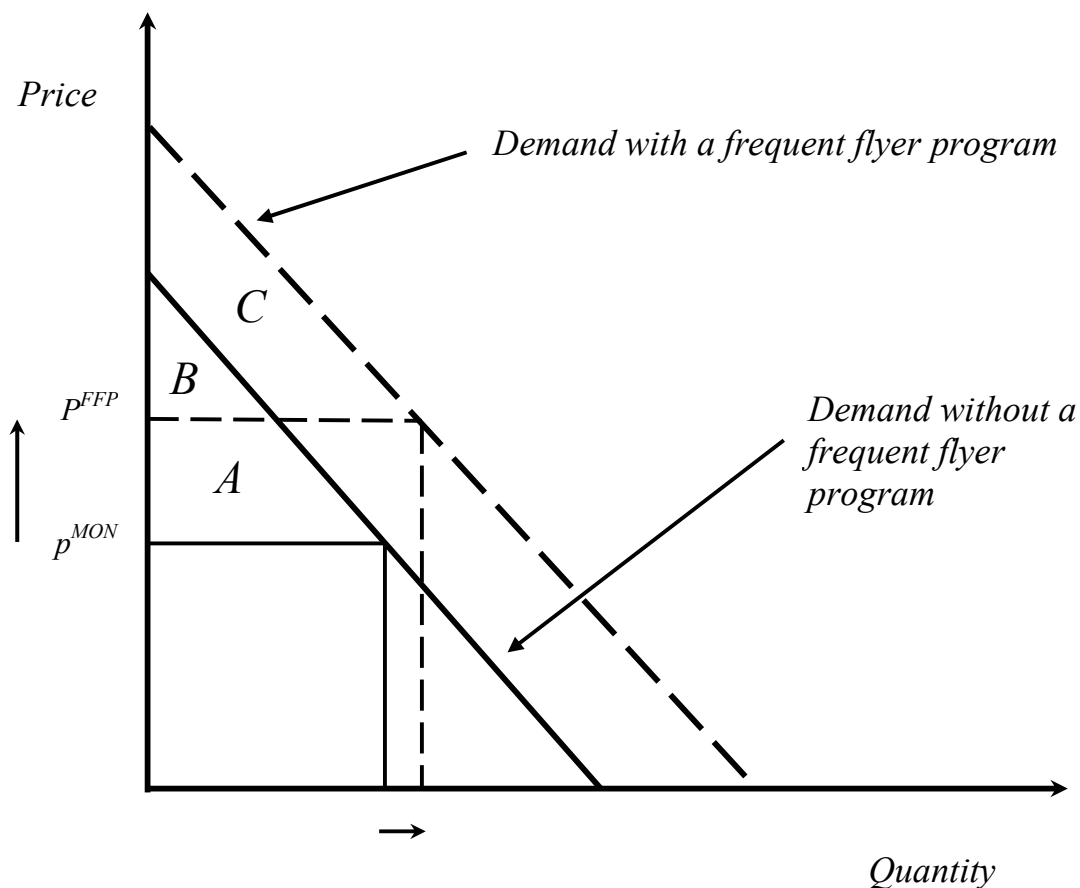
So far we have assumed competition both before and after the introduction of third degree price discrimination. Note, however, that third degree price discrimination can ruin profits when firms compete. As illustrated in Figure 6, third degree price discrimination can trigger intense price rivalry in some market segments. If so, competition may no longer be viable. Then the alternatives to compare are competition without price discrimination and monopoly. It should be obvious that welfare is higher with competition than with monopoly, which implies that society as a whole is better off with no third degree price discrimination in a competitive environment.

## 2.4 Frequent flyer programs

Frequent flyer programs can be regarded as a quantity discount: by purchasing a certain amount of a good, it receives one unit of the good for free. In this Section we analyse the welfare effect of such a particular price discrimination scheme. We start out by analyzing monopoly, and then discuss how our conclusions may change when we have a competitive setting.<sup>7</sup>

As a starting point, let us interpret a frequent flyer program as a discount program. The discount is not a price reduction as such, but a larger quantity offered for a given price. This is valuable for the consumer. The effects for the consumer are illustrated in Figure 7.

**Figure 7** The welfare effects of a frequent flyer program with monopoly



<sup>7</sup>The analysis we present here draws heavily on Steen and Sørsgard (2001), chapter 7.



The solid line is the demand if there is no frequent flyer program. If we introduce a frequent flyer program, then the demand expands from the solid to the dotted line in Figure 7. One way to see this, is to consider the consumers' willingness to pay. For a given quantity, the consumers will have a higher willingness to pay. The reason is that the consumers now receive an additional amount, or more precisely an option on an additional amount of the good in the future. Therefore, the demand curve shifts upward.

An increase in the willingness to pay is of importance for the firm's price setting. The firm can extract part of the increase in consumer surplus by increasing the price. This is illustrated in Figure 7 with the price increase from  $p^{MON}$  to  $p^{FFP}$  in Figure 7.

What are the effects for the consumers of the introduction of a frequent flyer program? With no frequent flyer program the consumer surplus is  $A + B$  in Figure 7. From the Figure we see that after the introduction of the frequent flyer program the consumers surplus is  $B + C$ . Then we see that the effect for the consumers of the introduction of a frequent flyer program is ambiguous. On the one hand it has a higher willingness to pay for the good, since it includes an option for a free unit in the future. On the other hand, the consumer is hurt by the price increase triggered by the introduction of the frequent flyer program. We see from Figure 7 that the consumers are worse off after the introduction of the frequent flyer program if  $A > C$ .

The introduction of a frequent flyer program is analogous to an increase in quality for the good in question. As shown in Spence (1975), a quality increase has an ambiguous effect on the consumer surplus. The basic reason is that the consumers care about how a quality change affects the *total* willingness to pay, while the firm cares about how quality affects the marginal willingness to pay. There is no mechanism that can assure that those two effects coincide. Hence, there is no reason to expect that the market outcome leads to the quality level the consumers would prefer.

The above analysis shows that from a consumer point of view the frequent flyer program has an ambiguous effect in monopoly. However, there are two important aspects that are left out of the analysis so far. First, the incentive structure for the consumers. In the industry in question we often observe that the person that buys the product is not paying for the good. An employee buys the air ticket, while the employer pays the ticket. However, the frequent flyer program is an individual program. It implies that the

employee buys an air ticket, receives the frequent flyer bonus, and the employer pays for the ticket. Obviously, there are some potential incentive problems in such a system. The employee has no strong incentives to make a cost efficient decisions concerning traveling. On the contrary, each employee can receive large bonuses from the frequent flyer program if s/he travels more and travels more expensive than what s/he otherwise would have chosen to do. This is an argument saying that such a system may lead to excess consumption of this particular good, and thereby an excess cost burden for firms and for the society.

Second, we have so far assumed monopoly. If there is more than one active firm, or one active and one potential firm, it is important to discuss how a frequent flyer program affects competition. In the literature, it is pointed out that frequent flyer programs are loyalty programs.<sup>8</sup> The consumers are becoming loyal to one firm, to accumulate frequent flyer bonus on this particular firm. On the other hand, firms compete to attract new consumers that can become loyal. Although the net effect is ambiguous in theory, in his survey Klemperer (1995) concludes that loyalty programs typically are detrimental to welfare:

*'While there are exceptions to these conclusions, they suggest a presumption that public policy should discourage activities that increase consumer switching costs (such as airlines' frequent flyer programs), and encourage activities that reduce them' (p. 536)*

According to his conclusion, frequent flyer programs are expected to have anticompetitive effects. In particular, it is reason to be aware of the possible effect in a setting with one (or a few) established firm(s) and a potential entrant. If established firms have many members in their frequent flyer programs, an entrant can find it difficult to capture those consumers that are more or less loyal to the established firms.

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<sup>8</sup>See, for example, Klemperer (1984, 1995) and Carns (1990).

### **3. THE AIRLINE INDUSTRY**

In the previous Section we have briefly mentioned the airline industry, primarily as a motivation for the theoretical analysis we have undertaken, but also more directly concerning the frequent flyer programs. In this section we relate our results more directly to the airline industry. We first report some empirical findings concerning the airline industry (Section 3.1), and then discuss the implications for public policy (Section 3.2).

#### **3.1 Some empirical findings**

In the previous Section we discussed three different forms of price discrimination: versioning, discounts for large consumers and frequent flyer programs. Let us here discuss the role of each of them in the airline industry.

##### *Versioning*

As we have already argued, it is quite obvious that the airline industry practices versioning. The high quality version is the flexible ticket, where you can reschedule your flight at any time and even cancel the flight without any costs attached to it. The damaged version is a so called restrictive ticket. There can be several restrictions on it. For example, Saturday night stay-over, advance purchase and no flexibility concerning rescheduling of the flight. Note that the main reason for damaging the product was to make it less attractive for the consumer with the high willingness to pay. This is obviously the driving force in the airline industry when they introduce a particular restrictive ticket. All three restrictions mentioned above are important for the business travelers and damages the product from their point of view, but not so important for the leisure traveler. For example, a Saturday night stay-over restriction implies that the business traveler – who typically travels during the week – finds such a version unattractive. A leisure traveler, on the other hand, might prefer to travel in the weekend and then such a restriction is not a problem at all. The observed behaviour is consistent with the findings in Gale and Holmes (1993). In their theoretical study they find that a monopoly airline will offer tickets with restrictions to ‘weed out’ consumers with high valuation of time.

How would competition affect the profitability of versioning in the airline industry? Dana (1998) shows that in theory versioning could be observed also in an environment with low market concentration. Again, casual evidence indicates that actual performance is consistent with the theoretical prediction: versioning is also observed in a competitive market outcome in the airline industry.

There are some studies that tests for how price discrimination in the airline industry is affected by competition. Some studies find that the average price level in the airline industry increases with market concentration (see Borenstein, 1992; Morrison and Winston, 1990). But this does not say anything about whether the price discrimination is more prevalent in a competitive setting. Borenstein and Rose (1994) find that price dispersion in the airline industry is larger in a competitive market situation than in a monopoly market situation. This suggests that firms price discriminate more in a competitive setting. Stavins (2001) tests more directly for how versioning is affected by competition. She considers two kinds of product damaging: Saturday night stay-over requirements and advance-purchase requirements. By using data from the U.S. airline industry for 1995, she tests for how those two restrictions affects the discounts. Discounts can be seen as the difference between the price of the high quality version and the price of the damaged version. No surprise, it is found that both restrictions lead to lower airfares. Less obviously, though, is how competition affects the discount. She finds that the discounts are larger in markets with low market concentration, and this is true both for the Saturday night stay-over restriction and the advance-purchase restriction. She concludes as follows:

*'The results are consistent with the hypothesis that, as more carriers operate on a given route, the carriers' competition for consumers with higher price elasticity of demand increases, while fares charged to consumers with inelastic demand stay high.'* (Stavins, 2001, p. 202).

Her results are consistent with the results found in the Norwegian airline industry (see Steen and Sørsgard, 2001). Using data for the period 1996-2001, it was found that a shift from monopoly to duopoly had no effect on the price of the high quality version (the

flexible air ticket, labeled C-class ). On the other hand, a shift from monopoly to duopoly had a price-decreasing effect – although of minor magnitude – on the price of the damaged product (the restrictive ticket, labeled the M-class).

#### *Discounts for large consumers*

While versioning is an example of second degree price discrimination, discounts given to selective groups is an example of third degree price discrimination. As far as we know, there are no studies in the existing international literature of third degree price discrimination in the airline industry. However, this kind of price discrimination played an important role in the Norwegian airline industry in the period 1998-2001. Let us explain the experience from the Norwegian airline industry.

After the deregulation in 1994 of the domestic airline market, the airlines SAS and Braathens were the only competing firms. Both had routes throughout Norway, and competed head to head on the largest routes. We did not observe any changes in the prices of the flexible tickets (high quality product) after deregulation. These were tickets intended for the business segment. Despite this, the airlines started to compete on prices for the business segment. Gradually large firms that were demanding large quantities of those flexible tickets started exploiting their buying power. Each firm asked both SAS and Braathens to offer discounts to the firms' purchase of airline tickets, and each firm typically wrote an exclusive contract with one of the airlines.

The discounts were typically a discount on the price of the flexible ticket, typically a percentage discount. In the first years after the deregulation in 1994, the discounts were very limited. But from 1998 and onward this changed. Some firms were offered substantial discounts. There are examples of firms that were offered a discount of more than 50% on particular routes, which implied that they paid a price of the flexible ticket that was below the average price of the restricted ticket.

If we take a closer look, it is quite obvious that the discount we have described is a result of competition rather than deliberate price discrimination. As is well known from theory of third degree price discrimination, a firm would find it profitable to set a high price in a segment with price inelastic demand and a low price in a segment with price elastic demand. However, we observe the opposite in the Norwegian airline industry.

Large discounts were given to firms, who typically buy flexible tickets. Such a firm's demand is typically price inelastic. The reason for the large discounts to those firms is that the firms triggered a Bertrand-like competition between the two airlines: The firm with the best offer wins the contract, which means that the other firm lose all its revenue from that particular consumer. It implies that each airline has a very high own price elasticity of demand from each of those firms. We know from theory that this may lead to price close to marginal costs. As we have already describes, competition on price for some large consumers indeed become very intense.

### *Frequent flyer programs*

This arrangement can be interpreted as a kind of quantity discount, and thus as a special kind of second degree price discrimination. As referred to already, theoretical studies conclude that frequent flyer programs can result in more loyal consumers and thereby have an anticompetitive effect. Unfortunately, there are few empirical studies of the effect of frequent flyer programs. Let us refer to those two studies we are aware of.<sup>9</sup>

Nako (1992) quantifies the effects of frequent flyer programs on the business travelers' choice of airlines. It is found that such a program has a significant effect on business travelers' choice of airline. The effect varies between airlines. It is shown that the presence of a corresponding airline in the home city of the traveler is of importance for the effectiveness of a frequent flyer program. If the corresponding airline is not present in the traveler's home city that would make it less likely that the traveler chooses the corresponding airline on other routes. Such an effect is strengthened by the frequent flyer program.

Proussaloglou and Koppelman (1995) model air carrier demand, and identifies and measures the relative importance of factors which influence air travel demand. They show, among other things, the importance of a carrier's frequency (number of flights) in a

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<sup>9</sup>SAS in Norway has recently asked MMI (Markeds- og Mediainsittet) to undertake a questionnaire survey of how airline passengers would react to a ban on the frequent flyer program in the domestic market in Norway. They were asked how such a ban would affect their choice of airline on international flights. 42% of those asked that are gold member in SAS Eurobonus answer that they would prefer other airlines than SAS on international flights. This suggests that the loyalty effect of such a program is substantial. Furthermore, more than half of those asked that have traveled on Eurobonus answer that they would not have made the trip if they had to pay for it as an discount ticket. This suggests that the consumer surplus accrued to the bonus flights might be limited.

city pair market and the importance of a frequent flyer program for a passenger's choice of airline. They demonstrate in the empirical part of their study the dramatic impact of frequent flyer programs on carrier choice for individual flights. Furthermore, they found that these effects are particularly strong among the frequent business traveler.

The latter result is of interest. Why should frequent flyer programs be of large importance for those who travel most? Note that a typical frequent flyer program is made in such a way that the bonus benefits are non-linear. When the traveler reaches certain threshold levels, s/he is entitled to some extra benefits from the frequent flyer program. For example, a member of SAS Eurobonus is entitled to becoming a silver member after a certain number of points earned in one year, and entitled to becoming a gold member when s/he reaches an even higher threshold level. At the highest threshold level the member is entitled to extra service, for example highest priority if the flight is overbooked. This implies that each traveler has incentives to stay with one carrier, since that would lead to a large number of points earned and thereby a chance that s/he can reach a threshold level and receive some extra service.

This kind of loyalty program, where the accumulated purchase is of importance for the benefits accrued to the program, is in text books described as an optimal way to create loyalty among its consumers (see Shapiro and Varian, 1998). Seen from a welfare point of view, though, such programs are bad. Loyal consumers would lead to less fierce price competition and thus higher prices. It suggests that not only frequent flyer programs as such, but also the non-linearity in such programs, can have severe anticompetitive effects.

### **3.2 Public policy implications**

We have described some of the effects of the various kinds of price discrimination devices that are used in the airline industry. The next question is what implications our analysis should have for public policy. Let us comment on each of those three kinds of price discriminations separately.

*Versioning* is very common in the airline industry. In our theoretical discussion we have shown that versioning has an ambiguous effect on welfare. The reason why it can be detrimental to welfare is that the consumers with low willingness to pay are hurt

by the damaging of the product they buy. Is this effect of large importance in the airline industry? Note that the product damaging we have described are typically harmful for the business segment, if they choose the ‘wrong’ version, but less harmful for those who actually purchase the damaged version. For example, a Saturday night stay-over restriction is probably not very harmful for a leisure traveler. If so, there is reason to believe that versioning improves welfare. Moreover, versioning seem to be even more welfare improving in a competitive setting. The empirical studies indicate that competition leads to larger discounts on restricted air tickets. Then output expands in the leisure segment, the most price elastic segment. It is then very likely that versioning leads to an increase in total output. As shown above, an increase in total output would be a necessary condition for a welfare improvement.

In the airline industry an increase in total output is related to frequency. Higher demand means that the airline can find it profitable to offer more flights and thereby to increase the frequency. If so, versioning has a positive externality. In the business segment, in particular, higher frequency is valuable since a typical business passenger would benefit from a large choice of departure times.

Given that the airlines needs a certain revenue to cover its fixed costs, such a price structure as we have described here is the most appropriate one seen from the society’s point of view. The welfare loss due to price above marginal cost is at a minimum if the price-cost margins are high in segments with price inelastic demand and low in segments with price elastic demand. This is exactly what we expect to observe in an environment in the airline industry with versioning and competition.

*Discount to large consumers* has an ambiguous effect on welfare, as was the case with versioning. In a monopoly setting, the airline has incentives to set price-cost margins so that they are high in segments with price inelastic demand and low in segments with price elastic demand. In such a perspective it can be beneficial. However, competition may have negative welfare effects. As illustrated by the experience in the Norwegian airline industry, competition may lead to discounts in those segments with buying power. That would typically be some parts of the business segments, where the buyers are large. If so, the discounts are large in segments with inelastic demand. This is not an optimal way for the airlines to cover its fixed costs. Moreover, selective discount may lead to



very intense rivalry on prices. The reason is that a Bertrand-like competition is triggered. Such a kind of price discrimination may therefore lead to exits from the market, because not all the airlines are able to cover their fixed costs. In a similar manner, potential entrants might be deterred by the potential for selective discounts. It knows that the established airline is able to challenge it by offering selective discounts to large consumers. Since these discounts are secret and therefore more difficult to detect for competition authorities, such a kind of price discrimination may make predation a more credible threat. This suggests that discounts to large consumers are anticompetitive in a setting with a potential entrant that may challenge the established airline. In our view, discounts to large consumers should be banned in a market situation where there is one large dominant carrier.

*Frequent flyer programs* have an ambiguous effect on consumer surplus in a situation with only one airline. However, such a program has no doubt anticompetitive effects in a setting with more than one airline or a setting with one established airline and one potential entrant. This is predicted from theory, and those few empirical studies we are aware of give support to such a prediction. From a welfare point of view it is then obvious that such programs should be banned. Note, though, that a partial ban of frequent flyer programs will hurt those firms that are not allowed to have frequent flyer programs more than other airlines. From a domestic perspective a ban on our domestic airline's frequent flyer program can then hurt our domestic airline. However, even a partial ban is expected to lead to more rivalry on prices. The airline facing a ban on its frequent flyer program must respond, and one response is to cut prices. The domestic consumers will therefore be better off, even with a partial ban.

#### **4. SUMMARY AND CONCLUDING REMARKS**

Casual observations suggest that the airline industry practices price discrimination. The purpose of this report has been to discuss the welfare effect of price discrimination in the airline industry. We distinguish between three different forms of price discrimination: (i) versioning, (ii) discounts to large consumers, and (iii) frequent flyer programs. For each of them we present what theory predicts, and then relate the results from the analysis to the airline industry.

Versioning implies that the airline offers different versions of its product, and the consumer can choose between them. The high quality version is a flexible ticket, where the passenger can reschedule and even cancel the flight whenever it wants. The low quality version is a restricted ticket, typically with a Saturday night stay-over and advance purchase requirement. In the theoretical literature the restricted ticket is called a damaged product. The airline offers a damaged product because it then makes this low-quality version less attractive for the business traveler. It enables them to charge a high price for the flexible ticket, and still serve the passengers with a low willingness to pay by offering them a damaged product. This leads to increased output, and increased output may lead to higher frequency.

Apparently, damaging a product is detrimental to welfare since the airlines offer an inferior product. But we argue that the net effect of versioning in the airline industry is probably positive. The product damaging is harmful for those who do not buy the product but rather the high quality product – the business travelers – but probably not very harmful to those who actually buy that version. For example, a leisure traveler might travel during the weekend and then a Saturday night stay-over is not harmful at all. Moreover, the alternative to versioning might be that no low quality version would be offered. If so, the segment with low willingness to pay would have been hurt by a shift from versioning to no versioning. Finally, empirical studies indicate that competition leads to a cheaper damaged product. Since this segment is typically quite price elastic, it would lead to a substantial output increase and thereby a substantial welfare increase. Therefore, we conclude that versioning is welfare improving, especially in a competitive setting.

Discount to large consumers is an example of third degree price discrimination. A shift to this kind of price discrimination would imply that some groups face a lower price and some groups a higher price. It can easily be shown that such a kind of price discrimination can be detrimental to welfare. The gain from those who face a lower price might be outweighed by the loss for those who face a higher price. In a monopoly setting we expect that the airline sets a high price for the segment with price inelastic demand, which is a price structure that minimizes the welfare loss from such price discrimination. In a competitive setting, though, it can be different.

When airlines compete, there might be some large consumers that can exploit its buying power. The large consumers can ask for offers from the airlines, and write an exclusive contract with only one airline. This may trigger intense rivalry on prices. And so it did in the Norwegian airline industry after 1998 where large firms such as Statoil, Kværner and Hydro wrote exclusive contracts with either Braathens or SAS. Some large consumers received more than 50% discounts, which implied that they paid a lower price on a flexible ticket than the average price for ordinary consumers for the restrictive tickets. But from a welfare point of view, such price discrimination is not the optimal one. It leads to low prices for a typical price inelastic consumer, and thereby a very limited output increase. Moreover, it implies that the airlines lose important revenues, since prices are low in parts of the business segment. This was one out of many factors that led to exit by Braathens, and SAS became the monopoly carrier in the Norwegian market. It illustrates that this kind of price discrimination can be harmful to welfare, especially in a setting where there is a probability of exit or entry.

Frequent flyer programs can be seen as a kind of quantity discount. We argue that the effect for the consumers is ambiguous in a monopoly. It leads to higher consumer surplus, but the airline's response is to set a higher price. However, a pure monopoly is very seldom a realistic alternative. Either we would observe an incumbent threatened by entry, or oligopoly. In oligopoly, both theoretical and empirical studies show that such programs lead to more loyal consumers. A frequent flyer program thus has an anticompetitive effect. It also makes entry less profitable, since it is more difficult for an entrant to capture market shares from the established firm. In line with this we argue that frequent flyer programs should be banned.

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