DEREGULATING NORWEGIAN AIRLINES[#]

by

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Abstract:

In April 1994, all domestic firms were free to enter the Norwegian airline industry. The purpose of this chapter is to discuss the consequences of this deregulation. There have been only two active firms in the industry after deregulation. We observe collusion on prices in the business segment and we have found that this has triggered intense rivalry for capacity. In addition, flight departures are located closer in time in the business segment in duopolies than what is the case on routes that have continued to be served by a monopolist. We discuss which anti-trust policy lessons we can draw from this experience and how anti-trust measures can destabilize collusion on prices in the business segment.

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1. INTRODUCTION

According to conventional wisdom, deregulation can result in substantial benefits for society. The key word is, as we all know, competition. It can result in lower prices, and thereby force the firms to lower their costs. In a survey of the effects of deregulation of American industry, Winston (1993) concluded that '.. the evidence clearly shows that microeconomists' predictions that deregulation would produce substantial benefits for Americans have been generally accurate'. However, the experience from the deregulation of the Norwegian airline industry differs from what we have seen in the US. Deregulation also changed the conduct in this industry, but not exactly in the way we expected: Except some secret price cuts in exclusive dealing contracts between each carrier and some large customers, prices did not fall in the most important market segment, the business travellers segment. There was no substantial improvement in service frequency concerning time scheduling of flights, but rather a tendency of local clustering. The battle for market shares has resulted in intense rivalry along other dimensions than price, such as advertising, service and number of flights. On the other hand, the large number of flights has resulted in an increased number of seats available in the leisure travellers' segment, where we have experienced lower prices.

In what follows, we will first describe the initial, pre-deregulation situation in this particular industry. Then we will explain the consequences of deregulation, focusing on the effect on prices, capacity and time-scheduling of flights. Finally, we summarise and discuss briefly how entry might affect the market outcome.

2. THE REGULATION ERA: LEGAL MONOPOLIES AND MARKET SEGMENTATION

The largest routes in Norway are of almost equal size to the routes between many specific airports within Europe as well as within the United States.[1] Therefore, the experience in the Norwegian airline industry can be of interest for what may happen in airline industries in other countries. As in most countries, the Norwegian airline industry has been heavily regulated. For each route, one single firm was given the exclusive right to offer flights. Both prices and time location of flight departures were regulated. In October 1987, a second airline was permitted a limited number of flights for a few particular routes - with a maximum of four flights at on each route. The first carrier could, though, act as a monopolist on the residual demand on those routes. Both prices and time location continued to be regulated by the government. However, there are indications that the regulation was not a binding constraint on each firm's price setting.[2]

The airline industry in Norway, as well as in many other countries, provides us with a textbook example of third degree price discrimination. The business travellers typically have a low price elasticity of demand, while the leisure/holiday travellers' demand typically is more sensitive to price changes. The two kinds of customers were segmented by setting restrictions on the travelling pattern for the low price tickets. In particular, low price tickets had to be bought and often paid for in advance, and the night between Saturday and Sunday had to be spent away from home. Thereby, each carrier succeeded in charging a high price from the business travellers and at the same time a low price from the leisure/holiday travellers.

[Figure 1 approximately here]

Figure 1 illustrates the effect of third degree price discrimination. The difference in price elasticity in the two segments is illustrated by a flatter demand curve in the leisure segment than in the business segment. When marginal revenue in each segment is set equal to marginal costs, the final price to the consumers differs between the two segments. We will argue that the market segmentation still remains, and that the post deregulation rivalry has widened the gap between prices in these two segments: Prices in the leisure segment have fallen, while prices in the business segment have remained high.

3. COMPETE, COLLUDE, OR BOTH?

In April 1994, all routes, except those between the smallest airports, were further deregulated. Free entry was permitted, and the airlines were free to set prices as well as departure times for their flights. However, there were two restrictions on entry. First, only Norwegian firms were allowed to enter. Second, there was a limited number of slots available at Fornebu, the airport near Oslo, at peak hours. The latter was not a *de jure*, but a *de facto* entry barrier.

It turned out that the two incumbent firms for the routes in question, SAS and Braathens, became the only active firms in the deregulated system. Prior to deregulation, both firms threatened to cut prices following deregulation. However, a study indicates that there was no price reduction on the full fare tickets in the business travellers' segment following deregulation, and only a minor increase in the share of discounted tickets.[3] The study, though, is not an empirical test. The conclusions are drawn from observing descriptive statistics. Therefore, one may ask whether the firms colluded on prices or whether customers shifted

from purchasing full fare to discounted tickets. If the latter is true, we have de facto competition on prices although the prices of full fare tickets are not affected by the deregulation. Furthermore, the exclusive dealing agreements between each carrier and some of the large customers (large firms) are not taken into account. In these contracts prices are cut secretly. It is thus not clear whether prices in the business segment are quite high as the referred study indicates, or whether the secret price cuts and the shifts to discounted tickets are of large importance.

There are also some casual observations suggesting that there has been a large increase in capacity following deregulation.[4] However, one possible explanation could be that this is due to a general growth in demand. Alternatively, the capacity increase might also be triggered by collusion on prices. A high price-cost margin in the business segment gives each firm strong incentives to increase its capacity to capture market shares. Hence, it is natural to ask whether the firms competed on capacity and colluded on prices in the business segment after the deregulation. This is what we have set out to test.

We have made an econometric study where we test for the nature of competition concerning both price- and capacity setting [See Salvanes, Steen and Sørgard (1998a)]. We have data for twelve routes in the period 1985-1996, and half of them remained monopolies also after the deregulation in 1994. Prior to deregulation, we assume that there was a de facto collusion on both prices and capacity. Then we proceed in two steps.

First, we test whether there was a structural break in the capacity level following deregulation. We find a significantly larger increase in capacity on those routes where both firms were active than on those routes where only one firm was active after deregulation. This suggests that deregulation triggered competition on the duopoly routes.

Second, we ask what nature of competition prevailed after deregulation on the duopoly routes. There are two possible outcomes: either they compete on capacity and collude on prices, or they compete on both capacity and prices. The former we label semicollusion, and the latter competition.[5] To distinguish between these two cases, we have derived how a change in demand is expected to affect the choice of capacity. This is illustrated in Figure 2.

[Figure 2 approximately here]

Note from Figure 2 that if market size is large, then we expect capacity to be more sensitive to changes in market demand in the semicollusive regime than in the competitive regime. To understand this, note that an expansion of own capacity will result in a lower price in the competitive regime. This dampens the incentive to expand capacity. In the semicollusive regime, on the other hand, such a capacity expansion does not affect the price. The only - and important - effect is that it increases the firm's market share, since its market share is determined by its share of total capacity.[6] The larger the market size, the larger the absolute increase in sale by increasing the market share by a certain amount. Hence, a firm has stronger incentives to expand its capacity the larger the market size. With a limited market size, though, there is no reason to expand its capacity more than the increase in market size, because the absolute increase in sale from increasing the market share is limited.

We have tested the relationship between market size and capacity, and have found that a change in market size has a significantly larger relative impact on large routes than on small routes. However, monopoly routes are typically small routes and duopoly routes are primarely large routes. The difference can therefore be due to a comparison of monopoly and

duopoly routes rather than to the nature of competition on duopoly routes. Therefore, we have also made a test for the duopoly routes only. Again, we find that a change in market demand has a significantly larger impact on large routes than on small routes. This is consistent with semicollusion, where they collude on prices and compete on capacity, but inconsistent with competition. One interpretation is that a high price-cost margin in the business segment triggers intense rivalry for capacity in order to capture market shares in that particular segment. Almost 60% of the tickets are full price (non-rebated) tickets [see Lian (1996)], while the exclusive dealing agreements with large customers amounts to less than 20% of the total demand [see Konkurransetilsynet (1998)]. Then approximately 40% of the passengers are using a full price ticket, which suggests that the business segment is very important for the two carriers. It is therefore plausible that collusion on prices in the business segment has triggered a battle for market shares in that segment.

One might think that semicollusion is a very rare phenomenon, and therefore not of interest for other markets. However, in the literature we find numerous examples of semicollusion both in theory and in real life.[7] Just to mention a few, semicollusion has been observed in the American cigarette and cement industries in the 20s and 30s, the German cement industry in the 30s, the Norwegian cement industry in the 50s and 60s, among Japanese exporting firms in the 50s and 60s, and in ocean shipping.[8] This illustrates that such a nature of competition should be taken into consideration as one possible scenario when discussing the possible effects of deregulating a particular industry.

4. WHY COLLUSION ON PRICES?

As reported above, we have found support for collusion on prices and competition on capacities. The former is consistent with a descriptive study, concluding that firms colluded on prices in the business segment, and it suggests that the secret price cuts in the exclusive dealing agreements are of minor importance [see footnote 4]. Let us point out four factors that can explain why the firms have succeeded in avoiding price competition in the business segment.

First, there is a potential for collusive behaviour in this particular industry. There are only two active firms, and until April 1997 foreign firms were not permitted to serve domestic routes in Norway. Price changes will either be announced in the press or made through a travel agency, which in both cases will quickly be observed by the rival. Hence, both firms can quickly respond to the rival's price changes. Furthermore, both firms have expanded their capacity significantly following deregulation. As a result, both firms are able to expand their sale in the business segment and thus cut prices significantly following any possible cartel breakdown.

Second, the two firms had almost equal market shares in the domestic market initially, and it was natural to continue with the initial market sharing in the deregulated system. In fact, there were only minor changes in the market shares on each route as well as in the total market shares after deregulation.[9] At 24 out of the 32 city-pair routes, the initial monopoly carrier continued to be a monopolist. For the remaining eight routes, the pre-deregulation dominant firm continued to have a dominant position. On average, the dominant firm had a 13 %-points' reduction in market share on these eight routes, and it had no less than 60% market share on any of the routes in the deregulated regime.[10]

Third, for those routes where both firms did have flights, there exists a system for co-ordinating prices. The firms are permitted to consult each other concerning price setting. To

allow for late changes of flight schedules for normal (not discount) tickets, from one airline to another, the airlines have «transferable» prices. To implement such a policy, the firms are permitted to meet regularly to inform each other concerning future prices on non-rebated tickets - labelled interline tickets. Hence, there exists an institutional pre-play communication system where each firm can inform its rival about its future prices on normal tickets.

Fourth, the firms signalled an aggressive response to any move by its rival. In particular, each firm matches the rival's offer. For example, prior to deregulation Braathens introduced a rebate ticket *Billy* to match SAS' rebate ticket *Jackpot* and set a price NOK 5 below the *Jackpot* price. SAS responded immediately by reducing its *Jackpot* price by NOK 5. A statement by a representative for Braathens suggests that this is a deliberate policy for the firms in question:

> '*We will match any offer by SAS within an hour, and we can not accept that SAS has cheaper discount tickets than what we have'* (our translation) [C. Fougli to Dagens Næringsliv, 20/1/94].

Such an apparently aggressive behaviour is analogous to the introduction of a meet-competition clause. As shown in the literature, a meet-competition clause may have a dampening-of-competition effect [see Salop (1986)]. An explanation of this principle, which may also serve as an illustration of the companies' strategy, was provided by Audun Tjomsland, the public relation manager for Braathens:

> '*The two Norwegian firms on the Norwegian routes, Braathens and SAS, are of equal size and can follow each other during a price war. The firm that starts a price war will quickly be followed by the rival firm, so that the firm that starts a war will have*

an advantage only for a day or two. Accordingly, the firms are reluctant to trigger a price war.' (our translation) [Bergens Tidende, 31/7/95].

Although the study we referred to suggests that there was no fierce price competition in the business segment following deregulation, casual observations suggest that there has been more price competition in the leisure segment, where the firms offer discounted tickets. As mentioned above, the two firms competed on prices with identical kind of offers like *Billy* and *Jackpot*, respectively. These were discounted tickets with restrictions which made them unattractive for business travellers. There are numerous other examples of discounted tickets with restrictions, where the firms matched the rival firm's offer. For example, in the summer of 96 both SAS and Braathens introduced 50th anniversary tickets, which also were discount tickets with restrictions.

5. CLUSTERING OF DEPARTURES?

Given no collusion on prices in the business segment, how would we expect firms to locate their flight departures? According to theory of location, it is ambiguous whether a firm should locate close to its rival or not. [11] On the one hand, it should locate close to its rival to capture market shares. On the other hand, it should locate far away from its rival to dampen price competition. Typically, then, there are incentives for a firm to locate close to its rival - clustering - if there is competition on location, but not on prices.[12] However, the fact that each firm has several products - or more than one flight on each route - makes it troublesome to make clear-cut predictions from theory even when there is no competition on prices. There are examples, though, where theory predicts local clustering, as shown in Figure 3.[13]

[Figure 3 approximately here]

In the two examples shown in Figure 3, the battle for market shares results in local clustering or, put differently, pairwise flights. However, there are many examples where we expect inherent instability. In particular, the firm with a large number of flights will try to squeeze the firm with a low number of flights by locating flights close to theirs on both sides.

Theory, then, has no clear cut predictions. Moreover, if we observe price competition, the theory is even less clear cut.[14] Then the question is: what do we actually observe?

We have done an econometric study of the location of flight departures [see Salvanes, Steen and Sørgard (1998b)]. We investigated twelve routes, six of which remained monopolies after the deregulation. Before we proceeded to actually test for the effect of deregulation, we tested whether regulation did have an impact on location. We found that deregulation did not have any significant impact on the time location of flights on the monopoly routes. This suggests that the change in location pattern we have observed is not due to some binding regulatory constraint that was abolished, but rather due to the nature of competition that emerged when some routes changed from monopoly to duopoly routes.

We then know that the possible changes we observe in time-scheduling on those routes that are becoming duopolies, are changes from monopoly to duopoly and not from regulation to duopoly. There are three main findings we can report from our empirical testing, all of which can be illustrated with the time locations on the two routes Oslo-Bodø and Oslo-Stavanger, shown in Figures 4 and 5.

[Figure 4 approximately here]

First, deregulation seems to have no or only a limited effect on the time-scheduling pattern within each airline. In particular, the first carrier - the one with the largest number of flights - seems to spread its flights throughout the day both before and after deregulation.

[Figure 5 approximately here]

Second, the second carrier on each route has a tendency to locate its departures close to those of the incumbent firm. This is particularly clear on the route Oslo-Bodø, the smallest one of those two routes. On the larger route, the picture is not so clear cut. This leads us to our third observation:

Third, the tendency towards pairwise flights seems to be more prevalent in the morning segment as well as in the afternoon segment than in general. This is especially the case if we look at the route Oslo-Stavanger. In these segments, 7:00-10:00 and 15:30-18:00, the typical passenger is a business traveller.

One interpretation of our results is the following. The dominant carrier on each route has a policy of offering a high degree of service frequency. It spreads out its flights on those routes where it faces a rival. The second carrier, though, has a policy of offering flights primarely in the business segment, and to locate close to its rival to capture passengers. This is consistent with what we found when we investigated the nature of competition concerning capacities. We then found support for price collusion, which triggered intense rivalry on capacities. Our results concerning location suggest that the rivalry on capacities indeed was a battle for market shares in the business segment.

Interestingly, we have then found a tendency toward clustering only in the segment with collusion on prices. This illustrates a general conclusion from theory, which says that a relaxation of price competition will give the firms incentives to locate close to each other in order to capture market shares.[15]

6. POLICY IMPLICATIONS

The deregulation of the Norwegian airline industry was supposed to promote competition, which it certainly did. But competition was distinctly different from what we traditionally expected it to be. We did not observe a general fall in prices or an increase in service frequency. Instead, we observed collusion on prices in the business segment. Such a high price-cost margin in the most important segment triggered competition on capacities. This is an example of a prisoners' dilemma situation, where both firms increase their capacity in order to increase market shares. The firms seem to be aware this problem. For example, Braathens explained its poor result in the first quarter of 1996 in the following way:

> '*Braathens explains this [poor result] by increased competition. The firm has increased its capacity, but this has not helped much. The growth results in an increase in employment and other costs of production* (our translation) [Dagens Næringsliv, 10/5/96]

A few months earlier, SAS had announced several new initiatives:

> '*Among the initiatives are recruitment on the ground and in the cabin, adjustment of time-scheduling of flights, an increase in capacity amounting to 400,000 seats*

annually, better food on business class between Norway and other countries, ... (our translation) [Bergens Tidende, 9/3/96].

The battle for market shares resulted in pairwise flights in the business segment, and the increase in service frequency was therefore very limited, at best. The large number of seats available implied that the airlines had idle seats available for the leisure segment. Therefore, after deregulation they competed fiercely for the passengers in the leisure segment. No surprise, then, that after deregulation we have observed an even larger difference between the prices in the business segment and the leisure segment.[16] Some of the effects of deregulation are illustrated in Figure 6.

[Figure 6 approximately here]

The fall in prices in the leisure segment following deregulation is beneficial to society, shown by the trapezium which is marked in Figure 6. The installment of extra capacity, shown in Figure 6 by the increase in capacity from K_0 to K_1, is costly for both the firms and society. The costs associated with this installment of extra capacity - which is partly idle capacity - is shown with the rectangle which is marked in Figure 6.

We see that the welfare effect of deregulation is ambiguous. On the one hand, lower prices in the leisure segment are beneficial to society. In addition, secret price cuts in the exclusive dealing contracts are beneficial to society as well. Finally, although the increase in the number of flights has no or only a limited effect on frequency, the flexibility for business travellers is probably improved. A late rescheduling can now be easier, because there are more vacant seats available.[17] On the other hand, excess investment in capacity is costly for

society. This is typically also true for some other decisions by each firm which is triggered by collusion on prices, such as advertising. One could then argue that society would be better off with one monopoly airline serving the business segment, supplemented by low price airline(s) competing only in the leisure segment. This would be a remedy against the local clustering of flight departures in the business segment, it could dampen the excess investment in capacity, and at the same time ensure price competition in the leisure segment. This illustrates that semicollusion, which we earlier argued can be present in many industries, can be detrimental to welfare.

However, this does not solve the main problem in this industry: The lack of price competition in the business segment. What, then, should the government have done? There are some anti-trust policy lessons to be learnt from the experience in Norway. In particular, the government should have made it difficult for the firms both to find a market sharing arrangement and to coordinate prices. A second carrier should never have been allowed to enter the market prior to deregulating, as it did in Norway. Both firms were active on the largest routes before deregulation, and this made the transition from regulation to deregulation a very smooth process.[18] Now it is too late to take any action in this respect. On the other hand, the government still has the option to deny the airlines to consult each other concerning prices on full price tickets. Obviously, such an arrangement promotes collusion on prices and should therefore be abolished.

In October 98, the new main airport for Oslo - Gardermoen - opened. The number of available slots will increase, though only gradually. Several new airlines have announced that they will enter the market, and one firm - Color Air - established flights on some particular routes already in August 98. Hopefully, this might destabilize the semicollusion we have observed in this industry before the opening of Gardermoen. However, it is of interest to

observe how SAS and Braathens responded to Color Air's entry prior to the opening of Gardermoen. Color Air has low prices, and both SAS and Braathens responded in August 98 by undercutting their prices on the routes in question. However, the two incumbent firms have restrictions on these discounted tickets so that they are not attractive to business people. Apparently, then, the incumbent airlines hope that the new entrant is a rival only in the leisure segment. If so, we shall not see any changes in the rivalry in the business segment. Given the existence of semicollusion, this should come as no surprise. The present capacity competition between SAS and Braathens implies that a third carrier also has to install a large capacity to be attractive for the passengers in the business segment. It is doubtful whether it would be profitable for a third carrier to engage in such an intense rivalry for capacity, even if collusion on prices in the business segment is maintained. So even if prices are high, the endogenous investment in capacity in this particular industry may deter potential entrants.

Despite the doubt put forward here, there is still a chance that the new entrants will destabilize the collusion on prices in the business segment. But if they do not succeed in that respect, then what could the government do? As mentioned above, the ban of price coordination is still a measure that can destabilize collusion on prices in the business segment. If that is not enough, other measures must be implemented. The anti-trust authorities has decided not to publish the rebates each airline has given in exclusive dealing contracts with large customers. This is a good thing, because secrecy concerning price setting gives each firm stronger incentives to cheat on the collusive outcome. The government is a very large customer, and might destabilise the collusive outcome if they for example decided to have an exclusive dealing agreement for a quite long time period for the total government purchase in this market, and encouraged other large customers to do the same. No doubt, this will create some turbulence in this industry. Although turbulence is not what we would like

to promote in general in the airline industry, that kind of turbulence in this particular industry is a good thing for society.

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Figure 1. Price discrimination

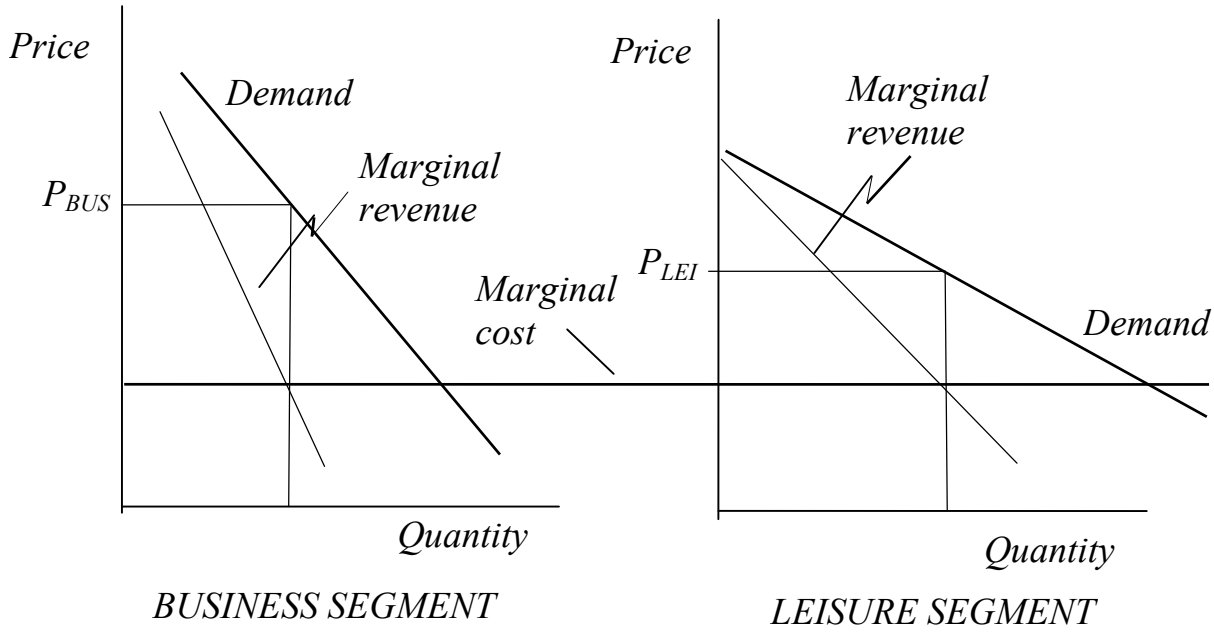


Figure 2. Market size and the relationship between market size and change in capacity

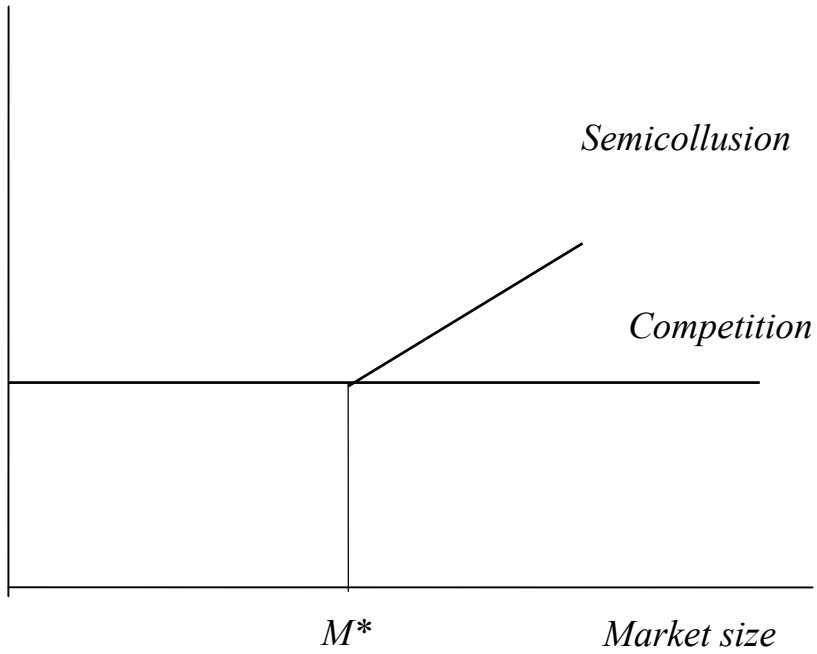
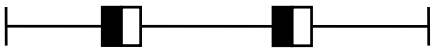


Figure 3. Location on a line with no price competition

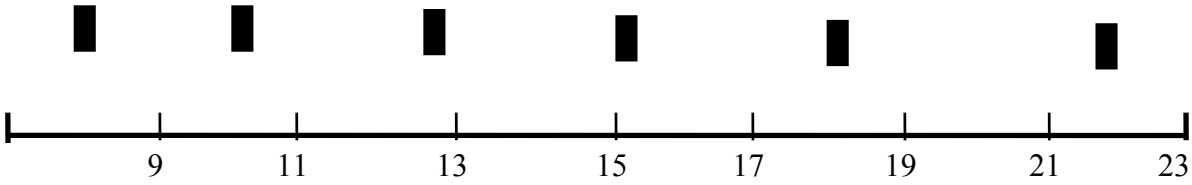
2 products each



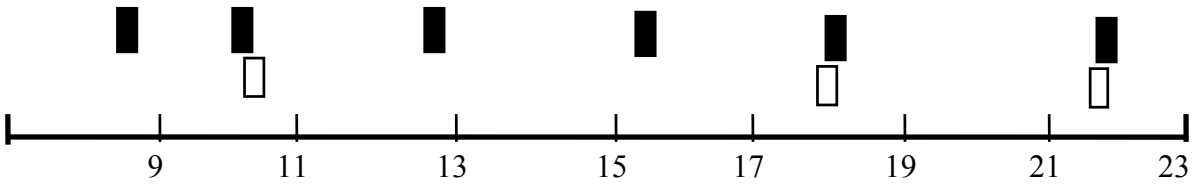
3 products each.

Figure 4. Flight departures Oslo-Bodø before and after deregulation

Before deregulation (winter 93-94):



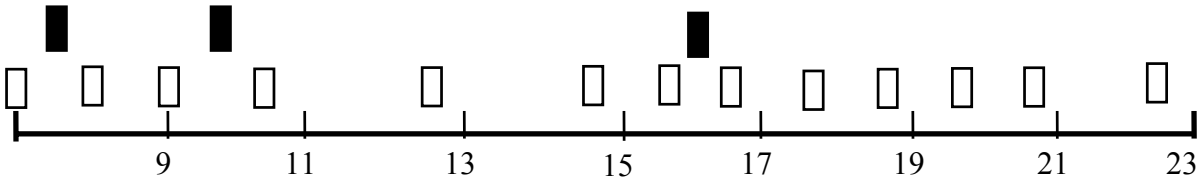
After deregulation (winter 96-97):



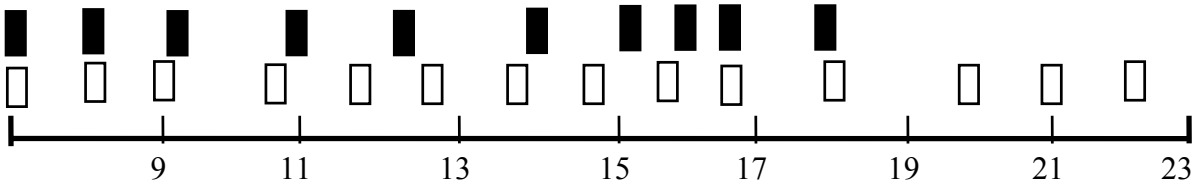
= *SAS* = *Braathens*

Figure 5. Oslo-Stavanger before and after deregulation

Before deregulation (winter 93-94):

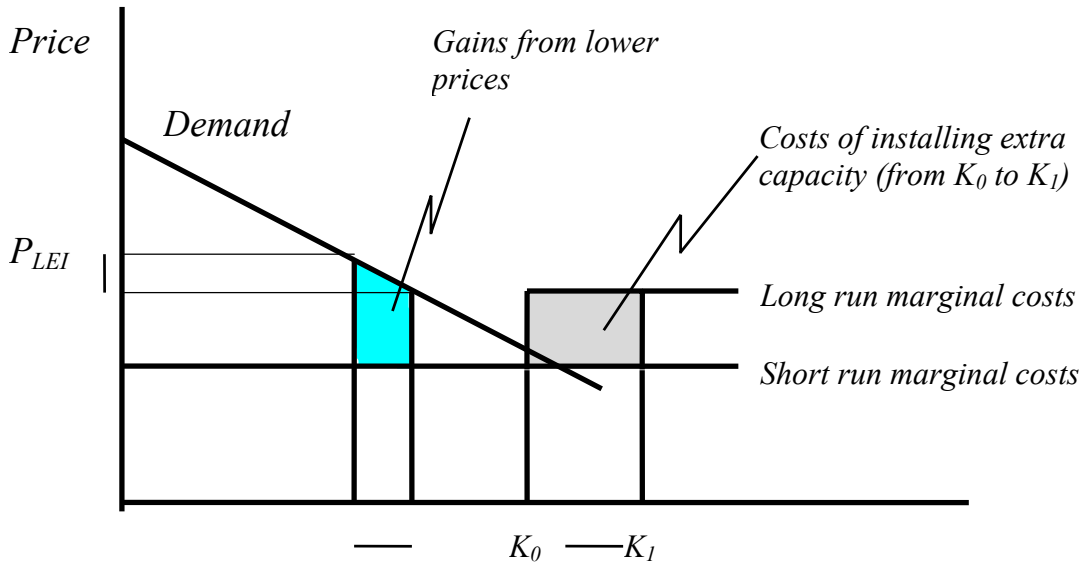


After deregulation (winter 96-97):



= *SAS* = *Braathens*

Figure 6. The effects of deregulation



END NOTES

LEISURE SEGMENT

[#]Our research has been partly financed by the Research Council of Norway through the Foundation for Research in Economics and Business Administration.

[1]Not surprisingly, the number of flights between city pairs as, for example, San Francisco-Los Angeles and London-Amsterdam, is much higher than between city pairs in Norway. However, when we take into account the fact that there are several airports in each of these large cities, then the number of flights between specific airports is at the same level as the number of flights on the largest routes in Norway [see Strandenes (1990)].

[2]The regulation dates back to the 40s. At that time the Norwegian economy was heavily regulated, with no focus on anti-trust issues. Each firm had to apply to the civil aviation authorities concerning price changes. Then each firm could argue that they had had cost increases, an argument that the authorities would find difficult to disprove. Norman and Strandenes (1994) have calibrated the market equilibrium on the route Stockholm-Oslo prior to deregulation in 1993, and they conclude that '[i]nsofar as our calibrated coefficients seem «reasonable», the regulatory constraint cannot be severe' (p. 96).

[3]This is shown in Lian (1996). He finds that the share of the discounted tickets increased by 2.5 %-point from 1992 to 1994-95. According to Lian (1996) this is no dramatic change: '*a 2-3 %-point increase in discount tickets in two-three years is in line with a long term trend and implies no sudden change in this trend'* [our translation] (p. 15). The increase in the share of discounted tickets are larger in the 'leisure' segment than in the business segment [see Lian (1996), table 4.4].

[4]For example, during the first year after deregulation, total capacity for routes to and from Oslo increased by 12.5 % [see Lian (1996), Table 5.2].

[5]As shown in Kreps and Scheinkman (1983), capacity setting followed by price setting may yield a Cournot outcome. Hence, what we label as competition is Cournot competition. Alternatively, we could assume Bertrand competition. This would not have changed the distinction between competition and collusion shown in Figure 2. The outcome in the semicollusive regime follows from the model in Fershtman and Gandal (1994).

[6]There are at least two reasons for a positive relationship between own share of total capacity and own share of total sale. First, the larger the capacity the larger the probability that the airline firm in question has a vacant seat. Second, the larger the capacity, the larger the number of flights, and thereby the larger the service frequency for the airline firm in question. More generally, when products and prices are identical, it is

reasonable to assume that demand is distributed so that each firm's sale is related to its share of total supply in the market.

[7]All theoretical studies of semicollusion assume collusion in the product market (either on prices or quantity) and competition along other dimensions. Competition on capacity is analysed in Fershtman and Muller (1986), Osborne and Pitchik (1987), Davidson and Deneckere (1990), Matsui (1989) and Fershtman and Gandal (1994); competition on R & D is analysed in Katz (1986), D'Aspremont and Jacquemin (1987), Kamien *et.al*. (1992) and Fershtman and Gandal (1994); competition on location is analysed in Friedman and Thisse (1993). For a survey of the literature, see Fershtman and Gandal (1994) or Phlips (1995), chpts 9 and 10.

[8]Price collusion led to intense rivalry for advertising in the American cigarette industry [see Scherer (1980), p. 388-389], the installing of excess capacity in the German [see Scherer (1980), p. 370] as well as the US cement industry [see Scherer and Ross (1990), p. 674], and to excess capacity in ocean shipping [see Scherer and Ross (1990), p. 674]. The existence of cartels in the domestic Japanese market, where quotas were allocated according to relative capacity, led to excess capacity in many Japanese industries during the 50s and 60s [see Matsui (1989)]. The price cartel in the Norwegian cement market led to the installment of excess capacity in the Norwegian cement industry in the 50s and 60s, which showed up as a large increase in exports [see Steen and Sørgard (1998)].

[9]Each firm's market share changed only modestly following deregulation; Braathens increased its market share from approximately 50% in 1993 to 52% in 1995 [see Lorentzen *et al*. (1996)].

[10]The exception is the route Bodø-Tromsø, where each had two non-stop flights both before and after April 1994.

[11]For an overview of the literature on location, see Eaton and Lipsey (1989) or Gabszewics and Thisse (1992).

[12]Friedman and Thisse (1993) show that collusion on prices in a duopoly after location is chosen non-collusively results in clustering. This restores the classical result found in Hotelling (1929).

[13]The example is from Eaton and Lipsey (1975). See also Gabszewicz and Thisse (1986).

[14]Whether there is clustering or not in the equilibrium outcome depends on, inter alia, the structure of the transportation costs and the consumer heterogeneity. For example, d'Aspremont, Gabszewics and Thisse (1979) apply a model with quadratic transportation costs and find that maximum differentiation is obtained. On the other hand, De Palma *et al*. (1985) show that minimum differentiation is obtained if there is sufficient consumer heterogeneity.

[15]See, for example, Tirole (1988) who concludes that one important insight from spatial models is that firms want to differentiate their products from their rivals' products to soften price competition (p. 286-287). In Borenstein and Netz (1997), a study very much in the same spirit as ours, concerning flight departures, time schedules of flights in the US before and after deregulation in 1978 are tested empirically. They found that price competition typically resulted in less clustering of flight departures.

[16]As shown in Lian (1996), the prices of normal (non-rebated) tickets were not affected by deregulation. In addition, we have seen numerous examples of low price tickets tailored to the leisure segment. In September 1998, for example, Braathens offered a return ticket in Southern Norway for NOK 700 for two persons. Including taxes, the price per person is NOK 496. On the route Oslo-Bergen a full price return ticket, including taxes, amounts to NOK 2450. Then the price of the rebated ticket is 20% of the price of the full price ticket.

[17]It is, though, an open question whether this is of any large importance. Note that a monopoly has incentives to hold vacant seats as long as possible, in order to offer any person purchasing a full fare ticket very late a seat. Therefore, one could argue that flexibility is expected to be high even before deregulation.

[18]In Sweden, in contrast, the two active firms SAS and Linjeflyg merged prior to the deregulation in 1992. New airlines challenged the merged incumbent firm, and we observed price competition [see Randøy and Strandenes (1997)].