"On the price structure regulation of non-congested airports"

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Abstract:

This paper analyses the current price structure and its regulation of non-congested airports and its economic effects. It also seeks ways to reform the current price structure regulation. The aim of this reform is to find better Ramsey prices for airports with a revenue constraint and to improve welfare enhancing price discrimination of non-congested airports without a deficit problem.

Keywords: Airport economics, airport regulation, price structure

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1. Introduction

There are different tariffs and tariff structures in many industries, including transportation and regulated industries. Airlines, for example, have frequent flier programs which is essentially a form of bulk discount where a passenger receives a lower average price if she or he uses a particular airline or an airline alliance more often. In electricity or telecommunications markets two-part tariffs are quite common. A two-part tariff consists of a fixed fee plus a variable usage fee. Usually consumers have a choice between a strictly linear tariff and two-part tariff. The tariff structure is set up in such a way that the strictly linear tariff becomes unattractive if a certain amount of usage is exceeded. This is because the variable fee of the two-part tariff is smaller than the strictly linear tariff. Hence, consumers with a high usage will choose the two-part tariff and consumers with a low usage choose the strictly linear tariff. This is also a form of second degree price discrimination. It can be shown that two-part tariffs with the option of a strictly linear tariff are pareto-superior to a simple per unit price.

In some cases price discrimination is a necessary condition to break-even. In regulated, natural monopolies, where marginal cost pricing would lead to deficit, price discrimination is the only option if monopolistic prices are not allowed. This is because the marginal costs are below the average costs for all units of the relevant output. For multi-product natural monopolies the revenue constraint can be overcome through Ramsey pricing, whereby prices are set according to the price elasticities in the different markets. This is done such that consumer surplus is maximized subject to the constraint that the firm just breaks even. The result is that the firm will charge high prices in markets with a price inelastic demand and low prices in markets with price elastic demand. This is comparable to the simple mark-up rule known from microeconomics where the profit maximizing price is set above marginal costs n times. Here $n = e_i (1 + e_i)^{-1}$, and e_i is the own price elasticity of demand. That means that the mark-up is high if demand is inelastic.

An important point to keep in mind is that the examples given above refer to final consumer markets. In the case of infrastructure however, pricing is usually a cost to the service provider of the respective good in question. In the case of airports for example the airlines deliver their output to the final consumer, i.e. the passenger. The airport is an (essential) input provider for the airlines. This is also called a vertical structure, because airport and airlines are within a supply chain. The pricing of inputs is a different “kettle of fish” compared to the pricing of final consumer products. Yet, in infrastructure pricing similar price differentiation techniques can be found. For example the German railways, Deutsche Bahn, had a pricing structure for its railroad network whereby train operators could pay a fixed fee and then pay a reduced variable fee. Operators that did not pay a fixed fee had to pay a higher variable fee. Hence, it was not worthwhile for smaller train operating companies to pay the fixed fee. It should be noted however that welfare implications that have been reached for final products might not necessarily apply likewise to intermediate products (see Ordover and Panzar, 1982). Two-part tariffs for example might introduce distortions to the supply chain that would not occur with a simple linear tariff.

Another known problem in vertical structures is the so called double marginalization. This is a typical problem that arises in situations where there is an upstream monopoly supplier of an input and a downstream monopoly producer who sells its output to the final consumer. The two successive monopolists will each mark-up their prices so as to maximize their individual profits. That means that

each firm sets its monopoly price and hence the term double marginalization. The problem with this is that for the final consumers output is lower and prices are higher compared to a situation in which there would be only one (vertically integrated) firm supplying both the input and simultaneously the final output. Ideally the input should be priced equal to marginal costs. This can be achieved through vertical integration. In a vertically integrated firm double marginalization might not arise. If however the input is supplied by a department that acts profit maximizing the problem could occur as well. That department should set a transfer price that is equal to the marginal costs of producing that input. Even with two (vertically separate) successive monopolies there are ways to avoid double marginalization, for example through retail price maintenance or two-part tariff (see Rey and Vergé, 2005). Such a two-part tariff would be structured such that the variable fee reflects the marginal costs of producing the input and the fixed fee acts as profit sharing device. Although the case of two successive monopolies is the benchmark case, double marginalization prevails in oligopolistic markets, albeit to a lesser degree, and ceases only if one or both vertical levels are perfectly competitive markets.

With regards to airport pricing, charges are usually differentiated according to the weight of the aircraft. Additionally, airlines usually pay a passenger fee that is differentiated according to domestic, international or transfer passengers. The International Civil Aviation Organization (ICAO), the international body responsible for setting standards and principles and techniques in international air transport, sets guidelines with respect to airport pricing. Although each country is free to regulate the level and structure of airport charges on its own and although several airports around the world are subject to formal price regulation, the ICOA guidelines represent industry practices that are being followed even by airports that would be free to adopt any price structure they might want to. That means that at most airports around the world the ICAO guidelines of: weight oriented, transparent, non-discriminatory and cost-related airport charges apply. Furthermore, airport charges should not be adjusted according to stage length according to the ICAO rules, although Morrison (1982) has found this to be superior to simple weight based charges. The rationale behind this is that weight based landing charges do not necessarily reflect the wear and tear landing aircraft impose on the runway, but are essentially a form of value pricing and therefore a form of price discrimination. It is argued that larger aircraft are used for long-haul flights which have therefore a higher willingness to pay and should thus pay a higher landing fee. Morrison (1982) understood that this is not necessarily sufficient for proper price discrimination, because the same type of aircraft could be used for very different routes and therefore different stage lengths. He suggested that landing fees should also be based on the stage length of the landing aircraft. Yet, as this paper will argue, this might not suffice either.

A notable exception with respect to airport pricing is Sydney airport (see Schuster, 2009), as this airport strikes individual, secret contracts with the airlines operating from that airport. These contracts include agreements about the terms of use and specially negotiated prices which may include, for example, a two-part tariff structure. This is also comparable to the situation at US airports where airport use and lease agreements are being stipulated between airlines and airport operators (Graham, 2008). However, the basis for airport charges at US airports still are weight based landing fees that according to the rules by FAA, the US air transport regulatory body, have to be cost related. In Australia, by contrast, a light handed regulatory approach is being pursued by the government (cf. Forsyth et al, 2004). This allows Sydney airport to follow its unconventional pricing strategy. The findings by Gallamore and Panzar (2004) indicate for the railway sector that secret and

individual contracts by a vertically integrated provider of the bottleneck facility might actually be superior to mandatory open access with regulated access charges.

The aim of this paper is to analyse the existing structure of landing charges at non-congested airports and its regulation as well as its economic effects. It also seeks ways to reform the current price structure regulation. The aim of this reform is to find better Ramsey prices for airports with a revenue constraint and to improve welfare enhancing price discrimination of non-congested airports without a deficit problem. This division is needed because the exact shape of the average cost curve is unknown and it is impossible to tell whether airports actually have a revenue constraint or not. The proposed policy reform should be applicable to uncongested airports in general. Yet the implications differ slightly. For airports with a revenue constraint quasi-optimal Ramsey pricing could be improved. For those without a revenue constraint, the improved possibilities for price discrimination could enhance welfare by reducing distortions created by the current pricing system. The aim of the price discrimination is not to increase airports' profits, but to increase social welfare through the reduction of negative welfare effects that are being created by the current charging system of airports.

The paper is structured as follows. The next section will explain the current price structure regulation deals with the effects this has on the market outcome. The next section will introduce options for reforming the price structure regulation and explain the effects the new regulations might have. The final chapter summarizes and concludes.

2. The effect of the current price structure regulation

As said above, most airports around the world have weight based landing fees. Moreover, the airlines usually collect a per passenger fee from their customers which is being passed onto the airport, sometimes with a small discount for collecting the fee. This is the usual industry practice that is being put forward by the ICAO (see ICAO, 2004). These guidelines determine that airport charges should:

- be weight based[1],
- transparent,
- non-discriminatory,
- cost related, and
- not be differentiated according to stage length. (ICAO, 2004, p. 9f)

Rebates are allowed if they abide by the above rules, most importantly the rule of non-discrimination. That allows for discount schemes for example in the form route discounts, where discounts are given to airlines that open up new routes at a particular airport. Rebates are allowed if these rebates are open to all airlines. As said above, even though these guidelines are not binding and need to be established in each signatory country as a national law, the guidelines are being followed by many airports around the world

What are the effects of such a pricing structure on uncongested airports? Imagine an airport at mid-sized city. Furthermore, imagine that there are very thick, highly frequented routes between highly

[1] A fixed fee per landing or a fixed charge with a weight-related element is allowed at congested airports or during peak periods.

populated and economically powerful agglomeration centers. These are routes where airlines operating them, have a high willingness to pay, since the passengers flying on that route have a high willingness to pay. Call these routes A-routes. Next to that there are connections to very small cities, more insignificant tourist destinations or short-haul routes. These are called C-routes and they have a small willingness to pay. All routes in between are called B-routes. These might be routes to cities of the same size as the origin destination, i.e. medium-sized cities. To start off the discussion, imagine the airport has five C-routes and three B-routes.

To analyze airport pricing in such an environment it must be understood how a profit maximizing airport behaves. Thus, the premise under which this paper operates is that airports are behaving so as to maximize profits. Although the airport is able to set landing charges according to take-off weight a B-route as well as C-route could be flown with one and the same aircraft. On the same note, a B-route and an A-route could have the same stage length. Hence, another premise is that the weight-based landing fees as well as stage length based landing fees are not able to fully capture the willingness to pay of a particular route market. An example for this could be the following: Take Hamburg (HAM) airport as the starting point. The flight to Frankfurt airport (FRA) is probably the most important feeder flight for Lufthansa from HAM and has a high willingness to pay accordingly. Thus it would be an A-route. The flight to Cologne airport (CGN) is probably flown with the same aircraft, e.g. a 737 by Air Berlin and would be a B-route. These routes also have an almost identical stage length, but the willingness to pay is likely to differ between CGN and FRA. That is not to say however that weight based landing charges are completely unable to capture the willingness to pay of airlines. Especially with respect to A- versus C-routes it is likely that different types of aircraft are being utilized. Whenever long- and short-haul routes are under consideration weight based pricing is likely to be able to capture the relative willingness to pay in those markets. The stage length could theoretically serve as an additional indicator either. Yet weight based and/ or stage length based landing fees are likely to be imperfect. As it turns out there could be a simpler and more direct way to capture the willingness to pay of different route markets, which will be discussed in the next section.

Thus, the assumptions are that the airport behaves profit maximizing and must set a schedule of weight based landing fees that are imperfectly able to capture the willingness to pay of the different route markets and therefore represent a form of average price. The fictions airport was said to have five C-routes and three B-routes. Since the airport sets its landing fees such that they represent a form of average price, it means that the landing fee for the B-routes is a little bit too low and too high for the C-routes compared to a situation in which each route would be priced according to the willingness to pay. Hence, there is an imbalance with respect to airport charges. Under perfect price discrimination or individually negotiated contracts the landing fee for B-routes is likely to be higher and for C-routes to be lower than under an average price regime. This is the first distortion that is arises because of the ICAO charging principles. It would not matter much if the B- and the C-routes were operated by the same airline, since that airline could cross-finance the discrepancy internally. Compared to a situation where the two routes are operated by two different airlines the mismatch does matter, because the B-route would be comparatively cheaper to operate than the C-route.

A second distortion that arises is that certain routes could be priced out. Imagine our fictional airport gets six additional B-routes and two A-routes. Since the airport has ample capacity these routes can be easily accommodated. If the airport behaves profit maximizing it will increase the menu of landing chares so as to capture the willingness to pay in all of the markets that are being serviced now. Again,

since this is an imperfect price setting the landing fees are likely to create an imbalance between A- B- and C-routes. Eventually however, the landings fees will be set high enough that a number of C-routes are being priced out, meaning that they become economically unviable due to the high airport prices. If the airport could set prices low enough to make the C-routes viable they would not be priced out. Since some routes might not be served under a weight based pricing regime because the menu of landing charges is too high a welfare loss occurs since some connections cannot be realized. Welfare would be increased if the airport was able to set special charges for such routes. In some countries, such as the UK but also in continental Europe, route discount schemes have been developed by some airports. Those are discount schemes for route development, which means that airlines can a discount on the landing fees if they open a new route.[2] If it is assumed that those new routes are predominantly C-routes, at least temporarily they could become financially viable again.

The third distortion that arises through the current pricing regime is the double marginalization. In situations where there is only one airline serving a particular route there would be such a double marginalization. Yet, as said above, even in imperfectly competitive markets a form of double marginalization is present in the market. The more competitive a market, in this case the route market, gets the less there will be a welfare loss through double marginalization. Only if either the down- or the upstream level of production is a perfectly competitive market (or at least one side sets the price for its output equal to marginal costs) double marginalization will be eliminated completely. Strategies to avoid double marginalization include resale price maintenance and a two-part tariff. Whereas resale price maintenance seems infeasible for the air transport industry, two-part tariffs could eventually be introduced. This will become important in the next section.

The example of Sydney airport, striking individual and secret deals between its users, has potentially the power to overcome all of the above mentioned forms of distortions. While Sydney airport may be the most prominent example, there are actually more airports using such contracts. In the pricing that is being laid down in those contracts there would be no distortion between the routes, since airlines serving A-routes would get higher prices than airlines serving C-routes. For the same reason C-routes would not the priced out. Furthermore, double marginalization could be eliminated through the introduction of two-part tariffs, which are sometimes part of such deals. However, there could be negative effects in the downstream route competition between the airlines using such an airport. These are negative effects that arise due to the non-linear pricing of inputs (see Ordover and Panzar, 1982). Take the example of Qantas at Sydney airport. Qantas gets a price (which eventually will include a two-part tariff) that reflects all of the routes Qantas operates from that airport. That includes all A-, B- and C-routes. An airline that whished to compete with Qantas, say on an A-route, and that operates only this particular route, gets a price that reflects just this single and expansive route. Thus, Qantas' competitor might have a comparitive disadvantage because it has to pay higher landing fees at Sydney airport. Eventually the competitor stays out of the market, which creates negative welfare effects through distortions in the competitive behavior of downstream firms.

3. Options for policy reform

Based on the previous section it can be concluded that an airport pricing system is required that: a) does not distort between routes, b) does not price out C-routes, c) avoids double marginalization

[2] The discounts are usually also subject to the condition that the route is being served for a specified amount of time, that a certain load factor is achieved and that the discount fades out after a while.

effects and d) avoids Ordover and Panzar (1982) style effects caused by distortions in the downstream competition.

Research by Morrison (1982), Martín-Cejas (1997) and Hakimov and Scholz (2010) indicate that landing fees in the US, Spain and Germany are lower than (calculated) optimal Ramsey prices. Although that may have several reasons, one of them could be that the airports are not able to price discriminate sufficiently due to the restrictions that a weight based charging system imposes. In airline merger and alliance cases the competition authorities usually investigate the relevant route markets, i.e. the relevant market is always the route. From the discussion in the previous section it is evident that the willingness to pay is based on the type of route that is being operated. If the relevant market for the airlines is the route market, then the same could be true for airports. An alternative pricing system that is being proposed in this paper will concentrate around a route based pricing system.

The first possibility would be to introduce a route based multiplier. The idea of such a multiplier would be that the airport sets up such a multiplier for each route in advance for each flight plan period. The weight based landing fee, which has to be identical for all airlines irrespective of the route and which would have to be posted in advance too, would then be multiplied by that route based multiplier. That way, the airport could charge high prices for A-routes and low prices for C-routes. Thus, there would be no distortions between routes. Furthermore, the route based multiplier is able to keep C-routes economically viable. Also, such a system would be non-discriminatory and transparent. The weight based fee would be cost related, since the airport can extract rents through the multiplier instead of the (weight based) landing fee itself. Yet, the problem of double marginalization could not be solved through a route multiplier. Since the airport is still setting a variable price to capture willingness to pay and since the airport is maximizing its individual profits, the price the airport sets will be too high compared to a situation where the airport is pricing its input equal to marginal costs. Moreover, there could be negative effects on the downstream competition. Just as in the example of Qantas in section 2, a smaller competitor that is not able to generate as much profits as a larger competitor might not be able to pay a too high route multiplier.

Another possibility is to implement a two-part pricing system, where the fixed component is route based and the variable component is the weight based fee. Again, the weight based fee has to be the same for all airlines irrespective of the route they wish to operate. The fixed component could be payable per landing, but ideally it would be a truly fixed fee in the sense that it has to paid annually or per flight plan period. Yet again, the route based annual fee would have to be published in advance for all routes that currently being operated or for routes that airlines wish to operate for the flight plan in question. Such a pricing system would have the same advantages as the route multiplier, but this time double marginalization would be avoided. This is because all airlines would pay the actual marginal costs of using the airport. The fixed and route based fee would act as vehicle to share profits between the airport and the airlines. Since the fixed component is route based the sharing would be based on the actual willingness to pay. There is however a drawback to the route based annual fee. The airport could set the annual fee so high that a smaller competitor might not be able to generate sufficient profits on a particular route (whereas a bigger competitor might). The result, again, would be that the downstream competition gets distorted since smaller competitors might refrain from entering the route market or experience cost disadvantages.

A possible solution to that problem would be to force the airport to appoint a split by which the airlines that want to operate a particular route market have to pay the annual fee. Since the fixed component acts to share profits in a particular market the airport's task would be to anticipate the rents that can be generated in a particular market and to anticipate the distribution of those rents among the airlines. There could be for example a two step process, by which the airport has to publish the annual route fee. First, the airlines can apply for slots. Then, if more than one airline whishes to operate a route, the airport has to appoint the split. Should one or more airlines wish to operate a new route (i.e. one that has not been served in the previous flight plan period) the process of negotiating the fee and the split would be simultaneous. If airport and airlines cannot agree on the terms and splitting of the fee, a regulator could be appointed who will be responsible for mediating between the parties and for ultimately appointing the splitting up of the annual route fee. The regulator's responsibility should be to appoint the split only, not determine the level of the annual fee. If the task would be to regulate the airport's level of charges the route based pricing would be compatible with a price-cap regulation, since usually with price-cap regulation only a basket of fees is regulated. That means that the overall level of charges must not exceed the mandated level laid down in the RPI-X formula.[3] Hence, the route based fees need only to become part of the regulated basket of prices. That is however not to say that either negotiations or regulatory arbitration are without problems on their own. Both, negotiations and regulation is cumbersome and, more importantly, costly. These costs could counteract the welfare effects that were just created by reforming the pricing system of airports.

4. Conclusion

This paper argued that the currently widely practiced[4], and through ICAO advocated, weight based pricing system creates several possible distortions. The first was that there might be a distortion between routes in the form that A-routes are comparatively cheap and C-routes comparatively expansive, compared to a situation where each route would be priced according to its individual willingness to pay. The second distortion is that C-routes might be priced out of the market if the airport, in its attempt to capture the willingness to pay in all the markets that are being operated from that airport, sets its profit maximizing price too high so that the smaller C-routes are being priced out of the airport. The third distortion is the double marginalization that typically occurs in vertical structures, because the firms at each stage will maximize their individual profits. Negotiated, individual contracts, such as those being introduced in Schuster (2009), have the problem of creating potential negative effects in the downstream route competition between airlines. Such effects would be similar to those documented by Ordover and Panzar (1982).

The aim of reforming the charging system of airports was not predominantly to increase airports' profits, but to increase economic welfare (which includes profits of airports and airlines but also consumer welfare). This is achieved through reducing the negative welfare effects that are brought by the distortions created by the weight based charging system. The aim was to reduce distortions in pricing between the routes, to keep in small C-routes, to reduce double marginalization effects and to avoid negative effects in the downstream competition among airlines. It was argued that a route based multiplier could deal fist the first two distortions, but would be unable to reduce double

[3] For an overview about airport regulation and especially price-cap regulation see Forsyth et al (2004).
[4] Although some airports, such as Sydney airport, have negotiated contracts with their users the weight based pricing system is being used by a lot airports around the world.

marginalization effects and could cause negative effects in the downstream competition. An annual route based fixed fee, as part of a two-part pricing system, could possibly deal with all three distortions. It could however also create negative effects for the competition among airlines if more than one airline wants to operate a particular route. The splitting up of the annual fee by the airport among the airlines that wish to operate that particular route could be a way to avoid this problem. Regulatory arbitration might help if airlines and airport cannot agree, but certainly this would create problems on its own.

Further limitations to the welfare effects of the proposed route based pricing system are that the distortions that have been said to be caused by the weight based pricing system could be quite small. As a matter of fact, there does not exist any empirical evidence about those distortions. Hence, it is unknown whether these distortions really create significant negative welfare effects. Secondly, the weight based charging system could, in simple words, be “good enough” price discrimination or “good enough” Ramsey prices to extract the willingness to pay. This would be the case if, for most destinations, the willingness to pay correlates with the weight of the aircraft, although findings by Morrison (1982), Martín-Cejas (1997) and Hakimov and Scholz (2010) would suggest otherwise. The question though remains whether the weight based charging system creates reductions in welfare sufficient to warrant regulatory intervention in the form of making a change in the airports’ pricing system compulsory. On the same note, the light handed regulatory approach in Australia and New Zealand, that makes negotiated contracts feasible (although they are being used in some other countries as well), could also create negative effects by distorting downstream route competition. Yet the exact extent of these distortions is unknown either. Considering that negotiated contracts have the power to alleviate all of the other distortions, the proposed route based pricing could end up being as efficient as negotiated contracts, concerning the welfare objectives.

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