

Corporatisation, Privatisation, and the Regulation of Australia's Airports

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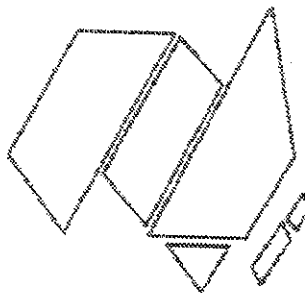
Abstract:

This paper considers the problem of the design of an incentive/regulatory environment to promote economic efficiency at Australia's airports. There are several efficiency problems that arise at airports - none of them is unique to airports and there are adequate solutions to all of them. The difficulty that arises with airports is that these solutions conflict, making an environment conducive to all aspects of efficiency difficult to achieve. This is especially true when quality is important. Airports are capital intensive and the purpose of much investment is to improve quality, for example by reducing congestion, rather than to increase throughput. The commonly preferred form of regulation, price capping, induces firms to underprovide quality and this could be a serious problem in the case of airports. This and other conflicts will need to be addressed if public airports are to be given profit incentives or privatised.

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CORPORATISATION, PRIVATISATION AND THE REGULATION OF AUSTRALIA'S AIRPORTS

Economic Analysis and Airport Performance

There has been considerable interest shown by economists in airports over the last 25 years, but their impact has been mixed. On the one hand, the contribution of economics to the analysis of major investments, through Cost Benefit Analysis, has been very significant. On the other hand, the impact on the actual operation and pricing of airports has been more modest. Economists have addressed the main pricing problems, namely those of cost recovery and the rationing of scarce capacity (or lessening of congestion), but the solutions proposed have been slow to have an impact. This is not because of their impracticality, as when these solutions are tried, they usually work well. Rather the institutional and incentive structure of the airport systems militate against adoption of efficient policies. While some airport systems perform efficiently (e.g. that in the U.K.), elsewhere, and especially in the U.S. some perform very poorly, in terms of congestion and problems of access. The solutions are known, but the problems remain.

The situation with airports reflects that with public enterprises in general until recently. Economists developed explicit characterisations of what efficient solutions would be, e.g. to problems like cost recovery or peak pricing, but they had little to say about how to encourage the enterprises to implement the solutions that they were suggesting. It became increasingly obvious that public enterprises were not paying much attention to allocative and productive efficiency even though they were required to do so by their owners. By the late 1970s there was growing evidence of poor performance, and economists were giving more attention to the task of constructing institutional structures that would give incentives for these enterprises to perform well in terms of their set objectives. This has been bearing fruit in a number of industries, especially in the transport sector, where deregulation and regulatory reform, along with changes in the relationship between owners and enterprises, such as corporatisation and privatisation, have been introduced to improve performance.

With airports, reforms have been present, though they have been slower than elsewhere. In Britain, airports have been privatised and subjected to explicit regulation, and the capacity rationing problem has been addressed. In the U.S. there is a multitude of institutional forms, types of ownership and sets of objectives. Some airports perform well, while others perform badly, with congestion being chronic at some and investment analysis being casual and inadequate. Airports like Boston have wanted to address their peak congestion problems, but they have been constrained from introducing efficient solutions by the interplay of vested interests.

In Australia, airports, and especially Kingsford-Smith in Sydney (KSA) have been subjected to a good deal of analysis, and reforms have taken place. Large investments have been subjected to detailed Cost Benefit Studies, especially the Second

Sydney Airport, though the same cannot be said about the third runway at KSA. As congestion mounted at KSA, there has been the introduction of peak pricing. Most of the major airports, with the exception of that at Cairns, have been incorporated within the Federal Airports Corporation (FAC), which has been given a more commercial charter than was the case when the airports were operated by government departments. These changes have been significant and would have improved performance, but questions about the best way to own, operate and regulate airports remain. As a result there have been several inquiries into various aspects of the FAC — these have included the recent Industry Commission Inquiry into Intrastate Aviation (Industry Commission 1992) and the current Prices Surveillance Authority (PSA) inquiry (PSA 1993). There have been proposals to privatise the FAC's airports, to set more explicit targets for the FAC, and to regulate airport charges.

In short, there have been several suggestions to change the ownership, incentive and regulatory framework of Australia's main airports. The issue being considered in this paper is one of what framework is likely to be most conducive to efficient performance. It will be argued that this is a difficult question to resolve, not because airports involve any especially unique problems but because they do involve a complex mixture of problems, and it is easy, by addressing one problem, to make others worse. Devising a good structure is an exercise of some subtlety.

In the following section, the nature of the efficiency problems in airports are outlined. The ways in which they each might be solved individually are considered in the third section. The real problems emerge because the solution to one problem interacts with other problems, and complex inconsistencies develop. In the fifth section, the analysis concentrates on the problem of devising an ownership/regulatory framework which minimises these inconsistencies and leads to as efficient performance as is possible.

Airport Performance: Aspects of Efficiency.

Several different aspects of efficiency are identified here. To some extent the breakdown into different aspects is arbitrary, but the distinctions help future discussion. Comments are made on how serious a problem each of these aspects are regarded as being in the Australian case — these comments are preliminary, since there has been little overall assessment of how these airports are performing. It is helpful also to provide a brief sketch of the cost and demand conditions that airports face, since these have a considerable bearing on how the efficiency issues can be resolved.

(a) Productive Efficiency

This will be taken to refer to whether cost is minimised for a given quantity and quality of service. This aspect of efficiency has been given much more attention recently than hitherto, and many examples of poor performance have been identified in other industries. There has been little analysis done of this aspect for airports, partly because of the capital intensive nature of the production process, and because of the locational differences between airports, which makes comparison difficult. The PSA has calculated total factor productivity indexes for some Australian airports (PSA 1993), though these

can only be used to determine trends rather than for comparative purposes. There is considerable competitive tendering for operations at airports, and this is a sign that productive efficiency is being taken seriously, though the PSA concludes that there is some scope for improvement.

(b) Price Levels and Cost Recovery

A good deal of attention is given to the cost recovery issue for airports, in Australia and elsewhere, because there is a conflict between this and efficient (i.e. marginal cost) pricing for most airports, and this has implications for the choice of price structure. The matter goes further, in that there is discussion of whether airports (and especially the aeronautical services side of their operations) should be subsidised, or whether they should use their locational monopoly to earn large profits, and effectively be used by their government owners to tax air transport. As a group, the FAC airports now earn moderately good rate of return, though individual airports — mainly the smaller ones — incur losses.

(c) Price Structures

Apart from implications for price structures that arise from cost recovery requirements, there may be problems of rationing scarce capacity and lessening congestion — for some airports, and especially Sydney KSA, this is a key aspect of the pricing problem. There may also be a pricing dimension that arises from the generation of externalities. The price structure for the FAC's airports has been an issue recently (PSA 1993).

(d) The Quality–Cost Trade-off

As with many industries, there is a quality–cost trade-off in airports, though it has not been given its deserved attention (apart from the congestion aspect of quality). This trade-off becomes important when enterprises are subjected to price regulation (see Rovizzi & Thompson 1992) and it can be shown that the enterprise will have incentives to downgrade quality excessively. Many investments made by airports are such as to improve quality rather than to increase capacity, and the issue arises of whether they will have the incentives to make the appropriate investments of this type.

(e) Investment Appraisal

It is widely recognised that many of the effects of airport investments cannot be captured by simple financial appraisals, and thus large projects are subjected to cost benefit analyses, as has been the case with the second Sydney airport. Typically, these analyses are conducted by bodies other than the airport operator. However many investments, large or small, can have impacts on externalities or quality, and there will be conflicts between making the operator more commercial and inducing it to take into account such effects. The PSA was critical of the FAC's investment appraisal techniques (PSA 1993).

(f) Access to Essential Facilities

Airports provide intermediate services, which are usually essential for production by other industries. They also have locational monopolies, which can be used to influence the terms under which users like airlines can operate. Airports can affect the competitive

outcome in the airline industry. This has become an important issue in the U.S., where some airlines dominate particular airports, and consequently, air travel to particular cities (Morrison & Winston 1989). This issue has not arisen at any large Australian airport. However, at one point it seemed likely that the FAC would be required to make non commercial investments to assure potential entrants of terminal capacity.

(g) Firm Structure

The corporate structure issue that is of interest here is whether the FAC should be responsible for a group of geographically separate airports, or these should be operated by separate enterprises. Two aspects are of importance. One is the "economic" aspect — whether there are any economies of scope in one enterprise operating several airports. The other is the "financial" aspect — whether there are financial advantages in having the airports bundled together. There may be scale economies in fund raising, and there may be efficiency gains from having a cost recovery constraint being met over a broad rather than a narrow base.

Cost and Demand Conditions

There are several aspects of the cost and demand conditions that are relevant to the later discussion that it is useful to summarise at this stage. Terminals are congestible facilities, rather like roads. Additional throughput can be achieved with a unit of given capacity at the cost of greater delays and crowding. While there may not be exactly constant returns to scale, prices set at marginal cost will approximately cover costs in the long run. With runways and associated facilities, the situation is different. There is a large sunk cost associated with the provision of the facility and marginal operating costs are low until there is a large throughput, not achieved by most airports, when capacity is approached and congestion develops. At this stage marginal costs are high. Efficient rationing prices may yield revenues much higher than costs. For all but busy airports there will be a cost recovery problem.

A further complexity arises in that there are investments that will improve the quality of the service provided (e.g. more taxiways) that will involve a sunk cost, but will have low operating costs — marginal costs may be close to zero. However, as traffic increases, it will be worthwhile to make more of these investments. There will thus be a correlation between traffic and total cost, but strictly speaking, marginal cost will be very low. Airports are capital intensive facilities, and involve large sunk costs, and relatively low operating costs, and only the very busy ones are subject to significant runway related congestion costs.

Demand conditions mean that the cost recovery problem can be resolved relatively efficiently. Airports have strong local monopolies, and demand elasticities are regarded as being very low. Prices well above marginal cost are not likely to be very distorting. Cross elasticities between different periods may be much higher, though there is little empirical evidence on them — airlines will be much more willing to switch to another period if the price for use in a period is raised rather than not use the airport at all. The down side of this is that the airport will possess very considerable monopoly power, and this poses a regulatory problem. Competition between airports is rarely likely to be strong.

Another pertinent aspect of demand is that there is a strong complementarity between "aeronautical" and "non-aeronautical" services. The former would involve runway use and baggage handling and the latter would involve such services as car parking and in-terminal retailing. Often airports attempt to maximise profits on the latter to keep aeronautical charges to a minimum.

These demand conditions usually mean that it is easy for airports and airport systems to cover costs, and sometimes earn high rates of return. Quite efficient performance, in terms of productive efficiency, price structures and investment programs, is feasible. However because airports can easily meet revenue requirements, and face no effective competition, and there is no pressure for them to actually be efficient. The problem is not one of characterising efficient behaviour, the task that economists have devoted most of their efforts to and solved adequately, but rather one of creating an environment in which the airport is either forced to be efficient, or has the incentive to seek efficiency. There has been little attention given to this.

Resolving Specific Problems

There are ways in which each of the problems identified can be addressed. In this section, the preferred solutions are outlined.

Productive efficiency will tend to be sought by a profit maximising firm. Granted that airports have considerable market power, it is unlikely that they would be permitted to maximise profit. They could be given incentives to maximise other objectives if they are public enterprises — if they can be given an incentive to maximise overall welfare, and if so they would seek productive efficiency. There have been mechanisms designed to give public firms incentives to maximise the sum of producers and consumers surplus (see Finsinger & Vogelsang 1982; Train 1992) and these would lead them to seek productive efficiency. However the airport problem is not simply one of monopoly power and such mechanisms would be insufficient — they would not capture the externality aspects, for example. In addition, these mechanisms have yet to be operationalised.

The solutions to the cost recovery problem are well known. An enterprise can use Ramsey prices, which are related to the inverse of demand elasticities to minimise the deadweight losses from achieving the revenue requirement, or they can use a non uniform pricing system, such as a two part tariff to achieve it, or they can use a combination of both of these (see Brown & Sibley 1986). In the airport case, it is a simple matter to approximate Ramsey prices by relating prices for runway use to aircraft weight, which is a proxy for the inverse of elasticity. This is done by the FAC and by most airports around the world.

There are complications that can arise. One relates to the presence of lumpy investments. When a major investment is completed, capacity may be ample, but overall costs increase. To cover these costs it will be necessary to increase charges, which have the effect of discouraging use at the very time that capacity has become ample and marginal costs are very low.

Caution has to be exercised in applying Ramsey prices to an intermediate product. They will distort factor choices by the firms using them — in general it is efficient not to tax intermediate products (see Heady 1993). This is especially true when the final products are taxed. In the case of air travel, this is not taxed directly in Australia, though it is subject to fuel taxes. When the final good is not taxed, there can be a case for taxing the intermediate good (Feldstein 1972). In practice, these complications mean that it is not possible to be confident that in designing a price structure for airports a perfect result will be achieved.

There is also the issue of how high the price level should be. If the airport is government owned, and the marginal cost of public revenue is high, then it might be efficient to set prices for airports well above cost recovery levels, because the deadweight losses from doing this will be low and the revenues can be used to reduce more distortionary taxation. As discussed above, if taxes are to be levied, it would be preferable to levy them at the level of air transport. Typically governments have not used airports as major revenue sources, as they have in the case of fuel for surface transport.

Cost recovery is one aspect of the problem of setting the level of prices for airport use. If the airport is privately owned, or is corporatised and given incentives to seek profit, there will normally be no problem of cost recovery — rather the airport will use its market power and set prices that are well above costs. The problem will be one of how to restrain prices, and some form of regulation will be a solution. It would be possible to use rate of return regulation, which is essentially cost plus regulation and which severely weakens the incentives for the firm to be productively efficient. The alternative, which is usually preferred now, is price capping or CPI-X regulation. This has more desirable incentive properties, though, as will be argued later, it has some undesirable features which are important in the airport context.

Many of the pricing issues in airports are straightforward. Terminals are simple to price — additional passengers impose additional costs and charges can be levied on the basis of throughput as they are in many airports (for example Cairns and the London airports). It is possible to take externalities into account when determining price structures — for example, higher charges can be levied for noisier types of aircraft.

Most of the attention on airport pricing has been focussed on the problems that busy, congested airports present. Large city airports often have capacity which is below the amount of traffic which would like to use them, especially at peak times. Sometimes this capacity is rationed by non pricing means, sometimes it is priced, but often it is rationed by the most inefficient mechanism of all, namely congestion in the form of delays. There are at least two ways of characterising the pricing problem. Some see it as a congestion pricing problem, similar to the road pricing problem, where it is a matter of setting a toll such that an additional user faces the additional congestion cost that it creates (see Carlin & Park 1970). This would be an appropriate way of viewing the problem if additional congestion was the price of enabling extra traffic to be served. However it can be argued that delays at airports are primarily rationing devices, and do not enable any substantial increase in throughput. If so, the problem is primarily one of allocating scarce

capacity as efficiently as possible. If a pricing solution is to be adopted, it is a matter of setting a market clearing price for each period.

Genuine price solutions to the capacity rationing problem at airports are rarely used — an exception is the peak surcharge at KSA. Quantitative mechanisms, such as slot allocation systems, are much more common. The capacity of an airport is declared for particular periods, and slots are given to users, or to groups of users who will allocate them amongst themselves, or they can be auctioned to the highest bidder (see Amos & Bullock 1979; Department of Transport and Communications 1990; Mills 1990). A disadvantage of the pricing solution is that demand for use in a particular period tends to be variable and uncertain — to equate demand with capacity, it will be necessary to vary the price from day to day, and the airport will need to have very good information about demand to set prices correctly. A quantitative solution can resolve these problems efficiently if slots are auctioned or are freely tradeable amongst potential users. Most airports which have tackled the scarce capacity problem have done so by using a quantitative mechanism. For example, the London airports are quantity constrained — while there are "peak" surcharges, these have little or no allocative function, and they are essentially revenue raising devices. Market clearing prices for London's airports would be enormous.

The resolution of the quality-cost trade-off is not a difficult one for firms that are in competition or are monopolies. Higher quality will add to cost, but it will push the demand curve upwards, and the firm will be able to recoup the additional costs if the extra quality is warranted. Monopolies will have an incentive to consider quality, as they can gain higher prices if they improve it, though they may not exactly optimise it (see Spence 1975). Quality problems arise in a regulated environment. With rate of return regulation, the firm may go in for "gold plating", knowing that extra costs will be recouped in higher prices. Price capped firms have an incentive to lessen quality. Costs will fall if they do so, and while demand will fall as a result of the lower quality, they will only lose a small amount of revenue from this (see Rovizzi & Thompson 1992). This is illustrated in Fig. 1. The firm is subject to a price cap of \bar{P} . Initially it is producing with a marginal and average cost of MC_1 and facing demand of D_1 . An improvement in quality will raise average and marginal cost to MC_2 and it will shift the demand curve up to D_2 . In the case shown, the gain in consumer's surplus exceeds the increase in cost and the quality improvement is welfare increasing. However the firm faces a reduction in profits, in this case to zero, and it will not make the improvement. Thus it will under provide quality. It will be necessary to monitor quality and perhaps regulate it, or give the firm specific incentives to take it into account. This could be done by making the tightness of the price cap conditional on the quality achieved. With airports a major problem is one of devising appropriate indicators of quality.

In theory, the investment appraisal issue creates no problem — all that needs to be done is a cost benefit analysis. These are now common for major airport investments, and the techniques have become well established. The difficulty arises in giving the airport enterprise an incentive to base its investment decisions on them — this is discussed further in the next section.

Airports can have a considerable influence on the way competition at the air transport level works out. Ideally all potential and actual users would have access to the airport's facilities at the same prices, unless the government wished to encourage competition by advantaging some competitors at the airport level. The access problem can be quite a complex one (see Forsyth 1992) and the best way of handling it depends on what the objectives of the monopoly are — a profit maximising firm may behave differently from a size maximising firm. A regulator can specify that all users be charged the same prices, and be given equal access. It is difficult to do this when capacity is at a premium, and established users claim that they have "grandfather" rights or a scheduling committee is used to allocate slots (see Mills 1990). There have been many bitter disputes over which airlines can use London's Heathrow airport. Apart from this, many of the dealings between the airport and an airline are highly specific, for example about specialised services, and they are difficult to regulate. There is still scope for the airport to treat some users preferentially.

Finally, the issue of the optimal corporate structure for airports is one that has not been given very much attention, though it was an issue when the British Airports Authority was privatised (see Starkie & Thompson 1985). The FAC has argued that there are scale economies in financing, and economies of scope in operating a network of airports (FAC 1993). These may exist, though they are not likely to be large — in the U.S. networks of airports are rare, and if these economies were large, one would expect to see more of them.

However, there is a valid case for having a group of airports financed together if a cost recovery constraint is to be imposed. If Ramsey pricing is to be used, the deadweight loss from meeting the constraint will be lower if it is spread over a wider than a narrower base. Having each airport cover its costs would result in larger deviations from first best prices than if the constraint is imposed on the whole group. This will be especially true when lumpy investments are made at individual airports, as is the case. Individual airport cost recovery constraints would require large rises and falls in prices, lowering them when marginal costs are high and raising when they are low as a result of investments in capacity. Granted that the cost and demand conditions at different airports vary, with some busy and capacity constrained, while others are only lightly used, it will be efficient to have some incurring losses, while others are earning profits. This will not be cross subsidisation in the economic sense, as long as prices are set at or above marginal cost.

Thus the system of pricing that the FAC adopts across its network can be justified, though not using the arguments that the FAC itself has used (FAC 1993). If marginal costs are low for most airports, except for the busy ones like Sydney KSA, and demand elasticities from airport to airport are not expected to vary systematically, a good approximation to Ramsey prices will involve the same prices for each airport — this will result in losses at some airports and profits at others. Prices at busy airports will need to be higher than at others if they are to perform a capacity rationing function. While there are advantages in recovering costs over a broader rather than a narrower base, it is not clear how large they would be. The additional deadweight losses from taking an airport

out of the system may not be very large if demand elasticities are low, as is probably the case.

Conflicting Solutions: Inconsistencies Between Policies

There are several efficiency aspects to airports and none of these is unique to airports. Each of these problems has a solution, which may be more or less satisfactory. The difficulty with airports is that these solutions interact, and the solution to one problem makes other problems worse. This happens with other industries, though the conflicts with airports are particularly difficult to resolve. Some of the more tricky issues are dealt with in this section.

It is not always the case that solutions to efficiency problems conflict. Quite often, a particular policy can address a number of difficulties. Take, for instance, price caps. These may be implemented to constrain the use of market power. They can result in prices being close to costs, they can preserve incentives for the firm to be productively efficient and they will result in profit maximising firms choosing efficient price structures. They are not a complete solution however, as they introduce an incentive to choose sub optimal quality.

As there are many possible conflicts, it is necessary to narrow the scope of the discussion somewhat. It will be taken that one objective of the regulatory framework is to restrict the use of monopoly power by the airport. The government desires that prices for use of the airport to be set below the profit maximising level, which would most likely be very high. It can do this in several ways. One of these is to give the airport an incentive to maximise profit by privatising it or corporatising it and relating rewards to public sector managers to profit; however it will be necessary to constrain pricing behaviour by some form of regulation. In much of this discussion, price caps will be assumed, though rate of return regulation is a possibility, and it will be referred to in places.

An alternative would be to relate managerial rewards to an indicator of overall welfare (Fingsinger & Vogelsang 1982; Train 1991). This is an interesting approach, though it has not yet been operationalised and it would only resolve one of the problems that have been identified, the monopoly pricing problem. Another solution is to set rate of return targets for a public airport, but to subject it to price caps. This is the approach that has been adopted with Telecom, and it may be the direction that the government is moving in with the FAC. In some respects it is like a weak version of privatisation.

(a) Price Caps and Quality

This conflict has already been referred to, and the basic idea is straightforward. With airports that are not busy, there will be a tendency to provide minimum facilities, since the airport owners cannot gain by offering better facilities, even though they can be justified on cost benefit grounds. Better facilities will mean very little additional traffic, and no higher price. Airlines and their passengers will simply have to bear the costs of inadequate facilities themselves.

With busy airports, the same conflicts arise, but in addition, there is the issue of how much capacity to provide. If prices are capped, more capacity can lead to less congestion — but is there any incentive for the airport to provide the appropriate level of capacity? This might be regarded as a quality issue, but there are further dimensions to it that are explored below.

(b) Price Caps, Capacity Rationing and Investment

Consider a busy airport, like Sydney KSA, which would be subject to excess demand, at least during some periods of the day. At some stage, additional investment to increase capacity will be warranted. However, to control its use of market power, it is price capped. The problem is one of designing price caps that allow efficient pricing in the short run, and also give the airport the incentive to invest when appropriate.

If the price cap is set high, as with \bar{P}_1 , in Fig. 2, the airport can charge an efficient, market clearing price, P_1 when capacity is restricted to OX_1 in fact it will charge P_1 . In the long run, this is less than the optimal level, OX_3 , shown by the intersection of the demand curve and the long run marginal cost, LMC. The problem is that the airport has no incentive to make the investment to increase capacity, since it is already being constrained to charge less than a profit maximising price, and reductions in price to increase traffic will only lower its profits. Thus an efficient price cap in the short run will result in insufficient investment in the long run (unless, implausibly, the price cap is set above the long run profit maximising price).

Alternatively, the price cap may be set low, as with \bar{P}_2 . Demand will exceed capacity, and it will need to be restrained in some way. This could be done inefficiently, by congestion, or efficiently, if airlines trade slots to use the airport freely. In the long run, there may be an incentive to increase capacity towards the optimal level, OX_3 . If the airport is subject to the price cap \bar{P}_2 , it will find it profitable to expand output to OX_2 , a little short of the optimal level. This is not the end of the matter, however. There are several periods in the day, and demand may not be excessive in all of them. Excess demand in one period is served in another. By expanding output so that peak demand can be accommodated, the airport may gain little additional revenue (peak prices may deter some low value users — see Mills 1982). Much of what additional capacity succeeds in doing is shifting demand from one period to another — while this is desirable on welfare grounds, it will not be profitable for the firm. In a price cap environment, to a firm to find it worthwhile to invest, it is necessary that output increases, and that the additional profit exceeds the cost of the investment. This will not happen with a tightly price capped airport.

This type of result is possible if congestion is present. Again the key issue is whether an addition to capacity leads to an increase in output. This is possible whether congestion is efficient, in the sense of it being the price of additional throughput, or it is inefficient, in the sense that it simply functions as a rationing device and does not enable any more output. In the airport case, investment in extra capacity may result in less delay, but it is likely to result in only a small addition to output, and the incentive to invest for the price capped airport will be minimal.

If there is a rate of return target without a price cap, there will be neither a positive incentive to undertake worthwhile investments nor a disincentive. When a price cap is imposed on such a firm, there will be a disincentive to invest, since investment will add to costs but it will not add to revenues. When there is rate of return regulation, there will be an incentive to over invest, since the cost of investment can always be recouped, and the larger the capital base, the greater the aggregate profit.

Price caps have been shown to possess several desirable features, but when imposed on airports, they will distort investment choices. For many busy airports, and in particular those that are busy for only part of the day, additions to capacity will result in little addition to output, and thus they will result in little addition to revenue. They may be worthwhile in that they enable users to be served when they want to and they may result in a reduction in congestion. Unless an airport is so busy that extra capacity enables more users to be served, and some like London Heathrow are in this category, capacity increasing investments are primarily quality improving investments, in that they change the time of service rather than anything else. It is not possible to rely on price capped profit maximising airports to make efficient investments in increasing capacity.

(c) Cost Benefit Analysis and Investment Appraisal

Quite apart from the issues discussed above, it will normally be desirable that airport investments be subjected to cost benefit analysis — this is especially true of large investments. Airports often involve a wide range of external effects, from noise, urbanisation effects, to environmental impacts and it is appropriate that these be taken into account. The PSA, in its recent report, considered that it was a deficiency of the FAC's investment appraisal that it only took into account financial aspects (PSA 1993, ch. 12).

The problem is that it is very difficult, if not impossible, to create an environment in which an enterprise has an incentive to make investments according to cost benefit criteria. This will be true for a profit maximising enterprise, but it will also be true for one which is given incentives to pursue broader objectives, such as the sum of producer's and consumer's surplus. Cost benefit analysis involves making an estimate of the overall impact on welfare. It is not feasible to ensure that the enterprise "maximises welfare" in any operational sense. It would be possible to give the enterprise incentives to maximise profit measured at shadow prices, but this would require that it is possible to specify all relevant shadow prices in advance. For some types of problem this might be possible, but it would not be possible for airports. One of the main aspects of cost benefit analysis when applied to airports is that it is a process of finding out what the effects of the investment are, and also a process of finding ways to evaluate them. It is not possible to conduct analyses by using "off the shelf" shadow prices.

The PSA's comments on the FAC's investment appraisal need to be seen in the light of the discussion here. While it is desirable for the FAC to use thorough cost benefit analysis in the assessment of its projects, it does not face incentives that would induce it to do so, and it will be a very difficult task to devise an environment in which this is the case.

(d) Other Conflicts

One concerns the conflict between profit and keeping worthwhile airports operating. The FAC operates several unprofitable airports, and as argued above, there is a case for both profitable and unprofitable airports to be incorporated under the same cost recovery umbrella. If the FAC has a profit maximising objective, it will have an incentive to dispose of the unprofitable airports. While it may not be able to sell these airports to other buyers, it would have an incentive to close them down. If it is not permitted to do this, as is likely to be the case, it would have an incentive to minimise investment and standards at such airports.

A second arises with terminals. Many of the same points made above about the incentives to invest in runway related facilities can also apply to terminals when there is price capping. By investing in terminals, delays and crowding can be reduced. An airport may have specific terminal charges, but if all prices are capped, the FAC will gain little additional revenue from such investments, as lower prices will not lead to a significant increase in throughput since overall elasticities for the use of the airport are low. While there are other arguments for having FAC provided terminals, in particular to ensure that new competitors have access to facilities, there is a case for allowing airlines to build and operate their own terminals, as is the case with the domestic airlines at several airports. Airlines will be able to choose the appropriate capacity and standard of terminal to suit their needs, and there will not be a problem of under investment. If there is rate of return regulation, there will be an incentive for the FAC to provide excessively high quality and expensive terminal facilities.

A third conflict arises with externalities. Noise can be a considerable problem at airports, and there is a good case for charging noisy aircraft more to use the airport than other aircraft. Under most incentive structures, the airport would not be interested in setting charges to limit externalities like noise. This may be a relatively easy conflict to resolve. If the government or regulator relates incentives, such as the tightness of the price cap, to the noise generated by the airport, the airport will have an incentive to charge according to the noise created by users.

Finally there is the question of how a profit maximising but price capped airport will act in relation to its airline users. An unregulated airport will have an incentive to allow equal access to all potential users, but to also extract as high a price from them as possible. It will not have any interest in adding to competition at the airline level however. By contrast a price capped monopolist may have some incentive to promote competition at the airline level because such competition will tend to reduce fares and encourage air travel, thus adding to the demand for the airport's services. This is a complex issue that has not been given very much attention, though it is a potentially important one, since what goes on at the airport level has a major bearing on how airline competition works out, as the U.S. experience shows. It is important not to let the locational monopolies of airports limit competition in the quantitatively much more significant airline industry.

Choosing the Best Ownership/Regulatory Environment

With many industries, it has been possible to devise microeconomic reforms that are both practical and achieve most of the efficiency gains. The domestic airline industry has been deregulated, and while the level of competition is not as high as could be desired, the performance of the industry has improved significantly (see Smith & Street 1992). The telecommunications industry has been subjected to major changes, though there has not been the maximum use made of the scope for competition. The structure, of corporatised or privatised enterprises subjected to price caps and quality monitoring, creates an environment which is conducive to efficient performance. With airports, it is much more difficult to devise an environment which achieves efficient performance in all of the dimensions that have been identified. In particular it is very difficult to create an environment that leads to the enterprise responsible for airports to choose efficient levels of investment and appropriate levels of quality.

At present, the FAC is required to achieve a rate of return target; it has strong monopoly power, and scope to charge prices which enable it to meet its target, though it is subject to prices surveillance by the PSA. It can be argued that it has chosen a good price structure (though this disputed by some such as the PSA). To an extent this structure has come about because of direct government intervention — in particular, the peak pricing policy at Sydney KSA was imposed upon it. In terms of productive efficiency, it is probably a reasonable performer, though there is little available evidence on this issue. There are serious difficulties with its investment analysis. Major investments, like the third runway for Sydney KSA, are assessed by the government, which is appropriate given that they raise many matters that would not be of direct concern to the FAC with its commercially oriented charter. Its assessment of smaller investments is a matter of controversy — many claim that it is over investing and providing a higher level of capacity and quality than is warranted on economic grounds. (This is what would be expected of an enterprise which has market power and which, while not expected to maximise profits, but which is required to meet a rate of return target.)

It would be possible to conceive of many changes to the ownership/regulatory environment for Australia's airports. Some are much more likely than others though. A move towards more extensive corporatisation, with a greater emphasis on profit is one possibility. In the longer term, privatisation is an option. If either of these comes about, some form of more explicit price regulation is likely, and this would probably take the form of price capping rather than rate of return regulation. Such an environment will change the incentives for the FAC to pursue the various aspects of efficiency.

It will give the FAC a stronger interest in seeking productive efficiency, and it will reinforce the incentive to charge quasi Ramsey prices. It will sharply alter the incentives with respect to investment, and it will induce the FAC to under provide facilities, rather than over provide them, as some have suggested that it does presently. As much investment has the effect of improving the various dimensions of quality, such as service at the preferred time, and relatively little effect in most cases on output, the FAC will have little to gain from making these investments if it is price capped. In fact it will have an incentive to under provide any dimension of quality which is costly to provide, not just

those dimensions of quality which require investment. It will probably offer access on equal terms to all potential users, and it will be unlikely to give preference to existing users and thereby lessen competition. It will be keen to dispose of its unprofitable airports, and to the extent that it is required to keep subsidising them, disputes with the government will arise.

Granted all this, it is not likely that reforms of this type will hold out the prospect of "light handed regulation" and the opportunity for the government to turn its attention away from airports. To ensure that the airport system performs tolerably efficiently, the government will need to continue to intervene as a regulator or in a monitoring and perhaps a decision making role. Areas which will need attention are:

- (a) Investment Appraisal. It is clear that major proposals will need to be subjected to cost benefit analysis, and the FAC will not of its own accord undertake these. Such analyses would probably be continued to be performed by the government. Smaller investment projects pose a problem, since many would be unattractive to the FAC even though they are worthwhile. They will have to be evaluated and when they are worthwhile, some means of inducing the FAC to make them will need to be devised. In some cases, the airlines themselves will be keen to make them, and if so, they will need to be given the scope to do so.
- (b) Rationing of Scarce Capacity. It has been argued that price capped airports may not have the scope and incentive to price or otherwise allocate scarce peak period capacity at busy airports efficiently. It is important to ensure that wasteful delays do not build up. There are several ways in which this can be done. Capacity can be declared, and slots allocated and freely traded. Alternatively they can be auctioned — this could be done by a body other than the FAC, or it could be done by the FAC and revenues from this source can be excluded from the price cap. In Britain there are price caps on the major airports, and there is excess demand, but this is rationed by quantitative mechanisms such as slot allocation.
- (c) Quality Incentives. Many though not all dimensions of quality can be monitored — this will need to be done. It may be desirable to go further than this and incorporate incentives to maintain and improve quality through the price cap mechanism. For example, reductions in quality could result in a tighter price cap being set.
- (d) Externalities. If these are important, it will be necessary to regulate them directly, or give the FAC incentives to address them itself. This can be done through adjustments to the price cap mechanism.

This may seem a complex process and a long way away from the simple and light handed regulatory environment that has been possible to achieve with many other industries. What it is doing is recognising the complexities that exist with airports — these are often ignored, which is one of the reasons why the performance of airports around the world is often regarded as unsatisfactory.

Conclusions

It is difficult to devise an incentive / regulatory environment for airports which is practical, simple and promotes efficiency. No country has come up with a clearly superior system though some experiments like the British one of private airports that are subjected to several forms of regulation may turn out to be quite successful. The problems are inherent in the nature of airports. While they do not involve any especially unique problems, they incorporate a combination of problems that are difficult to deal with simultaneously. The solution to one problem makes another problem worse.

This can be seen best when the issues of investment in capacity and improvements in quality are considered. If the system of regulation which is usually preferred, that of price caps, is adopted, the airport will face incentives to downgrade quality and under invest. The effect on quality is well known, but the effect on investment is also a major problem. This is because in the airport context, much of the effect of investment is to improve quality, broadly understood. Such investments may be warranted on efficiency grounds, but the price capped airport will not have an incentive to make them, because they will add little to its revenues, and subtract from its profits.

It is possible to improve on the environment within which the Australian airports operate, so that the problems that have been identified are addressed. However all of the more obvious simple reforms will introduce their own problems. It will be necessary to address these explicitly if overall performance is to be improved. Inevitably, a good incentive/regulatory environment for airports will require more extensive monitoring and perhaps regulatory devices than are usual for most industries.

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