An Analysis of the Trade-Offs in International Aviation Rights.

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Abstract:

In recent years the Australian Government has made substantial progress in reforming the aviation industry. Most people are aware of the gains, most notably the cheaper air fares, that have resulted from enhanced competition in the domestic market. However, less scrutiny has been levelled at the Government's international aviation reforms. This is in part because they are more recent and some outcomes such as Ansett's entry onto the international stage are only beginning to eventuate. But they are no less important than the domestic reforms.

Given this background we are interested in determining what the possible implications are for the net national benefit if our air services agreements were liberalised.

To this end we are constructing a computer-based model which could be used to assist in the evaluation of net changes in Australia's economic welfare as a result of changes to air services agreements. We discuss the economic framework for our model, its structure, and our estimation of key model parameters. We then report the results of running a prototype of our model for a number of 'cases' in which we modify key characteristics of a hypothetical Australian air services market. We use these analyses to demonstrate the nature of the trade-offs that would occur if the air services agreement covering this market were extended. We estimate the distribution of welfare gains and losses between Australia and the global community, and between Australian air travel consumers, airlines and tourism operators. We also demonstrate how these trade-offs will change depending on certain key characteristics of the market.

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1. INTRODUCTION

International airline services throughout the world are established and operated within a complex network of air services agreements negotiated mainly on a bilateral basis between individual countries. These agreements cover such things as who can operate a service, how much capacity is allowed, what routes can be flown and what freedoms[1] are allowed to airlines. Australia is part of this worldwide network and has many bilateral air services agreements with foreign nations.

These bilateral agreements are not static. Developments continue to occur in aviation markets that become stimuluses for changing air services agreements. For example, the Australian government's aviation policy development in 1992 (Collins 1992) has led to the phased entry of Air New Zealand into Australian 'beyond' markets, and has also generated the need to negotiate multiple designation rights under certain air services agreements as Ansett commences international operations. There are also the oft occurring and varied requests, instigated by foreign airlines, for increased capacity rights or enhanced access to elements of the Australian market.

The impetus to change air services agreements is ever apparent, and comes not just from the desires of airlines or aviation policy makers. Calls for change have also come from organisations such as the Industries Assistance Commission (1989) and the Business Council of Australia (1993), and from commentators such as Filmer and Dao (1994) — Filmer and Dao identify international aviation reform as the second biggest ticket item in a list of estimated savings achievable from microeconomic reform of the transport industry, projecting a saving ranging from zero to as much as $1110 million per annum.[2] Clearly there is scope for refining such estimates, both in an aggregate framework and even more interestingly, within a market specific context. Given Australia's air transport regulatory framework of bilateral agreements, what would be the net benefit to Australia of changing a specific air services agreement?

This is a question that should not be treated lightly, as there are potentially large gains or losses to Australia's international airlines, consumers and the tourism industry from changing existing agreements, gains and losses which are both difficult to measure and which interact with each other in complex ways. For example, a change can affect the symbiotic and competitive relationship between the airlines and tourism in so far as the tourism and airline industries depend upon each other to create and meet consumer

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[1] Freedoms refer to the international aviation rights of passage and are described in Appendix A.

[2] It is interesting to note that the basis for this figure of $1100 million is simply the multiplication of an across the board 20 per cent price reduction of Australian inbound and outbound air fares by the total expenditure on air fares to and from Australia in 1988. The pronounced 20 per cent reduction in price was based on an IAC (1989) estimate that Qantas' air fares were on average 20 per cent higher than other airlines and the costs of other airlines were 70 per cent of Qantas'. The numbers were subsequently disputed by Qantas and hence Filmer and Dao set the other end point on their sliding scale of benefits to zero.

demands, but compete with each other for a share of the tourist's dollar. The issue is one which Dwyer and Forsyth (1992) refer to as the 'aviation–tourism' conflict. They say: "the issue is a complex one involving a host of trade-offs, for most of which there is little empirical assessment".

Moreover, these gains or losses can be considered from different perspectives. For example, it may make economic sense, from a global viewpoint, for Qantas[3] to cease operations in a particular market if a foreign airline were able to operate in the market more efficiently. Or it might be 'globally' beneficial to increase competition in one of Qantas' markets, with the aim of stimulating price reductions and making travel cheaper for consumers. Yet, from a national perspective, if the market is dominated by foreign travellers do we want to reduce any profits which Qantas may be earning from carrying these passengers?

Questions of this type are likely to be faced in the future by aviation policy makers, who will require access to a sound framework within which to analyse the complex web of trade-offs. We have contributed to the construction of this framework by building a counterfactual partial equilibrium benefit–cost style model which can be used to abstract from the changing aviation market scene, focus on the issues under consideration, and evaluate the net effect on a country's economic welfare (its net national benefit) of changing air services agreements.

In following sections of this paper we discuss the economic framework for our model, its structure, and our estimation of key model parameters. We then report the results of running the model for a number of 'cases' in which we modify key characteristics of a hypothetical Australian air services market. We use these analyses to demonstrate the nature of the trade-offs (between Australia and the global community; and between Australian air travel consumers, airlines and tourism operators) that would occur if the air services agreement covering this market were liberalised, and we demonstrate how the trade-offs change depending on the characteristics of the market.

2. THE MODELLING METHODOLOGY

Related studies

Other authors have looked at the costs of air transport regulation, or conversely, the gains to be made from liberalisation. One such study is that by Gillen et al, 1990. In this paper the authors model the potential gains which might be realised from a liberalisation of the Canada-USA air services agreement. The specific characteristics of this market lead them to focus on route and hub access issues as being the principal barriers to transborder competition. To do this they construct a trade in services model that focuses primarily on frequency competition and uses game play between non-cooperative profit maximising airlines to determine competitive equilibria

[3] We really mean an Australian airline but clearly Qantas will be the dominant Australian owned airline for the foreseeable future.

outcomes. Simplifying assumptions remove price-based competition and make passenger demand exogenous to the model.

Another interesting study, and a little closer to home, is one by Dwyer and Forsyth, 1991. In this study the authors examine the case for Australian Government support for tourism promotion. They construct what is essentially a benefit-cost model of Australian tourism demand and supply and use this to examine the outcomes of tourism promotion in both an undistorted and a distorted economy. Although their results are very tentative given a paucity of data, their analysis suggests that promotion expenditure by the government would produce net benefits using this benefit-cost criteria.

We have also chosen to use a benefit-cost framework in this study, although its scope attempts to capture the aviation industry as well as tourism. This framework is discussed in detail in the following section.

The economic framework

The model works within a partial equilibrium benefit–cost framework and determines the gains and losses in economic welfare experienced by the following groups:

- air passengers who face air fare and service quality changes as airlines increase or reduce services;
- airlines which experience changes in market share, the number of passengers carried and their revenues (or yields, as known in the industry) as a result of changes in the level of competition; and
- Australian tourism operators, whose profits vary as the number of overseas tourists visiting Australia change and Australians substitute international for domestic tourism

These economic welfare gains and losses are summed for each country and an estimate of the change in a country's net national benefit is thus obtained

Measuring welfare change for air passengers

We measure welfare change for air passengers as a change in consumer surplus. An individual's consumer surplus is defined (roughly) as the difference between the full price[4] which the traveller is willing to pay for travel and the full price actually paid.

In figure 1 the air fare which was paid in the base case is represented by P and the corresponding level of demand for airline travel by Q. The line D represents the demand relationship between the air fare and the number of airline passengers. A service quality

4 We assume airline travel involves two costs to the passenger: the cost of the ticket; and the cost of time spent in waiting to travel and of any associated inconvenience or discomfort. The full price that a traveller pays for travel is the sum of these two costs. We assume the amount that individual travellers would be willing to pay for a reduction in this waiting time can be measured and that this is also the amount by which they are better off if flight frequency increases result in more convenient travel

improvement, such as an increase in flight frequency and hence available departures times, can be represented by a shift in the demand schedule from D to D*, and through the demand relationship, a corresponding increase in either demand to Q* or price to P* A reduction in air fares is depicted by a reduction from P to P**. If demand at price P has increased from Q to Q* due to the shift in the demand schedule from D to D*, a reduction in air fares from P to P** will further increase demand from Q* to Q**.

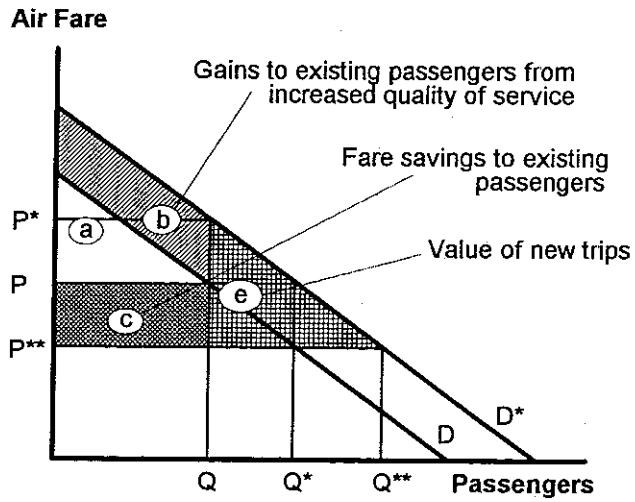

Figure 1 Welfare analysis framework for airline passengers

Aggregate consumer surplus in the base is estimated as the area under the demand curve D less the sum of the prices paid. This is depicted in figure 1 as the triangular area 'a', representing the sum of the differences between willingness to pay and what it actually cost to travel.

In the event of a change in the full price of travel, either in service quality (an increased number of services) or in air fare, those passengers who would have travelled in any event derive additional surpluses from improvements in the quality of service, depicted by the shaded area 'b', and from reductions in air fares, depicted by the shaded area 'c'. The shaded area 'e' represents the net consumer surplus of passengers who were induced to fly on account of lower air fares and/or improvements in service quality.

Measuring welfare change for airlines

We measure welfare change for airlines as a change in their operating profits. Specifically, we account for changes in profits arising from lower or higher air fares, lower or higher numbers of passengers carried in business and leisure classes, and increased or decreased expenditures on aircraft operations (including aircraft lease charges), passenger servicing and operation of terminal facilities.

We assume there is minimal scope for further efficiency gains to airlines although if such gains were deemed possible it would be an easy matter to incorporate them into the

model. The BIE (1994, p55) finds 'Australia's air fares and freight rates are lower than in many other regions as a result of both favourable route structures and airlines which operate relatively efficiently'.

We do not account for changes in profits due to an airline's increased or decreased ability to avail itself of opportunities elsewhere in its network — the general presumption being that an airline would have already taken advantage of such opportunities if they were more attractive than the ones under consideration. Nor can we account for any changes in tax liabilities or abnormal or extraordinary financing costs.

It is also possible that producers could realise gains from greater use of hubbing. For example, if Australia liberalised certain air services agreements such that the new regime allowed Qantas to, say, hub in Singapore and pool its South East Asian and 'beyond' traffic in the one place, then economies such as aircraft size economies could result as the airline put larger aircraft onto existing routes. We believe that existing air services agreements constrain the emergence of such strategies, but even so it is worth noting that our model does account for economies of aircraft size in that it assigns staff costs to individual aircraft types operated.

Measuring welfare change for Australian tourism operators

We define the gross welfare change for the Australian tourism industry as the change in profits which results from increases or decreases in the demand for tourism arising from modification of air services agreements. We measure this net welfare change by accounting for transfers between Australian tourists and the tourism industry and for the share of profits accruing to Australian owners of tourism facilities and service providers. Figure 2 depicts the basic welfare framework.

In figure 2, S and D represent how supply and demand schedules for tourism services respond to changes in the price of tourism (proxied by average expenditures on tourism per person).

D* represents the increased demand schedule for tourism (the increase in foreign visitors) which would result if air fares were reduced. D** represents the net increase after account is taken of Australians who respond to this reduction in air fares by substituting international for otherwise domestic holidays. The analysis will work in reverse if air fares are increased.

The total shaded area represents the gross increase in tourism industry profits as approximately measured by the existing number of tourists multiplied by the higher prices paid for tourism services. However, taking into account the amount which represents a transfer from Australian tourists to the tourism industry (area 'a'), and the amount of profits extracted from foreign tourists which is repatriated to foreign owners of tourism facilities (area 'b'), we arrive at area 'c' as the estimated net welfare gain (loss) [5]

[5]There is potential for further net welfare change as measured by the excess of willingness to pay over costs of production among the additional foreign visitors. However, there is also an offset; being the reduced willingness to pay of ex Australian tourists and assessment could be problematic.

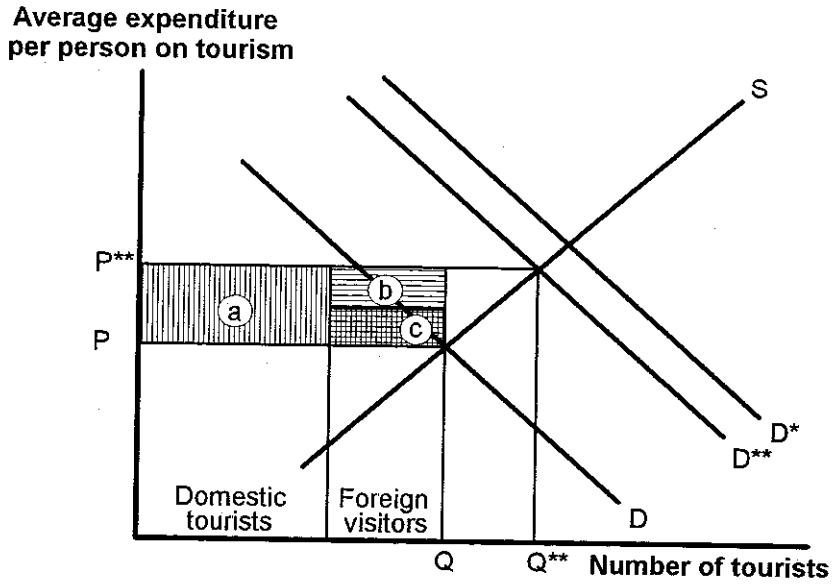

Figure 2 Welfare analysis framework for Australian tourism

Further areas where welfare change may occur

Rents earned by airline employees, airport ground staff and tourism industry staff would constitute a further area of welfare change. To the extent that these employee groups earn rents, competition induced airline cost-cutting, changes in the aggregate number of airline services through individual airports, and changing numbers of Australian tourism consumers may generate welfare gains and losses to the employee groups. However, in this version of the model we do not estimate these gains and losses.

As service frequency and prices change, participants in the air freight industry may also reap welfare gains or losses. Benefits could go to importers and exporters, to freight forwarders or be retained by shippers. However, to include this element of welfare change we would need, among other things, to estimate the degree to which prices faced by freight users will change as a result of changes to air services agreements.

We suspect that this element may not be as large as price changes to air passengers as Australia already has a liberal approach to freight charter approvals and multiple designation of freight carriers, and freight, when carried in the bellyholds of scheduled passenger services is the lessor value of the joint product. To expand the scope of the model in this direction would necessitate a complete study of the Australia-international air freight market, which although of interest, is currently beyond the scope of this paper.

The structure of the model

The model considers all services (direct and indirect) and origin–destination passenger flows within an air services market between Australia and another country. Also included within this market are the services and passenger flows stemming from 'third'

countries which form intermediate points between the end points of the market, end points being cities of trip origin and destination in Australia and the other country

Passenger types are separated into business and leisure and accorded different fares and demand elasticities

The model allows for multi-sector flights and distributes passenger demand between all alternate routing possibilities (direct and indirect) for an origin–destination city-pair. For example, a traveller flying Sydney to Hong Kong could fly direct or on a two sector flight via Bangkok. Any number of airlines and flights between cities can be entered by the user, and any aircraft type for which we have the operating characteristics can be used in the model

There is insufficient space in this short paper to discuss in detail the discrete mechanics of how the model operates, so we have summarised the basic structure of the model in figure 3 below. Briefly, the sequence of operations performed by the model is as follows:

1 We define, and enter into the model a 'base' in which we specify route-by-route details of passenger numbers, airline capacity, market shares, and air fares which exist before any change is made to an air services agreement

2 The model performs 'base' calculations to determine the airline operating profits which exist before any changes to the air services agreement

3 We define a 'scenario' where, most often, we add capacity to a route or set of routes by allowing selected airlines to offer new services on chosen city-pairs. We also specify any consequent changes in air fares for these routes

4 The model estimates how much new demand is generated by these changes and distributes the total demand (base plus new) among competing airlines. The basic form of the demand equation is $Q_{demand} = f(airfare, flightfrequency)$

5 The model now estimates the magnitude of the change in consumer surplus, the change in tourism industry profits, and repeats the financial calculations for the airlines to determine a change in airlines' operating profits. These three categories of change are distributed to the countries to which they belong and net national economic welfare changes for individual countries are obtained

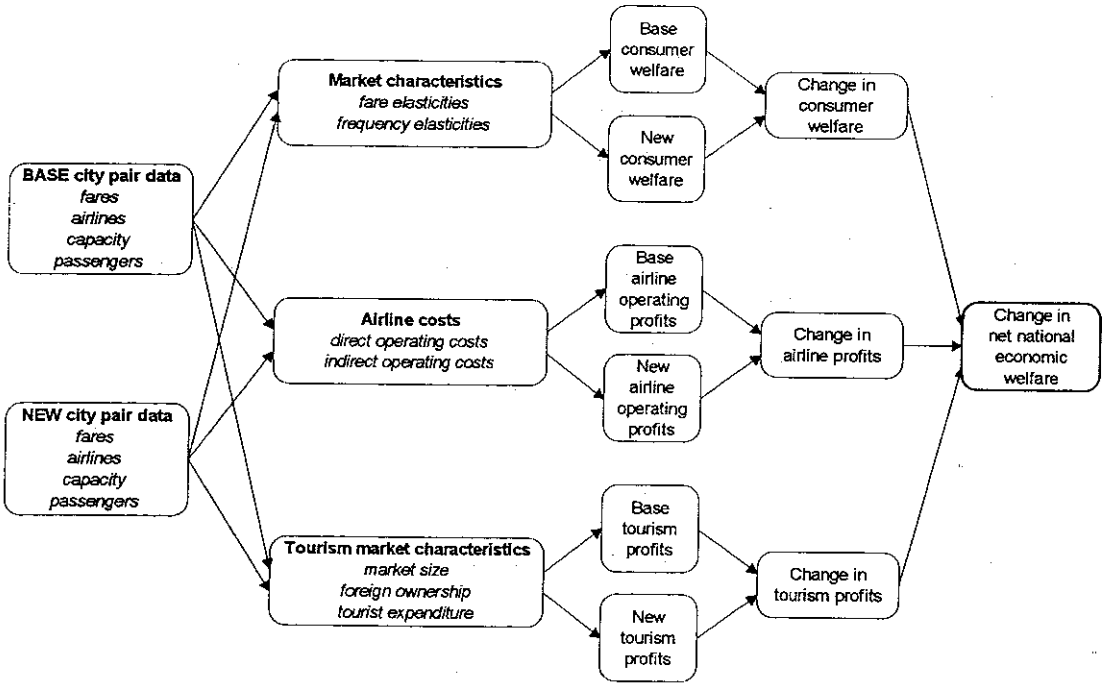

Figure 3 Broad structure of the model

Estimation of key parameters of the model

The model requires three key parameters to be estimated by the user These are: the degree to which an increase in the number of competitors results in a change in air fares; the air fare elasticity of demand; and the flight frequency elasticity of demand The latter two parameters are further broken down into separate estimates for business and leisure purpose of travel Unfortunately, space does not permit detailed reporting of the work we undertook to derive robust estimates of these parameters, and so what follows is a concise summary of our parameter estimates

How an increase in the number of competitors affects air fares

An essential element of our air services agreement liberalisation modelling is the assumption that a new airline(s) will enter to contest a route if previous access restrictions are removed Our a priori expectation was that an increase in the number of airlines operating a route would generally lead to a decrease in air fare on the route This was also consistent with the findings in BTCE (1993) which examined the Australian domestic aviation market after deregulation

In order to formally test this proposition we undertook an econometric analysis of international air fares to determine whether there was a relationship between fares and the degree of competition on the air route, assuming that the number of airlines operating on a route is a suitable proxy for the degree of competition The detail of this work is reported in Savage, Smith and Street (1994), however, for the purpose of this study we

are only interested in the results of the regression analysis which can be summarised as follows:

- an increase in the number of competitors on a route will lead to a reduction in air fares;
- the reduction in fares is greater for economy and discount fares than for business fares; and
- the addition of a new airline onto an international route will, on average, lead to an 8 per cent reduction in business class fares and a 16 per cent reduction in economy and discount class fares

Air fare elasticities of demand

The range of empirical estimates of the demand response to price in international aviation is quite broad We undertook an extensive literature survey of the topic and reviewed the work of Oum (1992), Poole (1988), BTE (1978), BIE (1982), and Crouch (1991) This survey indicated some pattern to the elasticity estimates in that business travel demand is consistently less responsive to price than leisure travel demand, but there was no apparent pattern with respect to journey distance or destination of traveller Based on these studies we have assumed that leisure travel is relatively sensitive to fare levels, with a price elasticity between -1 0 and -2 0, and business passengers being less price sensitive than leisure passengers have a price elasticity of -0 5 to -1 0

We use these 'average' estimates in this paper to demonstrate how the model may be applied in analysing a hypothetical market However, when we come to apply the model to specific markets we will hopefully have market specific demand elasticity estimates for both price and flight frequency The Bureau is currently undertaking a research project to update the set of demand elasticity estimates for air passenger transport in both the Australian international market and the domestic market

Flight frequency elasticities of demand

There is a range of factors that will influence the quality of service provided by airlines These factors include flight frequency, on-time performance, safety, in-flight service, and terminal facilities Given the difficulties associated with measuring many of these aspects of service quality we believe it is reasonable to use flight frequency as a proxy measure for service quality An increase in flight frequency will represent an improvement in service quality and vice-versa This is not to say that the other service quality attributes are not important For example, we know that an airlines safety record features in many a traveller's choice of airline However, the 'safety' of an airline is difficult to quantify and besides, we feel that this is not a characteristic of the market that is likely to change significantly under a liberalisation of an air services agreement

Compared to the available literature on price elasticities of demand, we found no studies that attempted to estimate the value of international frequency elasticity In the absence of econometric studies, the value of elasticity of demand with respect to flight frequency was based on our judgement of the likely response by passengers We felt that it is

reasonable to consider a flight frequency elasticity of the order of between 0 025 and 0 2. We assumed business passengers are more responsive to changes in service frequency, with an average elasticity of 0 15, while leisure passengers are assumed to be less sensitive, with an average elasticity of 0 05 This accords reasonably closely with the findings of Morrison and Winston (1986) who derived a business flight frequency elasticity of 0 21 and a leisure elasticity of 0 05 for the United States market

3. ANALYSES OF AVIATION MARKETS

In this section we discuss the results of using the model to analyse a range of outcomes of aviation market liberalisation We do not focus on actual Australian international aviation markets, but rather we look at a range of possible markets and examine whether liberalisation of these differently structured markets is likely to produce net benefits or losses to Australia This approach allows us to demonstrate that in liberalising a market there is no clear answer as to whether the liberalisation will produce net gains or losses to Australia, but rather that the likelihood of gains or losses will depend on a range of pre-existing route characteristics

The base result

We use our model to examine a 'typical' air services agreement between Australia and a hypothetical country X We assume three airlines serve the market between Australia and country X, one from Australia, one from country X and one from another foreign country We assume that capacity entitlements are fully used and that all airlines are achieving average load factors of around 70 per cent

We also assume: that the air passenger market between Australia and country X is comprised of 80 per cent foreigners and 20 per cent Australians; that roughly 20 per cent of passengers are travelling for business purposes and 80 per cent for leisure; and that passengers exhibit the 'average' elasticities of demand discussed in section two of the paper (business fare (-0 75), leisure fare (-1 5), business frequency (0 15), leisure frequency (0 05))

We then 'liberalise' the air services agreement, allowing unconstrained capacity expansion and the entry of new airlines In response to this we assume that one new (non-Australian owned) airline commences services, offering similar capacity as that of the Australian airline, resulting in a 30 per cent expansion of overall market capacity We also assume that all incumbent airlines remain in the market, and that the entry of this new competitor generates average fare cuts of 8 per cent for business class and 16 per cent for leisure and discount classes The welfare changes generated by this liberalisation are displayed in figure 4

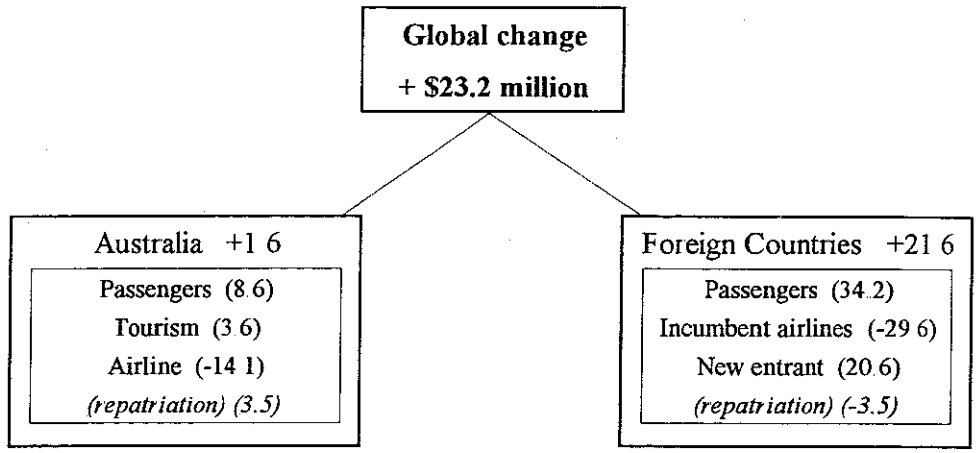

Figure 4 Base result — the welfare changes brought about by liberalisation of our hypothetical air services agreement between Australian and country X.

We can ask if this liberalisation is a good thing for Australia or not? Certainly airline passengers will gain, both from fare cuts and from flight frequency improvements, but Australia's airline loses[6] as a result of both reduced yields and lower load factors Also, what of the Australian tourism industry? Reduced fares might stimulate more travel, but the increase in inbound tourism is somewhat offset by Australians substituting domestic for international holidays.

In the liberalisation above, where we assume 80 per cent of travellers in the market are foreigners, Australian tourism comes out ahead But what if this proportion is lower than 80 per cent? At what point will the tourism industry experience a net welfare loss, and what are the counterbalances to this loss?

Case One. The number of Australians in the market

In case one we examine how the welfare trade-offs change as the proportion of Australian travellers in the market changes. We examine the same hypothetical market as in the above base analysis, retaining all parameters, but varying the proportion of Australians in the market from 10 per cent through to 90 per cent.

Figure 5 illustrates the welfare changes for the world and the trade-offs between Australia and foreign nations as the proportion of Australians travelling on the routes in this market is varied from 10 to 90 per cent Figure 6 then illustrates the trade-offs between different groups within Australia as these proportions are changed.

[6]Of course we are really interested in the Australian share-holding in Australia's airlines and so account for any repatriation of profit gains or losses to foreign owners.

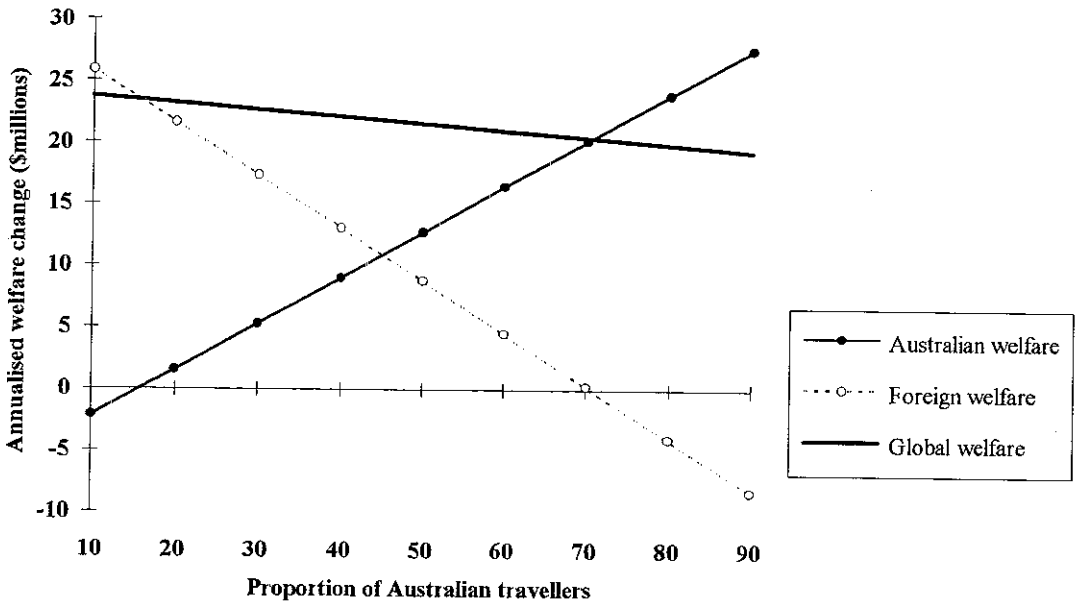

Figure 5 Case one: Aggregate annualised welfare trade-offs — varying the proportion of Australian travellers in the market.

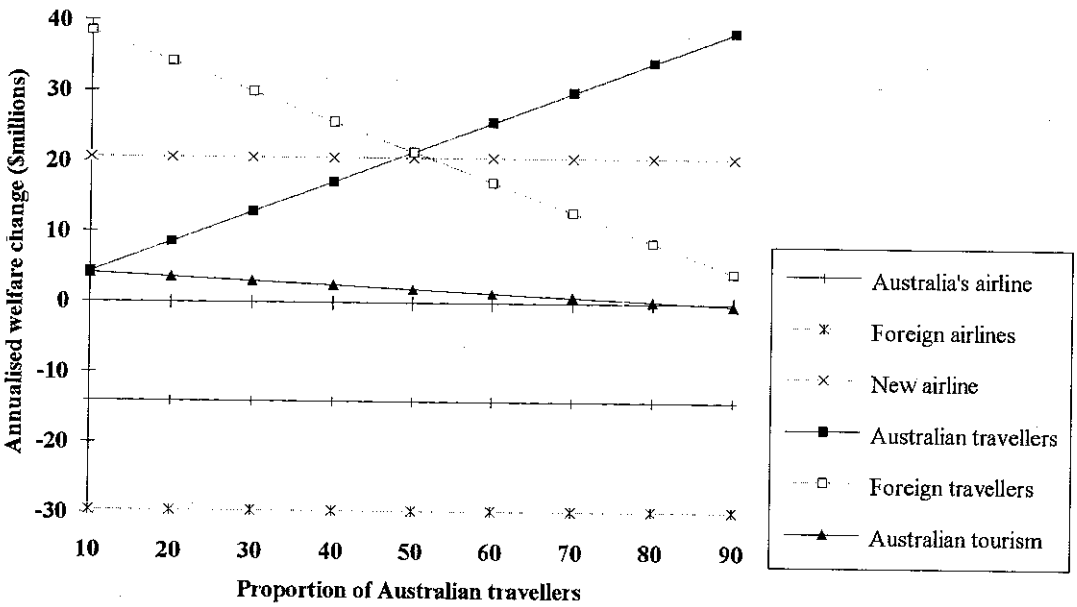

Figure 6 Case one: Distribution of welfare trade-offs among individual groups — varying the proportion of Australian travellers in the market.

We find that when Australians dominate the market, the Australian tourism industry experiences net welfare losses. This comes about due to Australians taking advantage of the cheaper international fares and substituting for their otherwise domestic holidays, a factor which outweighs the gains from increased foreign tourism when the relative number of foreign tourists (and hence new demand) is low.

Our 'hypothetical' market is not unlike, in structure, a number of typical Australian aviation markets. Therefore it is relevant to note our analysis indicates that in some instances — where the proportion of Australians in the market is low — it is not in Australia's interest to liberalise the market even though global welfare will increase as a result. In fact, global welfare gains are at a maximum when Australia's *losses* are at a maximum.

Case two. The underlying air fare elasticity of demand

There are characteristics of routes and markets, other than the proportion of Australian travellers, that have just as significant a bearing on the distribution of benefits from liberalisation. One of these characteristics is the air fare elasticity of demand. In section two we discussed our selection of 'average' elasticity estimates for application to all routes into and out of Australia. However, the following analysis will show that if the data are available, one should really consider discrete market-specific elasticity estimates when evaluating the trade-offs and determining the outcomes from a planned change to an air services agreement.

In case two we investigate how the trade-offs change as the air fare elasticities of demand for particular markets change. We again use our 'hypothetical' market but vary both business and leisure traveller air fare elasticities around our 'average' estimates. Figure 7 illustrates the welfare changes for the world and the trade-offs between Australia and foreign nations as the air fare elasticity of demand changes. Figure 8 illustrates the trade-offs that occur between different groups within Australia.

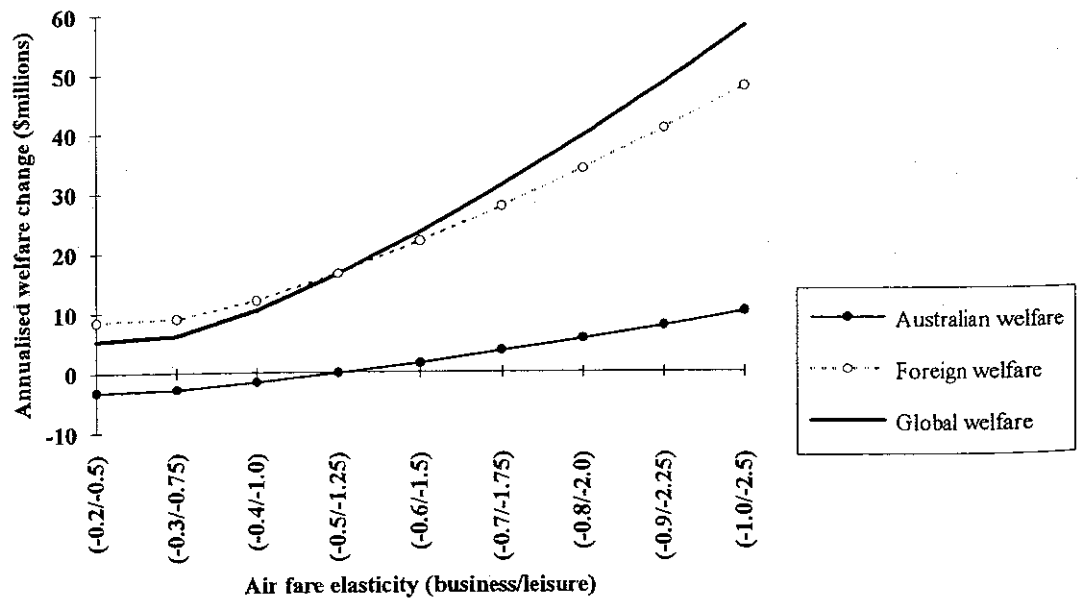

Figure 7 Case two: Aggregate annualised welfare trade-offs — varying the air fare elasticity of demand for the market.

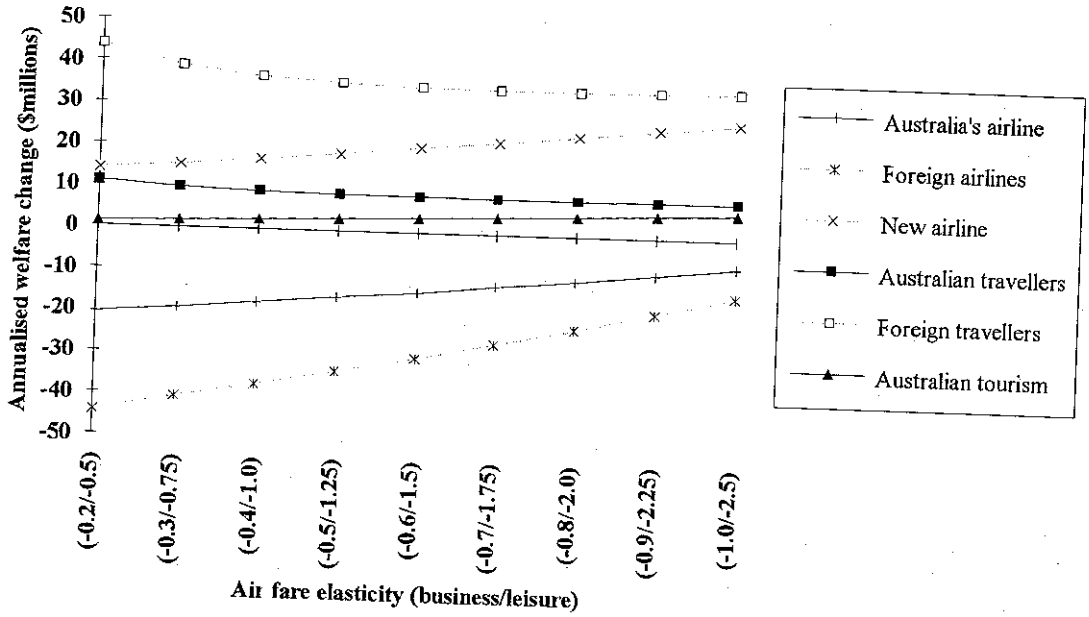

Figure 8 Case two: Distribution of welfare trade-offs among individual groups — varying the air fare elasticity of demand for the market.

There are no real surprises here The air fare elasticities for business and leisure passengers determine the degree to which the market will grow in response to a price cut, and as our liberalisation assumptions generate a price cut we see gains for consumers (Australian and foreign) and gains for Australian tourism as new foreign demand flows to Australia We see profitability for all airlines increasing as the elasticities rise However, Australia's airline was still experiencing a net loss even for elasticity estimates at the top of our range

Perhaps the more interesting result that emerges in this case is the trade-off between the different groups within the Australian net welfare equation While there are improvements in profits for the tourism industry and gains to Australian travellers, these gains do not fully offset the losses to Australia's airline until the set of elasticities reach about 0 5 for business and about 1 25 for leisure travellers Hence, the importance of establishing accurate market or even route specific elasticity estimates when evaluating options for air services agreement liberalisation is evident from this analysis

Case three. The mix of business versus leisure traffic

A further fundamental difference between markets is the proportion of airline passengers who are travelling for business reasons versus leisure reasons. Why should this affect the outcomes of a market liberalisation? The key reason concerns the different elasticities of demand displayed by the different type of passenger. Business passengers will be far less responsive to a price change than leisure passengers. Hence, if a market is predominantly made up of business traffic it may be that the losses incurred by Australia's airlines (as fares fall and load factors are diluted following the entry of a new operator) will not be fully compensated for by the benefits that flow from increased demand.

In case three we investigate how the welfare trade-offs from liberalisation are affected by changes in the relative proportions of business and leisure travellers in a market.[7] We again use our 'example' market from case one, fixing the traffic mix in this market at 20 per cent Australians and 80 per cent non-Australians, and assuming average price elasticities of demand as described in section two of the paper (-0.5 for business and -1.5 for leisure).

Figure 9 illustrates the welfare changes for the world and the trade-offs between Australia and foreign nations as the proportions of passenger types change. Figure 10 illustrates the trade-offs between different groups within Australia.

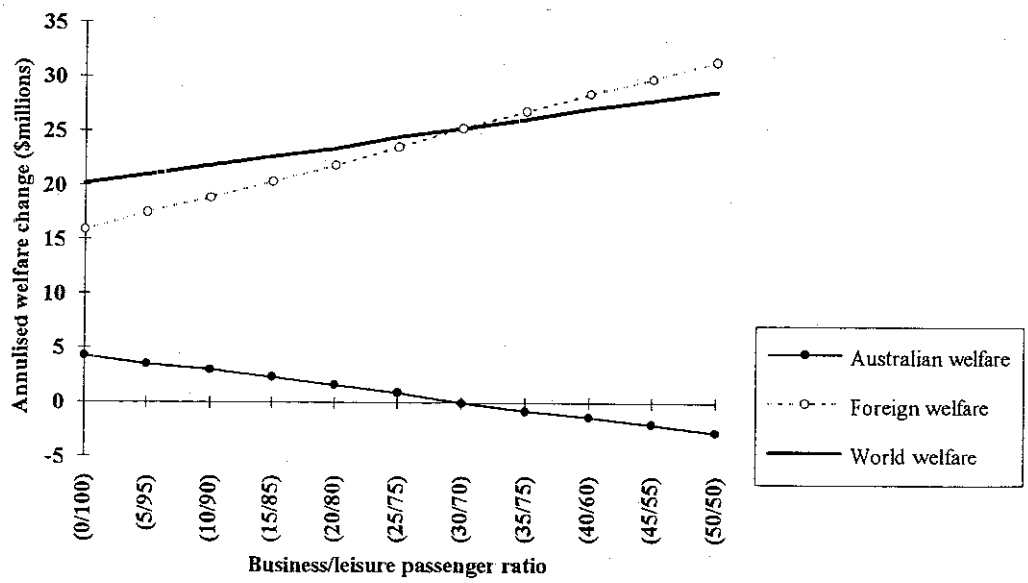

Figure 9 Case three: Aggregate annualised welfare changes — varying the relative proportions of business and leisure passengers.

[7]Good estimates of these relative proportions of traveller type can be obtained from Department of Immigration and Ethnic Affairs data in which inbound air passengers nominate their purpose of travel to Australia.

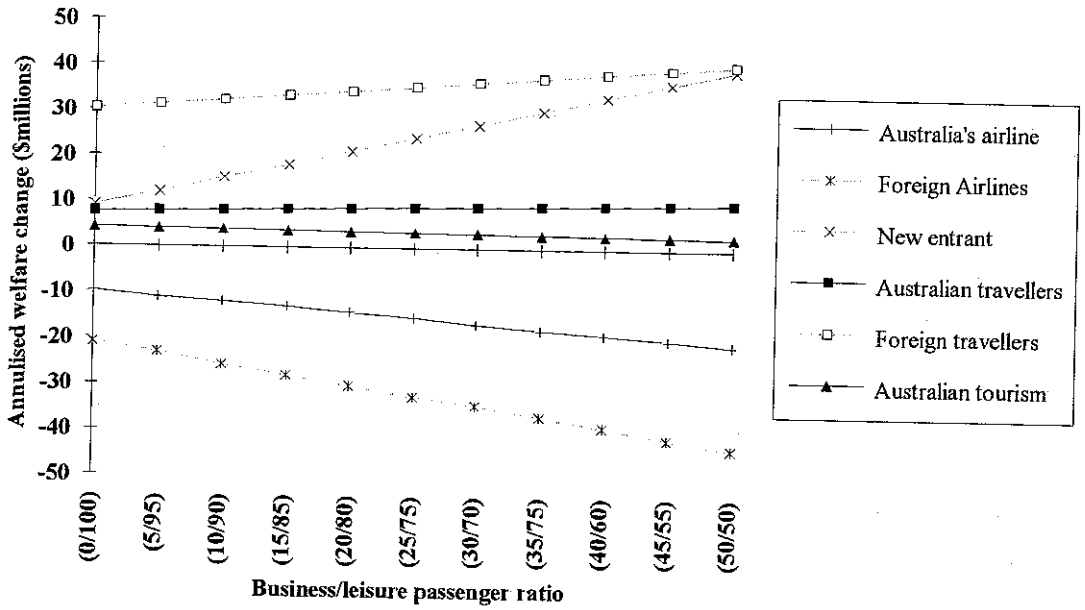

Figure 10 Case three: Distribution of welfare trade-offs among individual groups — varying the relative proportions of business and leisure passengers.

In case three, under the assumptions of our 'example' market, it is only in Australia's interests to liberalise the air services agreement if the proportion of business traffic on the route is less than about 30 per cent. Again, we see there is a contrast between global interests and the interests of Australia, as there are global welfare gains to be achieved irrespective of the traffic mix, and in fact even greater gains the more business travellers there are.

The trade-offs between Australian groups are again between welfare increases to airline passengers and Australian tourism and need to be balanced against the reduced profits of Australia's airline.

Case four

The above three cases illustrate the value of our model as an aid for decision makers who are involved in the negotiation and liberalisation of air services agreements. These cases emphasise that the specific characteristics of international air routes/markets must be carefully considered and the acceptability of trade-offs in benefits and losses between different parties must be determined in the process of deciding whether or not to liberalise an air services agreement.

In case four we do something a little different. We illustrate how the model can be used to analyse a liberalisation scenario over time. The value of looking at a liberalisation scenario in this way is that the dynamics of airline markets are taken into consideration as opposed to ignored if we simply focus on the first-round effects of a change in the market. In this way we attempt to account for downstream dynamics of initial outcomes,

and evaluate the sum of the series of short term gains, or the costs of arriving at them, when we consider the full net benefit of a liberalisation. Our path through time takes the form of a base (stage one in time) followed by three subsequent stages of possible development following the liberalisation of the air services agreement.

Stage one is our starting point and is the same as the hypothetical market used above. Australia has one airline offering four services per week between Australia and country X. Country X has one airline offering six services per week. A third (foreign) airline serves the market offering two services per week. Air fare elasticities are -0.75 for business passengers and -1.5 for leisure passengers. Flight frequency elasticities are 0.15 for business passengers and 0.05 for leisure passengers. The ratio of business and leisure passengers is one to four. 80 per cent of travellers on the route are foreigners.

Stage two occurs just after we liberalise the air services agreement. We assume that liberalisation allows the entry of one new (non-Australian owned) airline which commences four services per week between Australia and country X. This injects a similar capacity as that offered by the incumbent Australian airline and results in a 30 per cent expansion of overall market capacity. At this point all incumbent airlines remain in the market, and the entry of the new competitor generates average fare cuts of 8 per cent for business class and 16 per cent for leisure classes.

Stage three occurs sometime later when we assume that under the continued pressures of reduced revenues from lower average fares and diluted yields, Australia's airline has withdrawn from this particular market for more profitable routes elsewhere. Our experience has been that while air fares will fall quickly under the pressures of increased competition, they are not so quick to rise again after the removal of a competitor — as evidenced for example in the history of post-deregulation Australian domestic air fares (BTCE 1993, Chapter 6), and also in recent international air fare surveys undertaken by the BTCE (unpublished). Hence, at stage three we assume that air fares remain at the competition-induced levels of stage two.

Stage four occurs further on in time and reflects the absence of an Australian airline in the market — and the associated reduction in the total number of competitors. However, as we move this far out from the base case it becomes more difficult to predict the likely reactions of the market. Overlaying anticipated airline responses will be other factors such as exchange rate effects, regional conflicts etc. Hence, we model three possible stage four outcomes (stages 4a, 4b and 4c). 4a is our conservative case in which we allow average air fares to move only half way back to the base level (stage one values). 4b is our middle estimate in which we allow air fares to return fully to the base level. 4c is our upper estimate in which we model the possibility that with no Australian airline left in the market, the remaining airlines are not so committed to marketing Australia as a destination and hence, would rather extract higher profits from fewer passengers. Therefore, we model stage 4c with air fares that on average are 10 per cent higher for both business and leisure passengers than they were in the base case.

Our 'stage' analyses are presented as annualised estimates of welfare change, but clearly, the duration between some stages, although difficult to predict, may be substantially less

than one year. These annualised estimates of change between stages could be proportionally scaled down as befits any particular real-world scenario analysis. Table 1 illustrates the change in net national benefit to the world and the trade-offs between Australia and foreign nations as we move in time from stage one to stage four. Also illustrated are the changes and trade-offs in net benefits experienced by groups within the Australian net benefit sum.

Table 1. Summary of annualised estimates of welfare change that occur as the market responds to the Case four liberalisation scenario.

	Annualised estimate of welfare change ($ millions)				
	Stage 2	*Stage 3*	*Stage 4a*	*(or) Stage 4b*	*(or) Stage 4c*
World welfare	**23**	**46**	**21**	**0**	**-27**
Australian welfare	2	-14	-20	-25	-31
Australia's airline	-14	-33	-33	-33	-33
Australian passengers	9	7	3	0	-5
Australian tourism	4	3	1	0	-2
Foreign welfare	22	60	41	25	4
Foreign Airlines	-30	5	2	0	-2
New entrant	21	35	34	33	32
Foreign passengers	34	29	13	0	-18

Note: Included within 'Australian welfare' and 'Foreign welfare' is the profit repatriation from Australia's airline to its foreign owner. Hence, these totals differ from the sum of their displayed components by the amount of this repatriation.

The value of a time-series style analysis is demonstrated clearly in table 1. For example, if we had simply focussed on the first-order outcome from liberalisation we may have been tempted to propose that it was beneficial to Australia, as a small annualised welfare benefit of $2 million is predicted by the model. However, in anticipating further market developments it becomes apparent that the initial gains become swamped by subsequent welfare losses to Australia.

If, by way of example, we assume that each development takes about three months to occur and we assume that short term equilibrium is achieved at stage 4b then Australia's net welfare loss in the first year following liberalisation would be approximately -$15.5 million[8]. In fact, if we assume that equilibrium is achieved at stage 4b then even from a global perspective there is no long term value in liberalisation as the losses to Australia are ultimately equally offset by gains to foreign countries and the global net gain is zero.

Sensitivity analysis of key parameters of the model

A model such as this one relies, in part, for its accuracy on good parameter data. We believe our parameter estimates are soundly based, but are not so confident as to ignore the need for sensitivity testing. We tested the sensitivity of the three main parameters for the model, these being air fare elasticities, flight frequency elasticities, and the magnitude

[8] (0.25*2+0.25*-14+0.5*-25) =-15.5

of change of the competition-induced price cuts. Our base for sensitivity testing was case one, assuming a 20 per cent proportion of Australian travellers in the market. Appendix B contains a detailed summary of the results of the sensitivity analysis. Our conclusions are discussed below.

The sensitivity analysis highlights the importance of careful specification of these three parameters — flight frequency elasticity being least critical. The link is easy to see, as fare cuts and air fare elasticity both determine the size of the post-liberalisation market. The larger the new market, the greater the net tourism expenditure, and the better the load factors achieved by airlines. We would of course welcome any additional quantitative research that adds to the debate of the magnitude of these parameters.

4. CONCLUSIONS — THE TRADE-OFFS

Our findings — even though the results are from analysing a hypothetical market with a work-in-progress version of our model — clearly indicate that there are a range of trade-offs which can be quantitatively evaluated when examining the complex questions associated with potential changes to air services agreements. Our findings, even if they are to be viewed as indicative at this stage in the development of the model, suggest that it will not necessarily be the case that easing the conditions of an air services agreement will always return a positive outcome to Australia. Our analyses suggest that welfare changes may just as easily be negative, and it is on this point that we disagree with the suggestions of commentators such as Filmer and Dao (1994) that gains to Australia could range from zero to $1100 million.

Trade-offs which policy makers must evaluate are those that occur between what is best for the world versus what is best for Australia, and what is best for Australia's international airline interests versus our tourism industry versus our air travel consumers. Of course, we are evaluating welfare change within a partial equilibrium framework and we note that these partial equilibrium trade-offs would most probably need to be considered within the broader context of more general trade-offs in trade. For example, the potential gains or losses from aviation reform could be used in bilateral discussions to counter gains or losses from modifying market access for say, grain or motor vehicles. However, the advantage of being able to quantify the partial equilibrium gains and losses to aviation and tourism is that the actual magnitude of this trade-off can be factored into the total trade-off equation.

There are other considerations which could be factored into the trade-off equation. There are the costs of congestion to air travel consumers and operators, such as passenger time lost, aircraft delay costs, and pollution from aircraft emissions, and there are the costs of congestion caused by increased tourism. For example the surpluses of local tourists can be reduced if an influx of international visitors to beauty or wilderness spots adds to crowding and so reduces the intrinsic value of the destination. Latimer (1981) raises a number of interesting issues that come about from increased tourism including: that tourism expenditure can cause local prices to rise such that locals in these tourist destinations are disadvantaged; and whether consumer surpluses of visitors should be considered equal to those of residents.

There are also the possible adverse environmental effects of increased tourism to consider, as many of Australia's prime tourist destinations are considered ecologically fragile and sensitive to overcrowding These environmental and distributional effects of tourism are all worthy of further investigation, and while we do not attempt in this version of the model to capture all the costs or to evaluate all the related trade-offs, we believe our work in developing a national economic welfare model provides a useful contribution to the development of methodologies and tools for evaluating trade-offs in aviation reform.

5. ACKNOWLEDGMENTS

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7. APPENDICES

Appendix A International aviation rights of passage

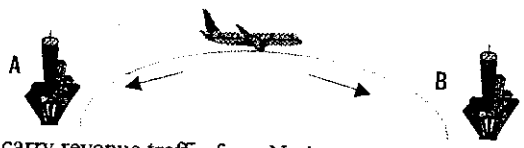
First freedom

The right to fly over another country without landing

Second freedom

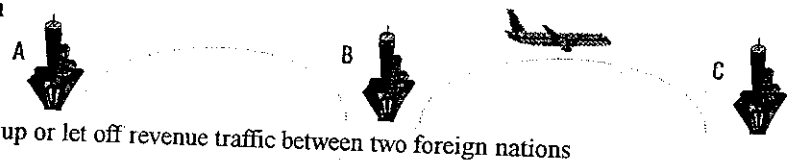
The right to make a technical landing (eg , refueling or maintenance) without picking up or letting off revenue traffic

Third freedom
Fourth freedom



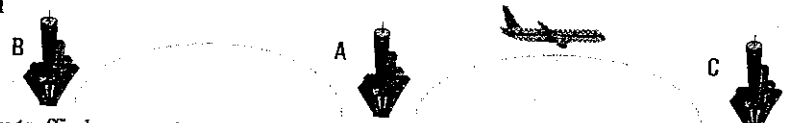
Third - The right to carry revenue traffic from Nation A to Nation B
Fourth - The right to carry revenue traffic from Nation B to Nation A

Fifth freedom



The right to pick up or let off revenue traffic between two foreign nations

Sixth freedom



The 'right' to carry traffic between Nations B and C via the homeland of the airline (Nation A)

Note. the country of registry of the aircraft in each example is Nation A

Appendix B Sensitivity analysis of key parameters of the model

This sensitivity analysis is undertaken to demonstrate how sensitive the model is to the parameters of: air fare elasticity; flight frequency elasticity, and the price-response to competition The 'central' point in the analysis is our 'Base' assuming a 20 per cent proportion of Australian travellers in the market

Table C 1 summarises the results of the sensitivity analyses When viewing the results it should be noted that the net welfare change for a country also includes any changes in the repatriation of airline profits For example, if Australia's airline records a 'liberalisation' operating profit $10 million lower than in the base case, and if it is 25 per cent foreign owned, then there is (for Australia as a whole) a +$2 5 million repatriation offset against the -$10 million dollar change in operating profit The rows in the table where this occurs are marked with a (1)

Table B1. Sensitivity analysis of key parameters of the model.

	Welfare change (varying the air fare elasticity parameter)		
	Low	*Central*	*High*
(business elasticity)	*-0.5*	*-0.75*	*-1.0*
(leisure elasticity)	*-1.0*	*-1.5*	*-2.0*
Australia's airline	-17.4	-14.1	-10.3
Australian passengers	+8.9	+8.6	+8.6
Australian tourism	+2.4	+3.6	+4.9
Net Australian welfare[1]	-1.8	+1.6	+5.7
Foreign airlines	-19.8	-9.1	+2.7
Foreign passengers	+35.5	+34.2	+34.2
Net foreign welfare[1]	+11.4	+21.6	+34.3
	Welfare change (varying flight frequency elasticity parameter)		
	Low	*Central*	*High*
(business elasticity)	*0.1*	*0.15*	*0.2*
(leisure elasticity)	*0.025*	*0.05*	*0.1*
Australia's airline	-14.7	-14.1	-13.1
Australian passengers	+8.0	+8.6	+9.3
Australian tourism	+3.4	+3.6	+3.8
Net Australian welfare[1]	+0.4	+1.6	+3.3
Foreign airlines	-10.6	-9.1	-6.4
Foreign passengers	+32.1	+34.2	+37.1
Net foreign welfare[1]	+17.8	+21.6	+27.4
	Welfare change (varying the size of competition-induced price cuts)		
	Low	*Central*	*High*
Business reduction	*4%*	*8%*	*12%*
Leisure reduction	*8%*	*16%*	*24%*
Australia's airline	-15.1	-14.1	-12.9
Australian passengers	+4.7	+8.6	+13.0
Australian tourism	+1.7	+3.6	+5.9
Net Australian welfare[1]	-4.9	+1.6	+9.1
Foreign airlines	-11.7	-9.1	-5.9
Foreign passengers	+18.7	+34.2	+51.9
Net foreign welfare[1]	+3.3	+21.6	+42.7