# Chapter 9

## Productive and Dynamic Efficiency Detriments

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# 1 Productive and dynamic efficiencies

1 The Commission says that major productive and dynamic efficiency losses will result from the Alliance. It is submitted that:

- The Commission's approach to estimating these detriments is analytically incorrect, is inconsistent with the literature and ignores key features of the situation;
- The method used to quantify expected detriments involves substantial double and treble counting, and results in estimates that are implausible on their face;
- Properly evaluated, the Alliance will result in gains in productive and dynamic efficiency.

2 This chapter summarises the material relevant to these points. A comprehensive discussion and substantiation is provided in Attachments A to I to this chapter.

# 2 Productive efficiency

3 Productive efficiency refers to ensuring that inputs are used as productively as possible.

4 The Commission's concern appears to be that were the Alliance to proceed, a degree of 'slackness' (often referred to as X-inefficiency) would set in to the way the Applicants operated, slackness which might manifest itself in ways that include:

- Less pressure on input suppliers, including providers of managerial services, to provide as great a contribution as they could;
- The provision of higher payments to input suppliers; and
- Resulting reductions in the Alliance's usage of these inputs, and hence some foregone output.

5 In contemporary economics, productive inefficiency is generally seen as resulting from two major sources:

- First, distortions in input markets, such as can (but do not inevitably) arise from collective bargaining; and

- Second, principal-agent problems, which result in misalignment between the incentives of agents (notably managers) and the interests of principals (notably shareholders). While the latter have an incentive in cost minimisation (and hence in eliminating any slack), it may not be possible for them to structure managerial incentives so as to do so, with the result that managers may be left with some scope to pursue objectives inconsistent with cost minimisation.

6 Although not fully articulated, the Commission's argument seems to be that:

- The Alliance will reduce competitive pressures on the Applicants;
- This will lead to more scope being given to the Applicants' managers to act in a discretionary, non cost minimising, way – that is, it will result in greater managerial slack;
- One form this will take is accommodation of demands for higher payments to input suppliers, such as unionised labour.

7 In other words, there is an asserted chain of causation from reduced competitive pressures in product markets, to worsened principal-agent problems in governance of the Alliance firms, and from there to various forms of inefficiency.

8 Before addressing the key elements of this argument, it is worth noting that the Commission's argument that slackness would set in seems inconsistent with arguments or assumptions it makes elsewhere in its analysis. More specifically, in assessing allocative efficiency losses:

- The Commission assumes the Applicants are *revenue* maximisers (rather than *profit* maximisers) in the Counterfactual. Since profit-maximising investors would not choose for firms to operate as revenue maximisers (rather than profit maximisers), this implies that the firms suffer serious principal-agent problems in the Counterfactual, and these problems manifest themselves as managerial discretion to act as revenue maximisers.
- The Commission then assumes that the Applicants become profit maximisers in the Factual. This implies greater, not lesser, alignment between the interests of investors and the incentives of investors in the Factual than in the Counterfactual;

- However, the Commission's analysis of productive efficiency operates on exactly the opposite premise – that managers will pay less regard to investor interests in the Factual than in the Counterfactual;
- This inconsistency is not noted, much less explained, in the Draft Determination.

9 Even putting this inconsistency aside, the following points need to be made:

- The Commission is incorrect in its assessment of the effects of the Alliance on product market competition, and hence on the extent of the pressures product market forces place and will continue to place on the Applicants to be efficient;
- To the extent to which economic theory and empirical analysis does find a link between product market competition and productivity, it suggests that link operates through factors that will not be adversely affected by the Alliance;
- In coming to a different assessment, the Commission:
  - Misinterprets the material on which it relies;
  - Ignores the implications of that material for the proper analysis of the Alliance's impacts.

  Indeed, the relevant work highlights a number of factors as importantly determining productive efficiency on which the Alliance will have a positive influence;
- The Applicants' own experience is consistent with that assessment.

10 These points are elaborated on below.

## 2.1 Competition in relevant product markets

11 The Commission's assessment starts from the premise that the Alliance will substantially reduce the competitive pressures operating on the Applicants, and that it is this that will result in additional, substantial, managerial slack. In fact:

- For reasons set out elsewhere, the Applicants will continue to face strong competition on most of the routes directly affected by the Alliance, including from a VBA entrant that will operate with a potentially significant cost advantage;

- In any event, most of the capacity supplied by the Applicants will continue to be provided under conditions that are not changed by the Alliance;

- Economic analysis confirms that firms cannot readily operate with different degrees of managerial slack, (for example, material disparities in the extent of managerial and staff perks) in different parts of their operation. Moreover, as a practical matter, the Applicants each operate as a highly integrated entity, with common systems and processes across the different parts of their operations.[1] Were the Applicants to allow slack to affect one part of their network, it would inevitably affect their efficiency on others. Given the stakes involved, it is implausible that the Applicants would sacrifice their competitiveness on their long haul operations by allowing 'wage creep' or other forms of slack in that part of their operations that was affected by the Alliance. This is most obviously the case for Qantas, which will continue to earn over 80 percent of its revenues from routes not affected by the Alliance,[2] including the fiercely contested and low yielding Kangaroo Route, which it serves in conjunction with British Airways, and that constitute roughly 30 percent of all international traffic to

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1 As noted in the Applicants' original application, the Alliance will involve the integration of IT systems maintenance, lounge maintenance and some frontline functions, such as baggage handling and check-in services (paragraph 384). A more detailed overview of the types of the degree of integration the Alliance involves is contained in the Strategic Alliance Agreement.

2 Based on Qantas results for the financial year ended June 2002. Qantas' total revenue figure was sourced from Qantas' ASX Report, Item 1.23. For Qantas, the Tasman, Australia / North America and Domestic New Zealand route groups are included in the JAO. Revenue data for these route groups was sourced from Schedule A of Response to ACCC request for further information. Tasman route group revenues include terminating services only. Australia / North America includes results from all passengers flying on USA and Canada services including operations via an intermediate point such as New Zealand. Passenger revenue is net of sales discount and does not include third party frequent flyer revenue. Qantas commenced domestic New Zealand operations in July 2001.

and from Australia, as well as Australian domestic routes, which comprise around a quarter of its ASKs, and where it faces intense competition from a low cost VBA;

- As a result, the overall effect of continuing competition, actual and potential, on the routes directly affected, and on the rest of the Applicants' networks, would preclude any tendency to allow management the rents of a 'quiet life'.

## 2.2 Link between product market competition and productivity

12 Even putting aside the fact that competition will continue to be intense, the economic literature, to the extent to which it finds a link between competition and productive efficiency (and that link is uncertain), identifies it as operating through channels that will not be adversely affected by the Alliance:

- The specific mechanism which the literature focuses on is the availability of market benchmarks – that is, of competitor firms which the owners of the firm at issue can use as 'comparators' when they evaluate the performance of their managers;

- There will continue to be many 'comparator' firms to which investors in the Applicants can turn to assess the Applicants' performance; these include very strong carriers such as Singapore Airlines, Emirates and Cathay Pacific, as well as VBA's such as Virgin Blue;

- The Applicants currently benchmark their own efficiency against these carriers, and there is no reason why they would not continue to do so;

- In fact, the Alliance provides a number of means by which the Applicants to improve their benchmarking, as it will allow them to share information on each other's costs, thus enhancing the information they can draw on in seeking efficiencies – this is discussed in greater detail below.

13 In coming to a different view, the Commission relied heavily on two studies. Properly evaluated, however, neither support its conclusions:

- The study by Oum and Yu is now very dated, and in any event does not allow a distinction to be drawn between the effects of deregulation (which should clearly increase efficiency) and those of market concentration (which in principle could go either way).[3] More recent work by a range of authors (discussed in detail in Attachment G) is strongly supportive of the efficiency enhancing impacts of Alliances;

- The study by Gonenc and Nicolletti is also misused by the Commission. Specifically, that study does draw conclusions about the impact of market concentration. However:

  - The study also recognises that overall productive efficiency is affected by a range of factors, including scale and economies of density;

  - As a result, any proper assessment of the likely impacts of the Alliance based on that study cannot simply look at the effect of changes in market concentration – it must also look at the other factors whose importance the study highlights;

  - When this is done, the model used in the study suggests that the Alliance will not reduce productive efficiency levels;

- By focusing solely on the studies referred to above, the Commission ignores a wealth of other work that finds that aviation alliances are likely to increase productive efficiency, including by means of:

  - Increased sharing of information within the alliance leading to enhanced knowledge of opportunities for increasing productivity;

  - Securing economies of scope, particularly by means of improved connectivity, thus realising savings that are otherwise stymied by double marginalisation;

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3 Oum, T. H and C. Yu, 1998, *Winning Airlines: Productivity and Cost Competitiveness of the World's Major Airlines*, Kluwer Academic Publishers, and cited by the Commission at paragraph 706 of the Draft Determination.

  - Securing greater economies of density, through joint carriage of traffic; and
  - Achieving economies of scale, by the scope for better use of fixed infrastructure, such as IT systems and frequent flyer lounges;

- Both the Gonenc-Nicolletti study and other studies also place significant weight on the adverse impact of government ownership on efficiency levels:
  - The Alliance will greatly enhance Air New Zealand's access to private equity, both directly through the Qantas capital injection and indirectly through its impact on the confidence private investors can have in the company and its future;
  - As a result, the Alliance will, on the findings of the Gonenc-Nicolletti study and of other empirical research, substantially increase efficiency levels at Air New Zealand;

- A proper examination of the literature therefore suggests that the Commission's preliminary assessments are unfounded.

14 The conclusion that the Commission's preliminary assessments are unfounded is importantly confirmed by a detailed analysis, carried out for this submission and reproduced as Attachment I, of the Applicants' own experience. Specifically:

- A detailed examination of the evolution of total factor productivity at Qantas finds no evidence that links Qantas' market share to reductions in the level or growth in total factor productivity at Qantas. There is absolutely nothing in the record to suggest that Qantas has at any time dissipated productivity gains by making excess payments to input suppliers or tolerating managerial slack;

- Indeed, Qantas's total factor productivity performance, which was already exceptionally strong, improved further when Qantas' market share increased following the collapse of Ansett;

- Consistent with the economic literature referred to above, there is also extensive evidence of productivity gains from the JSA between Qantas and British Airways, as detailed by Qantas and British Airways in their recent submission to the ACCC in support of an application for re-authorisation of that Agreement;

- Finally, the Applicants have recently announced further plans to cut costs. This confirms the very strong commitment of the Applicants to operating competitively and efficiently, and the Commission has no basis in the record for discounting that commitment. To do so would be plainly inconsistent with the experience of the Applicants' performance to date.

## 2.3 Approach to quantification

15 Even putting aside the errors discussed above, the Commission's approach to quantifying the expected detriment to productive efficiency is incorrect, not least in that it involves substantial double counting.

16 Quite independently of the double counting, the Commission's estimates are quite implausible. In effect, the estimates imply that the Applicants would dissipate in excess costs nearly all of the Commission's own expectation of the increase in producer surplus from the Alliance. Given that by reason of the factors referred to above, any such increase in costs will reduce the Applicants' competitiveness throughout their operations, and hence their profits, the Applicants would not, if these estimates were at all correct, have any rational interest in entering into the Alliance.

17 Further confirmation of the fact that the Commission's estimates are implausible comes from the fact that none of the independent financial advisers that have reviewed the business case for the Alliance – including the Commission's own financial experts – have included any such efficiency losses in their assessment of the Alliance's likely effects.

# 3 Dynamic efficiency

18 Dynamic efficiency refers to efficient use of resources over time. An important aspect of dynamic efficiency is ensuring that innovation and productivity growth occurs optimally over time.

19 The Commission says that the Alliance will harm dynamic efficiency for two reasons:

- The first is that firms with strong market positions are reluctant to innovate; and
- The belief that the Alliance will prevent VBA entry from occurring, and hence that efficiency gains from that entry over time will be foregone.

20 The Commission's view that firms with strong market positions are reluctant to innovate is inconsistent with economic analysis generally and with economic analysis of aviation specifically:

- As a general matter, economic analysis suggests that concentration has ambiguous effects on innovation performance;
- With respect to aviation, some airlines with very strong market positions have been very innovative, while some airlines that faced relatively strong competitive pressures have not.

21 With respect to the Commission's belief that the Alliance will prevent VBA entry from occurring, the Applicants' views in that respect are dealt with elsewhere. Given those views, the Applicants do not accept that the Alliance will lead to any dynamic efficiency detriment on that score.

22 Turning to the manner in which the Commission quantifies its expectation of the dynamic efficiency detriment, the Commission treats the entire difference in costs between the VBA and the incumbents as a measure of the detriment from foregone entry. However, some part of this difference in costs reflects a difference in the quality of service provided. As a result, the amount of any detriment would be limited to the quality-adjusted component of the difference. This will be a very much smaller amount, if any.

23 Additionally, as with the detriment associated with productive efficiency, the Commission's approach to quantifying the dynamic efficiency detriment involves substantial double counting, as it counts losses that are already included in the Commission's assessment of allocative efficiency detriments.

## 3.1 Conclusions

24 The Commission's estimates of productive and dynamic efficiency losses are:

- Not consistent with economic analysis;
- Based on evidence which is partial and in any event misinterpreted;
- Incorrect in their calculation.

25 The Applicants' record has been shown to be one of sustained productivity improvement. The continuing pressures to secure ever higher efficiency levels that are

placed on the Applicants both by competition and by their shareholders mean that there is no basis for assuming that the Applicants will not maintain this record into the future.

26 Alliance provides a range of incentives and mechanisms for identifying and exploiting options for productivity improvements going forward. Both international experience generally and the Applicants' own experience highlight the scope alliances provide for substantial such gains to be obtained.

27 The Applicants therefore submit that there are far more likely to be substantial gains rather than losses in productive and dynamic efficiency from the Alliance. If these gains amount to a 1 percentage point increase capital productivity alone in the assets covered by the Alliance (an amount that seems conservative relative to the outcomes of studies of Alliances), they will amount to $44 million in year 3 (measured as a saving relative to the written down value of the aircraft assets in that year), above and beyond the other benefits from the Alliance.

# Attachments to Chapter 9

# Response to NZCC's Assessment of Dynamic and Productive Efficiency Effects of the Proposed Alliance

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# Contents

# Attachment A: NZCC misunderstanding and miscalculation of productive efficiency and dynamic efficiency

This attachment describes the various ways in which the NZCC has misunderstood the concepts of productive efficiency and dynamic efficiency. It goes on to document the double and sometimes treble counting of efficiency losses probably as a result of this misunderstanding.

## *Mispecification of the conceptual framework*

In the NZCC's conceptual framework, productive efficiency is related to the incentive to minimise costs, while dynamic efficiency is related to the incentive to innovate.

Thus, when considering productive efficiency and the impact of the alliance, the NZCC focuses on the potential for a greater degree of 'slackness', also called X-inefficiency. It contends that weakened competition will mean that the firm will be less focused on minimising costs, and therefore more susceptible to "slackness"[1]

When considering dynamic efficiency and the impact of the alliance, the NZCC contends that increasing the number of competitors in a market will help ensure that incentives to innovate are efficient.[2] Elsewhere, the NZCC seems to equate dynamic efficiency with productivity growth and assumes that there is at least a high degree of association between the two[3].

It is not clear that these interpretations are the best way to view the two concepts of productive and dynamic efficiency, or that they conform to the standard approach economists use in defining these concepts.

For instance, it is inappropriate to equate dynamic efficiency with productivity growth, productivity growth can occur without innovation as a result of, for example, better than

1 Draft Determination, para 692.

2 Draft Determination, paras 675 and 676.

3 Draft Determination, para 683.

expected market demand enabling the realisation of economies of scale and beneficial externalities[4]. Equally, poor productivity growth can occur through mis-calculation or mishap or weaker than expected demand.

We consider that a better definition of dynamic efficiency is ensuring that the right decisions are taken such that both allocative and productive efficiency are maximised through time.

Irrespective of the definitions that are accepted, the important point is to ensure that estimates are meaningful and that there is no double counting of the consequences of expected changes (notably the welfare consequences of the factual relative to the counterfactual).

### *Double counting resulting from misunderstanding of the conceptual framework*

We believe a failure to carefully distinguish at a conceptual level between allocative, productive and dynamic efficiency may have contributed to the double (and for one aspect treble) counting of some economic efficiency effects.

The NZCC provided a summary of estimates of total annual detriments in Table A1 of its Draft Determination which it subsequently revised following an audit of its modelling.[5] For clarity the revised table is reproduced below.

**TABLE A1**
**Summary of Annual Detriments ($M)**

| Item | NECG's View* | Commission's Preliminary View | |
|---|---|---|---|
| | | Range | Most likely |
| Allocative inefficiency and transfers | 10.3 | 170 | 170 |
| Productive inefficiency | Very small | 25 - 180 | 95 |

4 These are advantages that accrue to a firm from transactions between other parties.

5 Draft Determination p. 174 and memo, Changes to Draft Determinations Resulting from Modelling Calculations Audit, as per memo released on 11 June 2003.

| | | | |
|---|---|---|---|
| Dynamic inefficiency | Nil | 50 – 150 | 90 |
| Totals | >10.3 | 245 - 500 | 355 |

***Year 3 estimate.**

Sourced from NZCC Draft Determination 2003, with revisions as per memo released on 11 June 2003

First, in estimating the impact on dynamic efficiency, the NZCC uses the lower costs of a VBA entrant to calculate the welfare impact of lower cost supply for existing and new demand captured by the entrant. The NZCC's concept of innovation is simply assumed to be reflected in the lower costs of a new entrant. However this is a problem in the sense that this sort of effect is already captured in the modelling used by the NZCC in calculating allocative efficiency effects. This is discussed in more detail in the section on double counting.

Second, in considering the concept of productive efficiency, the NZCC makes reference to various studies of productive efficiency for airlines and the association of productive efficiency with deregulation or competition. However, the measures of efficiency in these studies are generally some form of total or partial factor productivity that could just as easily be used as an indicator of dynamic efficiency in the NZCC's conceptual framework.

The double and triple counting by the NZCC in relation to dynamic and productive efficiency are detailed in the sections below.

***Double counting in the NZCC's estimates of dynamic efficiency losses***

The NZCC provides separate estimates of the annual loss of dynamic efficiency which depend on the market share gained in the Tasman market and which relate only to that market.[6] The precise basis on which the NZCC has made these estimates is unclear, and it is not apparent what steps, if any, the NZCC has adopted to ensure that losses are not double counted. That said, as best one can tell, the dynamic efficiency estimates constitute double counting because they are simply based on differences in cost between the entrant and the incumbent, the assumed market share of the entrant of existing and new demand, and the impact on price of additional volume being sold by the entrant with a similar demand

6 Draft Determination, p. 165.

function as in the Gillen model.[7] The Gillen model was used to calculate the allocative efficiency losses; and since this model has already calculated producer and surplus gains (but labelled allocative efficiency effects) based on the same factors there is clearly double counting, at least to the extent that the market shares of the entrant are the same in the model and in the separate calculations.

Although a conceptual error has clearly been made, the following discussion outlines the NZCC approach and the nature of the Gillen estimates to demonstrate that double counting has in fact occurred.

The dynamic efficiency estimates comprise :

> (a) the productive efficiency gain where the entrant displaces existing supply with lower cost supply; and (b) for the new demand created the additional consumer and producer (for the entrant) surplus (and ignoring the impact on incumbent's supply of the transfer induced by lower prices); [8]

In relation to (a) the productive efficiency effect for existing demand, this is calculated as the difference between marginal costs for the incumbent and entrant times the market share of existing demand of the entrant times the value of the market . For the case of a 5% market share this = $(0.77 - 0.58) \times .0.05 \times \$1502\text{m} = \$\ 14.269\text{m}$. Estimates are provided for market shares of existing and new demand of 5, 10 and 15 percent, so that the range of estimates is $14.269 m to $ 42.807 m.

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7 The key difference was that the Gillen model assumes a demand elasticity of –1.33 for the Tasman, whereas the NZCC assumes a demand elasticity of –1.0 for the revised estimates of dynamic efficiency effects reported in Table 10.

8 Draft Determination, para 686.

10 The parameters of the demand equation are first determined based on normalizing the initial price at 1 for an initial market value of $1502m and using the assumption of linear demand and an elasticity of –1.33.

The calculation of the components relating to (b) depends on the price in the counterfactual and the elasticity of demand.[10] In preparing the revised estimates of dynamic efficiency, the NZCC assumes an elasticity of demand of –1.0, which is different to the elasticity in the Gillen model of –1.33 and which was used for the original estimates prepared for the Draft Determination. The price in the factual is assumed to be 1 and a new price is determined given the assumed increase in new demand and the assumed elasticity of –1.0.[11] The consumer surplus gain on new demand is determined as the consumer surplus value associated with extra demand at a lower price. The producer surplus gain for new demand can be though of as having two components. The first is the difference between the marginal cost of the incumbent and the entrant times the new demand. The estimate for this component in relation to new demand is equivalent to the estimate for existing demand as per (a). The second component of the producer surplus on new demand is the difference between the counterfactual price and the incumbent's marginal cost times the new demand. Alternatively this calculation could combine the two components as the difference between the counterfactual price and the entrant's marginal cost times the new demand which is equivalent to the producer surplus for the entrant for new demand.

However, as noted these estimates are already part of the producer and consumer surplus estimates calculated in the Gillen model. This is because the preferred counterfactual calculated by Gillen assumes VBA entry on the Tasman route, with the new entrant estimated to secure a market share of 9.1 percent. And according to Gillen's memorandum of 4 April 2003, producer surplus is calculated as (fare - unit cost) × passengers for each scenario. The difference between the calculations of producer surplus (across all firms) for the two scenarios is then used as the estimate of the producer surplus efficiency effect associated with factual scenario. This approach suggests that producer surplus efficiency effects of lower cost entry have already been included for both existing and new demand.

As noted, the consumer surplus gain has also already been incorporated into the welfare estimates given that the calculations are based on the difference in welfare between a factual without VBA entry and a counterfactual with VBA entry. In particular Gillen's memo confirms that the difference between the calculations of consumer surplus for the factual and

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11 Note that strictly speaking there is a problem in assuming linear demand, an elasticity of –1.0 and an initial price of 1 as these three assumptions will imply that the demand intercept for the demand function is zero. Thus the assumption of an elasticity of –1.0 is an approximation for preparing the estimates.

the counterfactual scenarios is used as the estimate of the consumer surplus efficiency loss associated with the factual scenario.

In relation to the consumer surplus gain on new demand, it should also be recognised that there is problem in assuming that the demand schedule for existing demand for a full service airline can be used to estimate the consumer surplus associated with demand for a value based service. This difficulty is obviously most acute if one accepts the NZCC's contention, as reflected in its assumptions about cross-elasticities of demand, that consumers view the services provided by the VBA as inferior to those supplied by the FSA.

Additionally, the producer surplus gain for the entrant for both existing and new demand would not be a net gain to New Zealand to the extent that the new entrant was foreign owned, as the surplus would accrue to foreign shareholders.

In short, the dynamic efficiency costs, even if one accepted the NZCC's flawed conceptual framework, have been incorrectly calculated and double counted.

***Triple counting in the NZCC's estimates of productive efficiency***

The productive efficiency estimates are based on a contention that an entrant in the Tasman market would exert pressures on the incumbent to reduce costs on all of its operations in both the Tasman and domestic markets.

When the NZCC estimates productive efficiency gains from a new entrant it applies a cost saving factor to all existing variable costs for both the NZ main trunk and Tasman markets. The cost saving factor is based on an order of magnitude consistent with estimates provided in a study by Oum and Yu[12]. When the NZCC estimates the dynamic efficiency gain for existing demand (as described above) it also effectively applies a cost saving factor to that part of existing (and separately new demand) that is captured by the new entrant. In this case the cost factor is the difference in unit costs between the entrant and the incumbent. The Gillen model will also capture such an effect in his model when the difference in producer surplus between the counterfactual and the factual is calculated. It is this triple application of a cost factor to the existing market that would be captured by the new entrant that is the source of triple counting.

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12 Oum, T.H., and C. Yu, 1998, Winning Airlines: Productivity and Cost Competitiveness of the World's Major Airlines, Kluwer Academic Publishers, Massachusetts.

As a "productive efficiency" cost saving associated with the market share of the new entrant for existing demand is already captured in the dynamic efficiency estimate, or in the estimate of allocative efficiency from the Gillen model, it is not appropriate to apply a **further** productive efficiency cost saving to the whole market, without an adjustment for the saving already captured in the other estimates. To avoid triple counting it is necessary to reduce the size of the market to which the productive efficiency estimate applies by the extent of the existing market captured by the new entrant. This has not been done in relation to the estimates of the NZCC in Table 9 of their report so that there is clearly some triple counting of productive efficiency effects for the Tasman market.

The extent of the triple counting of productive efficiency associated with a new entrant would depend on the market share of existing demand gained by the new entrant. For a 5 per cent market share of existing demand the cost factor adjustment (to the extent it was relevant) should only be applied to 95 percent of the market.[13] However, after this adjustment has been made the estimates would still seem to be impla usibly large.

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13 Note that the productive efficiency estimates only relate to existing demand as new demand would relate solely to the entrant.

# Attachment B: The implausibility of the NZCC's estimates of productive inefficiency

This attachment assesses the credibility of the scale of the contended dynamic and productive efficiency estimates by reference to studies of the efficiency gains of airlines and also by reference to the profits that are estimated to arise as a result of the Alliance. It compares the efficiency differences implied by other studies with NZCC's estimates of the annual efficiency losses and profits and finds that the NZCC's estimates of productive inefficiency due to the Alliance are not only implausible, they imply that the parties are irrational in contemplating an Alliance because all of the potential profits will be lost through productive inefficiency.

## *Efficiency differences implied by other studies*

The NZCC[14] referred to the Bodas decision where the Commission considered that possible orders of magnitude for productive inefficiencies might conceivably fall in the range of 1 to 10% of current costs.[15] The NZCC in its draft determination used this range to estimate what they considered would be productive efficiency losses associated with the Alliance.

Before considering whether the scale of such estimates are supported by efficiency studies it is worth noting that two of the four commissioners who collectively made the Bodas decision qualified their views about possible productive efficiencies as follows[16]:

> 486 In addition, there are further, less readily quantified, losses arising from the potential deterioration in productive efficiency, reduced product quality and reduced incentives to innovate. However, Commissioners Allport and Auton believe that these effects, which generally result from "creeping" changes in corporate culture or attitude, given the very competitive culture from which they start, are only likely to occur over an extended time period and are likely to be further mollified by virtue of the fact that both

14 Draft Determination para 707.

15 NZCC 1996, Decision No. 78 involving Air New Zealand Ltd, Ansett Holdings Ltd and Bodas Pty Ltd, p.87.

16 Ibid, p. 91.

companies are involved in extremely competitive international markets. Therefore, "slippage" of competitive attitude is likely to be retarded by benchmarking and performance requirements from, particularly, senior management levels in both companies.

487 Further, the barriers to entry into the New Zealand domestic passenger air services markets, as defined, are such that Commissioners Allport and Auton are not satisfied that the acquisition would not result in Air NZ and Ansett NZ each and together acquiring a dominant position. However, they believe that there does remain some residual threat of competitive entry, sufficient to further depress potential losses in productive efficiency, reduced product quality and the incentives to innovate.

These qualifications to the Bodas decision highlight the relevance of such factors as the pressures and experience from competing on a prominent basis in the international aviation market, benchmarking and the threat of entry. And they reduce the credibility of the claim that there would be substantial productive efficiency detriments associated with the alliance.

In putting aside these qualifications the NZCC[17] also considered that the range of 1-10% fell within the efficiency gains found by Oum and Yu[18] and considered that the OECD study by Gonenc and Nicoletti[19] provided support for the notion of productive inefficiencies associated with the alliance.

However, as noted above, a careful review of the study prepared by Oum and Yu confirms that they do not specifically isolate competition and regulatory effects and do not demonstrate that lower market concentration has the effects inferred by the NZCC. Oum and Yu do identify significant improvements in efficiency for Asian and European carriers but do not demonstrate in a statistical sense that these improvements are related to more competition in specific markets. To reiterate in relation to their findings, Oum and Yu found that, after adjusting for output mix and stage length, the measure of residual TFP for Qantas

17 NZCC 2003, op.cit, pp.170-1.

18 Op. Cit. Oum and Yu, 1998.

19 Gonenc, R., and G. Nicoletti, 2000, "Regulation, Market Structure and Performance in Air Passenger Transportation, Economics Department Working Papers, No. 254, OECD, Paris.

was the second highest of the Asian carriers in 1993 (only slightly below the leading Asian carrier Singapore International airlines) and above the average for North American airlines.

As also noted earlier, if adjustments were made for other factors such as economies of density that are likely to provide greater advantage to US airlines, it is reasonable to conclude that the Oum and Yu results suggest a very good performance by Qantas with little scope for the interpretation of a significant difference between its efficiency levels (adjusted for factors largely beyond the control of management) and best practice. It seems difficult to believe that the Alliance, which affects only a small part of the Qantas network, could lead to these high levels of relative productivity being eroded – rather, the presumption would normally be that the Alliance would assist Air New Zealand to achieve the same productivity levels as were realised by its Alliance partner.

In the Gonenc and Nicoletti study, recall that, after adjusting for stage length, the US, UK, Japan and the Netherlands were ranked equal first being on the efficient frontier, New Zealand was ranked second with an efficiency gap of 7% and Australia was ranked fifth with an efficiency gap of 13% compared to an average of all countries of 24%. As previously noted, although this efficiency gap is relatively large it could also be explained by numerous operational characteristics that were not adjusted for as in the Oum and Yu study. In addition as also shown earlier, application of the OECD equations to the factual and counterfactual scenarios showed that there was not a statistically significant difference between the respective outcomes for technical efficiency, so that it is not reasonable to claim that the OECD study supports the contention that the Alliance would lead to a deterioration in productive efficiency.

### *The credibility of the efficiency losses in relation to estimated profits from the Alliance*

The revised estimates of the annual productive efficiency loss calculated by the NZCC that it considers most likely amount to $NZ 95 million. This represents over 6 per cent of variable costs for the combined NZ main trunk and Tasman routes and is just past the mid-point of the range identified as what the NZCC considers is plausible by reference to the estimates referred to in the Bodas decision.

The credibility of these estimates must be questioned given that the total producer surplus accruing to domestic shareholders associated with the alliance was estimated in the NECG[20] report prepared for the Draft Determination to be only [……..][21] million in year 3 of the alliance in present value terms. This implies that all of the expected benefits from the Alliance would be lost as a result of rising inefficiencies associated with the alliance and that in fact there would be additional costs as a result of the Alliance. This comparison highlights the absurdity of the scale of the productive efficiency detriments that the NZCC contends are relevant. The parties to the Alliance are hardly likely to go to the trouble of seeking regulatory approval and negotiating and undertaking the various tasks needed to implement the alliance if it is likely to be the case that all of the potential profits will be lost through a deterioration in productive efficiency.

However as noted the NZCC goes further and claims that productive efficiency detriments associated with the Alliance could extend beyond the impact on costs on the NZ main trunk and Tasman routes to the whole of the operations of the Alliance partners. To the extent that this was true it would suggest that the airlines were irrational in contemplating the Alliance.

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20 Network Economics Consulting Group 2002, Report on the Competitive Effects and Public Benefits from the Proposed Alliance between Qantas and Air New Zealand.

21 Based on exchange rate of $NZ 1.1282 per $A.

# Attachment C: Misplaced concern that the Alliance will lead to greater slack or 'x-inefficiency'

The NZCC has alleged that the Alliance will result in greater management slack or 'x-inefficiency'. This position is based on:

- a misunderstanding of the concept of x-inefficiency;
- inconsistency in assessment of the impact of x-inefficiency on governance; and
- a failure to distinguish between economic inefficiency and transfer components of x-inefficiency.

We believe that as a result, the NZCC's approach to productive inefficiencies is simply not credible.

In this attachment, we explain the nature of these misunderstandings, inconsistencies and failures. We draw on this discussion to rebut specific claims made by NZCC in relation to x-inefficiency and waste.

### *Misunderstanding of the concept of x-inefficiency*

The concept of x-inefficiency is a much contested term in the economics literature. The original formulation of the concept as a failure of a firm to maximise profits (and its conflation by the NZCC with the concept of productive inefficiency) is at odds with the maximisation framework that is widely accepted in the economics profession.[22] In the conventionally accepted maximisation framework, x-inefficiency refers to a failure to maximise efficiency due to the firm's inability to adopt a first best performance monitoring and enforcement mechanism. In other words, x-inefficiency is not an inefficiency in the standard sense (i.e. a waste of resources), but rather the result of agency monitoring and enforcement costs.

22 This is discussed in more detail in the Annex on Dynamic and Productive Efficiency, X-efficiency and the Impact of Market Structure.

The framework of Stigler[23] is instructive. His reasoning is that it is costly to enforce contracts and it will be efficient to monitor employee performance until the value to the firm of the marginal increase in efficiency equals the marginal cost of an increase in monitoring effort. This suggests that there could be some residual shirking in terms of work effort but that it is not economically efficient to incur additional monitoring costs or develop other arrangements that include additional transactions costs to further reduce any shirking. This residual is not an 'inefficiency' as it is not profit maximising for a firm to incur expenditure to reduce it. That is, it can cost more to further reduce shirking than the marginal value to the firm.

An important implication that follows from Stigler's perspective is that in assessing the impact of the Alliance one needs to consider how the Alliance would impact on monitoring arrangements. However the NZCC does not provide any meaningful analysis of the impact of the Alliance on monitoring arrangements. It simply contends that x-inefficiency would worsen.

### *Inconsistency in assessment of the impact of x-inefficiency on governance*

On any fair consideration, one would have to think that the Alliance would lead to better, rather than worse, governance. For example, the injection of substantial private capital into Air New Zealand should result in increased pressures for profit-maximising behaviour, including through the elimination of excess costs.

When it assesses allocative efficiency losses, the NZCC seems to accept this – the parties are modelled as revenue maximisers in the counterfactual scenario (an assumption which implies substantial managerial discretion in determining corporate objectives) but as traditional profit-maximisers in the factual scenario.

The NZCC's calculation of productive efficiency losses is inconsistent with its calculation of allocative efficiency. Rather than the Alliance leading to closer alignment between the objectives of shareholders and the firms' managements – and hence to what would likely be increased efforts to eliminate excess costs – the NZCC alleges the Alliance is likely to lead to a substantial increase in x-inefficiency.

23 Stigler, G. J., 'The Xistence of X-Efficiency', *American Economic Review* 66:1 213–16.

### *Failure to distinguish between economic inefficiency and transfers*

The NZCC interprets x-inefficiencies as genuine economic inefficiencies (i.e. waste), however not all x-inefficiency is waste. Some x-inefficiency leads to a transfer of income and some reflects efficient profit seeking or profit protecting expenditures.

Expenditures incurred to secure or protect a firm's profits do not represent income foregone but income earned and spent elsewhere in the economy. There may be some loss in the potential income that the economy can realise because optimal use is not made of the economy's resources, but the important point here is that this loss is not equal to the full expenditures associated with securing and protecting profits.

For a welfare loss to arise through x-inefficiency, actual income for the economy as a whole needs to be reduced as a result of the x-inefficiency (assuming income distributional effects are not important). Transfers of income and rent seeking or rent protecting expenditures associated with any x-inefficiency are not a net loss to the economy because they are reflected as additions to income elsewhere in the economy. It is the net loss in income associated with an x-efficiency detriment when comparing the factual and counterfactual that is relevant in determining a welfare loss.

For example, if x-inefficiency is interpreted as employees or management seeking a "quiet life" and reducing their effort levels, then any resulting loss to society needs to be assessed adjusting for the value of additional leisure that is associated with lower effort levels.

### *Points raised by NZCC that reflect failure to distinguish between inefficiencies and transfers*

The NZCC makes a number of specific claims as follows[24]:

1. NECG seemed to have in mind a situation where a firm's labour force and other input suppliers were able to capture some profit in the form of higher remuneration.

2. This argument ignores the problem that as rents are translated into costs firms will choose different production techniques, which can be wasteful.

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24 Draft Determination, paras 694-696.

3. The rent seeking literature leaves open the possibility that the rents potentially available could be absorbed completely by the resources devoted to obtaining them.

4. The whole of the cost base of the entity concerned, not just the efficiency gains that may flow from the proposed Alliance would be susceptible to rising costs as competition diminishes.

In relation to the first point, it is important to recognise that the extent to which some profit is effectively diminished and converted to higher remuneration of labour (or other factors of production) is a pure transfer. The only way there might be inefficiency is if additional resources are used up in the process. Whether that occurs depends on the efficiency of the contracting process (i.e. the extent to which the contracting process ensures that the sum of the wealth of shareholders and other factors of production is maximised).[25] As long as the contracting process is efficient in the context of the alliance (and there is no evidence to suggest it would not be), there would be little "resource wastage" in the labour contracting process attributable to the alliance.

The NZCC also has chosen to interpret NECG's remarks in an extremely narrow sense and ignores the broader point made by NECG. That is, for a welfare loss to arise as a result of x-inefficiency associated with the Alliance one needs to show that income for the economy as a whole is lower in the factual compared to the counterfactual as a result of a deterioration in governance. A significant loss, or indeed any loss, in income is simply not plausible when one reviews all the relevant evidence on airline performance and underlying forces and incentives that will apply in the future. Rather, it is more reasonable to conclude that there will be **greater** incentives and pressures to improve performance as a result of the Alliance when one recognises:

- the results of the relevant theoretical and empirical literature, both in general and in relation to airlines;
- new econometric research on airline efficiency;
- the highly relevant competitive pressures of the global aviation market; and

25 Applying such a concept Abowd found that an efficient collective bargaining process for a very large sample of wage settlements for a wide range of industries in the United States - see Abowd, J. M., 1989, 'The Effect of Wage Bargains on the Stock Market Value of the Firm', American Economic Review, 79:4, 774-800.

- the nature and arrangements of the proposed Alliance.

In relation to the second point, the NZCC asserts that transfers lead to inefficient decisions being taken, and hence can be counted as costs. To justify this claim, the NZCC relies entirely on a proposition that airlines do not shift to use of larger aircraft at congested airports because their costs would rise (due to higher pilot salaries with larger aircraft). The NZCC suggests that United Airlines is an example of this problem at LAX.[26] Even putting aside the unscientific nature of this anecdotal observation, it is peculiar to see the NZCC cite this as an example of the alleged close link between the lack of competition, managerial slackness and inefficiency. Whatever United Airline's problems, an absence of competition is not among them.

Additionally, the example seems inaccurate on its face. Normally the reason that small aircraft continue to be used at congested times at airports has more to do with slot allocation arrangements and the protection of certain services by airport owners or by governments, for example in relation to the protection of regional slots at Sydney airport.

In fact, the economic literature suggests that the pure costs consequent on x-inefficiency are likely to be small, all the more so in contexts such as those in which the parties operate. Despite this, the NZCC goes on to contend that the efficiency loss may be even greater than it has suggested as specified in its third and fourth points.

In relation to the third point, the NZCC is contending that the literature leaves open the possibility that there could be complete rent dissipation, with extreme competition between potential rentiers proceeding to the point where all rents have been converted into excess costs. The claim that complete rent dissipation could occur is, of course, in conflict with the proposition that x-inefficiency could entail large economic losses. In effect, far-reaching x-inefficiency implies a substantial departure from profit maximisation – shareholders, in the NZCC's view, allow managers to enjoy a 'quiet life' rather than maximising returns to shareholders. In contrast, the concept of all of the profits being dissipated by rent seeking activity implies substantial adherence to profit maximisation by all potential income claimants, including shareholders.

Moreover, in the standard economic literature on rent dissipation, rents are wasted in the process of seeking monopoly – not in the monopoly itself. For example, duopolists are more likely to convert potential rents into costs than will a monopolist, as the monopolist already

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26 Draft Determination para 694 and footnote 75.

enjoys the rents that the duopolists hope to secure. This merely highlights the more general point that, even if one thought that some rent dissipation would occur, what matters is the **difference** in rent dissipation between the factual and the counter-factual. There is nothing in the economic literature that allows a general assertion to be made in that regard, as offsetting effects would likely be involved.

The fourth point the NZCC puts in support of its contention that the productive efficiency losses may be far-reaching is that any x-inefficiency that arises in relation to the specific routes served by the Alliance could lead to slackness elsewhere in the parties' operation. In other words, the parties would suffer losses in efficiency not only in the routes directly affected but also throughout their wider networks.

This contention does not sit well with the fact that the Alliance partners compete in an international aviation environment where competition is and is likely to remain strong. More importantly, it suggests that the parties are irrational – for example, that Qantas would compromise its efficiency in its network as a whole for the sake of a modest increase in profits in the areas covered by the Alliance (much of which would, were the NZCC correct, be claimed by input suppliers and other potential rentiers). The NZCC gives no argument as to why such behaviour would occur or evidence of its occurring in respect of other airline alliances.

### *Summary*

In summary, the NZCC's approach to productive inefficiencies in its Draft Determination is not credible because it:

- seems to confuse x-inefficiency with productive inefficiency. The latter is an excess cost, while the former is in some part a transfer;
- as its factual basis for treating x-inefficiency as a cost, cites a single anecdote that seems both incorrect on its face and in any case not relevant to the link (between competition, factor prices and efficiency) the NZCC claims;
- notes the theoretical possibility of complete rent dissipation, but fails to note that this is inconsistent with substantial x-inefficiencies (due to a failure to pursue maximisation objectives) and that complete rent dissipation may hold in either the factual or the counterfactual; and finally, and
- contends that the parties would act irrationally in accepting substantial efficiency losses across the entirety of their operations for the sake of small gains in profits

which, if the NZCC is to be believed, would in any event be appropriated by other stake-holders.

The NZCC also adopts an inconsistent approach in assessing allocative and productive efficiency effects. In assessing allocative efficiency the NZCC makes the assumption that the parties are revenue maximisers (a form of x-inefficiency) in the counter-factual but profit maximisers in the factual. But in considering productive efficiency, it turns these assumptions around, and assumes that the parties are efficiently managed in the counter-factual but are x-inefficient in the factual. This is considered to be a major deficiency in the analysis of the NZCC.

# Attachment D: Sources of competitive pressure on the Alliance partners

An important function of markets is to provide information and mechanisms to reward good performance and sanction poor performance. Competition can play a role in generating appropriate information and ensuring appropriate performance mechanisms are in place. The general idea is that product market competition allows greater precision in performance measurement, provided firm circumstances are sufficiently similar.[27]

In determining the efficacy of competition in improving information and incentives to achieve efficiency, a concept of product market competition in specific geographic markets is likely to be too narrow in scope. One needs to consider all aspects of market processes that could be relevant in providing useful information and effective incentive arrangements. In the case of the Alliance, it is therefore relevant to consider the actual and potential competitive pressures that are likely to be imposed on the Alliance partners by:

- the international aviation market;
- the specific information advantages that arise from the proposed Alliance;
- the market for corporate control of firms; and
- the threat of VBA entry.

This attachment discusses all four of these source of competitive pressure and highlights how each would plays a role in imposing competitive discipline on the Alliance partners.

### *Competitive pressures imposed by the International aviation market*

The airline industry is evolving rapidly. Major airlines are being exposed to a range of pressures in numerous geographic regions of the world. Further liberalisation of global and domestic aviation markets, further privatisation of state-owned airlines, the presence and strong growth of low cost airlines, and existing excess capacity in the global aviation industry are likely to create further substantial and ongoing pressure to reduce costs and fares.

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27 Vickers, J. S., 1995, 'Concepts of Competition', *Oxford Economic Papers*, 47, pp. 1-23.

The Alliance will be directly affected by the same competitive pressures that the global aviation industry faces. It is therefore important that the analysis recognises the scope and underlying strength of such wider pressures and understands how this will affect the Alliance partners.

It is particularly important that the NZCC take into account global aviation industry pressures in this case, because the bulk of operations of the Alliance partners will still be outside the operations of the Joint Airline Operations (JAO) network. Qantas will have at least 85% of its total operations outside the JAO. While all of Air New Zealand's operations are in the JAO, a significant portion will be subject to third party competition.

It therefore is not credible to contend that with the exposure of the bulk of Qantas' operations to the direct and substantial competitive pressures of the international aviation market, that such pressures would not also have some productive efficiency benefits for the JAO network.

### *Specific information advantages that arise from the proposed Alliance*

Given the range of markets in which they operate, the parties will certainly learn quickly and painfully if they slip from best practice. The information benefits to shareholders from this broader involvement in the global aviation market would still exist in the factual. More specifically, the general forces at work in the global aviation market will show up in "yardsticks" from major routes where other major airlines are present. Nothing would be lost in terms of competitive efficiency yardsticks that are relevant to the Tasman and New Zealand trunk markets.

In fact one of the advantages of the Alliance is that the partners would learn more about aspects of each other's business. There would be greater scope for sharing of information compared to the situation where they were direct competitors. This has been true in the case of the Joint Services Agreement (JSA) between Qantas and British Airways. The JSA has facilitated extensive benchmarking that would not otherwise be possible and helped to identify detailed cost and productivity differences and their underlying causes. This has in turn led to a program of organisational and operational changes that entails ongoing productivity and service improvements.

Given the increasing concentration at both the domestic and international levels of the airline industry, the competitive pressures within the international aviation market are imposing a very important discipline on airlines to secure ongoing productivity improvements to be successful in that market. The JAO includes mechanisms for sharing information from both with in and outside the JAO networks and for identifying opportunities to improve performance. This is considered in more detail in the section on improved governance and productive efficiency.

It would be foolish to think that shareholders will be indifferent to this information – that they will not react promptly and strongly to signs of inefficiency. Rather, the forces acting to reshape the international aviation market will be likely to focus strong shareholder interest on the performance of individual airlines, including Qantas and Air New Zealand.

### *Competitive pressures imposed by the market for corporate control*

The market for corporate control is also highly relevant in ensuring efficiency of entities. This point has been acknowledged in seminal theoretical papers about the benefits of competition such as Hart's[28]. A good empirical example is provided by Nickell, Nicolitsas and Dryden,[29] who studied 580 UK manufacturing firms over the period 1982-94, and found that product market competition, financial market pressure and shareholder control were all associated with some degree of increased productivity growth and there was some evidence to suggest that the last two factors (i.e. financial market pressure and shareholder control) could substitute for competition.

An additional factor that is highly relevant here is that the Alliance entails an immediate reduction in the equity stake of the New Zealand government and improves the prospects of selling further government equity to private shareholders. This increases the likelihood of improved corporate governance, as one of the key findings of the review of airline efficiency is the negative impact of government ownership on productive efficiency (see Attachment H).

### *Competitive pressures through the threat of VBA entry*

We have canvass how the threat of VBA entry is likely to impose further competitive discipline on the Alliance partners in Appendix 1 of Chapter 8.

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28 Hart, O. 2001, 'The market mechanism as an incentive scheme', *Bell Journal of Economics*, 14: 366-382.

29 Nickell, S., D. Nicolitsas and N. Dryden 1997, 'What makes firms perform well?', *European Economic Review* 41: 783-96.

The NZCC has stated that it considers that VBA entry is unlikely in the factual scenario, noting that typically VBAs have not focussed on high priced markets.[30] This section outlines some key flaws in the NZCC's contention about the prospect of VBA entry in the factual scenario. The scope for VBA entry in the factual scenario is considered in more detail in Chapter 3.

Typically VBA's have focussed on offering a lower cost and lower priced service. This inevitably entails a focus on more price sensitive customers, but this does not necessarily mean that they will not focus on "high priced markets". The experience of easyJet in Europe and Southwest in the US may support a proposition that VBAs have not initially focussed on major traffic routes in the major markets. However in any market, including airline markets, a firm will enter in the segment where it faces the best prospect of profits.

A key issue in the initial development of VBA presence has been access to slots in busy city pair markets. Lack of access to such slots often led to the location of VBAs in smaller, less congested airports. However, this is changing. The involvement of VBAs in airline markets has rapidly evolved to the point where they are now present in larger city-pair markets. Indeed, Virgin Blue did **initially** enter the major city pair markets in Australia and has already developed a prominent presence in these markets, including secure access to slots in the major East coast cities.

As noted in NECG's report on the Competitive Effects and Public Benefits of the Proposed Alliance[31]:

- Virgin Blue has on several occasions publicly stated its aim to target the business market.
- Virgin Blue operated 11 return flights daily from Sydney to Melbourne as of July 2002.
- For 11 major competitive routes where either Virgin Blue or Impulse operated Qantas overall yields declined by 18.5% and business yields declined by 8.8% for the period January-June 2001 to January-June 2000.

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30 Draft Determination, para 680.

31 Network Economics Consulting Group 2002, Report on the Competitive Effects and Public Benefits from the Proposed Alliance between Qantas and Air New Zealand, pp. 49-53.

Virgin Blue was able to grow quickly prior to the Ansett crisis including securing significant market shares in key city pair routes. Virgin Blue now has around a 28% market share but a 33% share of Australian domestic profits. It has a prominent brand presence and it is also reported to have costs that are 30% lower than Qantas.[32]

It is well accepted that VBA costs are well below those of a FSA. Lower costs reflect the lower quality in flight service, the advantage of avoiding the legacy of industrial relations agreements struck in more sheltered times, greater use of capacity through increased seating density, faster turnaround times(where possible), direct sales to customers, and often no pre-assigned seating. Many of these features not only result in lower costs, but also a product that is less valued by many consumers. The following table demonstrates the extent of the cost advantage of a VBA over a short haul airline in the UK.

**Table D1: Cost comparison: low-cost easyJet and conventional short-haul airline British Midland, 1998**

| **Cost category** | **EasyJet** | **British Midland** | |
|---|---|---|---|
| | (pence per seat-km) | (pence per seat-km) | (% share) |
| Direct operating costs | | | |
| 1 Cabin/flight crew salaries and expenses | 0.43 | 0.92 | 9.4 |
| 2 Fuel | 0.35 | 0.55 | 5.6 |
| 3 Airport charges | 0.55 | 1.20 | 12.1 |
| 4 En-route | 0.39 | 0.41 | 4.1 |
| 5 Maintenance | 0.58 | 0.75 | 7.6 |
| 6 Depreciation | 0.02 | 0.26 | 2.6 |
| 7 Aircraft rentals | 0.80 | 1.23 | 12.4 |
| 8 Insurance | - | 0.02 | 0.2 |
| Total Direct | 3.14 | 5.34 | 54.2 |
| Indirect operating costs | | | |
| 9 Station costs | 0.01 | 1.36 | 13.8 |
| 10 Handling | 0.31 | 0.40 | 4.1 |
| 11 Passenger services | 0.04 | 0.63 | 6.4 |
| 12 Sales/reservations | 0.18 | 0.47 | 4.7 |
| 13 Commission | 0.01 | 0.78 | 7.9 |
| 14 Advertising/promotion | 0.27 | 0.31 | 3.1 |
| 15 General and administration | 0.17 | 0.44 | 4.4 |
| 16 Other | 0.06 | 0.14 | 1.4 |

32 Australian Financial Review, 17 May 2003, Companies Section.

| | | | |
|---|---|---|---|
| Total indirect | 1.05 | 4.52 | 45.8 |
| Total operating costs | 4.19 | 9.86 | 100.0 |

Source: Doganis, R., 2001, *The Airline Business in the 21st Century*, Routledge, Table 6.5.

The Gillen model used by the NZCC assumes that VBA costs are nearly 20 percent lower than the incumbent's costs. If VBA costs are around 20% lower than the costs of the Alliance partners, and if there is substantial scope on the Tasman market to attract consumers with a preference for VBA type services —which there is — it seems incredulous that entry would be completely precluded in the factual scenario or that the threat of entry would not exert some meaningful competitive discipline.

The emergence of VBAs in various segments of the international aviation market has been a very significant development and is likely to be a permanent feature. Furthermore it needs to be recognised that they have been successful in attracting business customers by offering lower fares with less restrictions than FSAs. A case can be made that although they offer a differentiated product they do provide important direct competition to the FSAs. Given these perspectives and recognising that the Tasman routes do not entail significant hubbing advantages for the incumbents, and that Virgin Blue would have adequate access to slots in both the east coast of Australia and in New Zealand, it seems reasonable to propose that there is a real prospect of VBA entry in the factual scenario.

The threat of VBA entry, coupled with the impact of wider competitive constraints (such as imposed by the global aviation market, specific information advantages that arise from the Alliance, and the market for corporate control) will help to ensure a continuing strong performance of the Alliance partners in terms of price outcomes. However, it is not considered that VBA entry is necessary for ensuring productive efficiency as this is likely to be achieved irrespective of VBA entry given the relevance of other competitive constraints in ensuring good performance.

# Attachment E: The impact of market structure on incentives to reduce costs and innovate

If the NZCC contends that greater concentration leads to slackness, it should really explain how this is clearly so given the circumstances of the Alliance partners, the relevant factors affecting competitive pressures in the global aviation industry, and shareholder pressures to achieve good performance.

This attachment draws on theoretical and empirical literature to demonstrate that increasing industry concentration need not lead to a deterioration in productive efficiency and innovation performance. In fact, a range of outcomes is possible in terms of the impact of market structure on the incentives to reduce costs and innovate.

The sections below outline key findings in the literature pertaining to:

- the prospect that the Alliance could generate sufficient information to ensure internal efficiencies;
- the link between more competition and greater productive inefficiency; and
- the lack of a simple relationship between concentration and innovation.

The discussion in these sections supports a general conclusion that the relationship between the level of product market competition and incentives to pursue internal efficiencies is at best an ambiguous one.

### *The Alliance may generate sufficient information to ensure internal efficiencies*

Competition may induce efficiency by generating additional information that can then be used to compare the performances of managers. That is, in a more competitive market, assuming that shocks affecting each firm's costs are correlated, owners can more readily compare the performance of the firms in which they have invested, to the performance of other firms in the same industry. This allows them to discriminate between say, low profits due to industry-wide cost shocks and low profits due to managerial shirking. Thus, **product market competition,** as an information mechanism, can help resolve shirking problems which ultimately trace their origins back to transaction costs and information asymmetries that prevent owners from agreeing on 'first best' contracts with managers given the divergence of interests between the two groups.

However, there are many complications in the determination of optimal incentives schemes that mean that schemes will vary depending on the information structure, manager's preferences and market environment.

***What the literature has to say***

The ambiguities are explored in more detail by Meyer and Vickers[33]. They begin their paper by noting that while comparative performance information (such as the information facilitated by product market competition) can improve performance where managers are disciplined solely by explicit incentives, the positive relationship breaks down once implicit incentives enter the picture.

One implicit incentive is the reputation effect whereby good performance enhances the manager's labour market prospects and therefore improves future earnings. Another is the ratchet effect whereby current performance affects not only the current reward but the term of future explicit incentive contracts which may demand tougher terms from the manager where the manager exhibits good current performance. Meyer and Vickers bring these elements together in a model, which allows for the design of explicit incentives within periods but where there is limited precommitment between periods and risk aversion on the part of managers. The model finds that the efficiency consequences of comparative performance indicators such as those facilitated by competition depend on the ratchet effect. Though explicit incentive schemes can be defined in a way to address ratchet effects, this will be at the expense of imposing more risk on managers — therefore a reduction in welfare cannot be avoided. The model finds that it is possible for the dynamic ratchet effect to outweigh the static efficiency enhancing effect of better explicit incentive schemes that align managerial payoffs with performance. As a result there is no unambiguous relationship between better comparative performance indicators and higher overall efficiency.

Hart[34] examines the implications of incentive schemes when there are both managerial firms (M-firms) where there is separation of ownership and control and entrepreneurial firms (E-firms) which is managed by its owner. He considers the standard principal agent problem whereby owners of M-firms cannot monitor managerial effort while managers aim to

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33 Meyer, M. and J. Vickers 1997, 'Performance comparisons and dynamic incentives', *Journal of Political Economy* 105(31): 547–581.

34 Hart, O. 2001, 'The market mechanism as an incentive scheme', *Bell Journal of Economics*, 14: 366–382.

minimise their efforts for the wage earned. Owners can observe the outcome of managerial effort, firm performance, subject to the uncertainty that some of this performance is due to other factors. Owners then choose a managerial incentive scheme to encourage managers to pick the right amount of effort from the perspective of the firm.

It is worth noting that Hart, in setting up this model, makes certain strong assumptions about managerial preferences for the sake of analytical tractability. In particular the manager is assumed to be extremely risk-averse such that an income below a certain level is seen as catastrophic; however income above the same level has no value for the manager.

Under the conditions set out by Hart, there will be some managerial slack even with an optimally chosen incentive scheme (that is, optimal in the sense of the owner designing the scheme that can best motivate the manager to pick the right levels of effort given these peculiar preferences). Under these conditions, Hart shows that product market competition from E-firms which do not face the same agency problems, can reduce managerial slack, assuming some common component to costs.

A crucial aspect of this model is the existence of E-firms. Hart observes that how much more internal efficiency is promoted by competition depends on the responsiveness of supply by E-firms with respect to input prices and the responsiveness of demand to the expansion of supply by E-firms. It will also by extension depend on the proportion of firms in the industry that are E-firms. This points to the apparent inapplicability of the competitive mechanism in the case envisaged by Hart to the context of the proposed Alliance. The industry in which the Alliance would operate is populated almost solely by M-firms. However, in addition as noted by Hart himself, his results, which derive from strong managerial preferences were set up in a way which renders incentive schemes less effective than they probably are in the real world[35]:

> If managerial tastes are less extreme, ordinary salary incentive schemes will become more effective in reducing managerial slack, and competition will become less important.

Furthermore, Hart ends his paper by noting that the competition he investigates is not the only sort which reduces managerial slack, and cites competition in the market for corporate control as an alternative mechanism.

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35 P. 381 of Hart, O. 2001, ‘The market mechanism as an incentive scheme’, *Bell Journal of Economics,* 14: 366–382.

As was noted, Hart's result depends on quite strong assumptions about managerial preferences. This point is taken up by Scharfstein[36], who re-examines Hart's model but modifies some assumptions. Like Hart, Scharfstein assumes a risk-averse manager who can take steps to minimise work effort given imperfect information. He also assumes that the marginal and total productivities of effort are perfectly correlated across managers, facilitating comparisons between them. However one twist in his story is that such productivity can be either high or low. Each manager is assumed to observe his own productivity after signing up with a firm but before making production decisions. Another twist from Hart's story is that Scharfstein introduces more realistic assumptions about managerial preferences. In particular he assumes that the marginal utility of income is positive and finite.

Given these conditions, in particular the possibility of a low productivity state and a high productivity state of the world, it is not optimal for the owner to offer just a single profit target as was the case with the incentive scheme in Hart's model. Rather the owner must specify a revenue target for each state and an incentive payment for each revenue target. However it is this division of payment schemes which leads Scharfstein's model to the counterintuitive result that increased competition can worsen outcomes.

In interpreting the relevance of these theoretical models for assessing the alliance, it is useful to interpret the divide between E-firms and M-firms as one of degree rather than type. One firm can be said to be closer to being an E-firm than another firm if its incentive scheme comes closer to being first-best. Thus, a pure E firm would have a first best incentive scheme. Note that this way of interpreting the E-firm and M-firm divide is generous to the sorts of arguments run by the NZCC because it means that models along the lines of Hart's are not entirely irrelevant.

### *Implications for the Alliance*

The essence of the NZCC's concern is that the incentive schemes tailored for the management of companies within the Alliance and the market for corporate control that affects the management of companies are insufficient for ensuring internal efficiencies. In other words, the NZCC's implicit assumptions are closer to the theoretical set-up envisaged by Hart, where incentive schemes are inadequate to the task of preventing shirking and the

36 Scharfstein, D. 1988, 'Product market competition and managerial slack', *Rand Journal of Economics*, 19: 147–155.

market for corporate control is ignored. From these implicit assumptions arise the NZCC's normative judgement that greater product market competition than what would be possible under the Alliance is necessary for promoting appropriate incentives for cost reduction.

The lesson that can be drawn from Hart's model following on from our reinterpretation of the E-firm / M-firm divide is that product market competition can yield an efficiency benefit to a firm which has a shirking / 'slacking' problem to solve where it is subject to competition from a firm which has an incentive scheme closer to first-best. The issue of relevance thus still arises in this more general interpretation — can the NZCC point to the possibility that absent the Alliance, the firms in the Alliance can face competition from other firms which are better at resolving their own principal agent problems than they are? In the NZCC's favour it could be argued that new entrants are more likely to be sole operator entities or firms which are closer to the E-firm than the M-firm operation (for instance, those with a dominant shareholder). In this case the Hart model suggests there might be benefits from greater competition on minor routes in terms of encouraging internal efficiency to the extent that wider market constraints and incentives were not relevant.

However it is not reasonable to ignore wider market constraints and incentives. As the Alliance competes in an international aviation market there will be a host of relevant performance benchmarks available as well as the profit and survival-driven pressures to ensure the overall efficiency of operations in an increasingly demanding international environment. Although it may be possible to argue that the extent of price competition might be reduced, to the extent that the relevant markets for competition purposes were city-pair markets and there were meaningful entry barriers, it strains credibility to argue that productive efficiency would be adversely affected on the routes covered by the Alliance because of the relevance of wider market constraints and basic profit incentives.

In addition, doubt should be cast on the confidence placed by the NZCC on the benefits of further competition by the results of models such as Scharfstein's which are arguably more realistic in their assumptions about managerial preferences and the fact that incentive schemes might be tailored to take account of different targets for different scenarios. The lesson from Scharfstein's model is that there is not even a guarantee that the competitive discipline imposed on firms by other firms with better resolution of their principal-agent problems will improve matters for the first group. Indeed under more realistic assumptions about managerial preferences, competition may worsen matters.

### *Sometimes more competition leads to greater inefficiency*

Competition can also be viewed as a discovery and selection process whereby market prices communicate information that has been discovered and competition assists in the selection and survival of more efficient firms.[37] Such a process assumes that firms are asymmetric so that superior performance cannot be easily imitated and it also normally relates to a situation where there is a high degree of competition.[38]

However the results are not robust when competition is not perfect. Vickers shows that in the standard Cournot oligopoly model with a homogeneous product and symmetric firms with constant unit production costs and fixed sunk entry costs, more competition leads to a lower price but less exploitation of scale economies. Under rather general conditions there is too much entry in this model. When the assumption of symmetric costs is relaxed the outcome depends on the mix of high and low cost firms. For the case where all of the incumbents are high cost firms and there is a low cost entrant, entry is beneficial to consumers but the overall welfare effect is negative.

A related perspective is that while competition may induce greater effort to avoid the risk of liquidation it can also reduce the incentive to innovate relative to a more concentrated market structure because the profits from innovation will be less.[39]

### *There is not a simple relationship between concentration and innovation*

As was the case with theories relating competition with incentives to pursue cost efficiency (with which there is some overlap since a cost reduction can be formalised as a process innovation), the literature on competition and innovation produces a vast array of contradictory results. Though the overwhelming part of the theoretical literature does not find much support for the straightforward Schumpeterian hypothesis[40] of a positive relationship between concentration and innovation, neither is there much support for a straightforward negative relationship. Rather, the relationship turns out to be more complex with the most intriguing but defensible finding being that there may be an inverted U

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37 Op cit. Vickers, 1995, pp. 12-13 and Nelson. R. and S. Winter, 1982 *Evolutionary theory of economic change.* Harvard University Press

38 Op. cit. Vickers, 1995, p. 13.

39 See Schmidt, K. 1997, 'Managerial incentives and product market competition', *Review of Economic Studies* 64: 191-213 and Martin, S. 1993, 'Endogenous firm efficiency in a Cournot principal-agent model', *Journal of Economic Theory*: 445-450.

40 Schumpeter, J. 1942, *Capitalism, socialism and democracy*, Harper and Row.

relationship between concentration and innovation with too much and too little concentration being detrimental to innovation. For example Kamien and Schwartz[41] show that within certain bounds, increased rivalry stimulates greater innovation effort, but only as long as the pool of appropriable quasi rents remains sufficiently large that each firm tapping the pool can anticipate a reward to cover front end costs and that there is some maximum where if the number of rivals grows further, appropriable benefits will fall short of costs in which case incentives to innovate start to fall.

How applicable are these models to the scenario considered by the NZCC in evaluating the Alliance? For those models that predict a positive relationship between competition and innovation, this arises as a result of the difference between the valuation of pre-innovation profits and post-innovation profits to an existing monopolist. As was highlighted in a seminal paper by Arrow[42] the existence of monopoly rents, irrespective of innovation, reduces the incentive to innovate. However the aviation market has already been subject to substantial deregulation and innovation in response to competition and what the NZCC is looking at is a market that already has some important degree of competition, albeit less on some routes than others. This implies that other strands of the literature where there is some pre-existing rivalry and competition are likely to be more relevant. However, as these other strands of literature reviewed demonstrate, while it is predicted that more competition can promote more innovation above some baseline (namely that of monopoly) it is not clear whether more competition always promotes more innovation.

Consider applying the more complex and more realistic models that predict an inverted U relationship between competition and innovation to an assessment of the impact of the Alliance The effect of decreased competition on specific routes caused by the Alliance would strictly speaking have to depend on where on the inverted U the aviation market is currently at. Using these models no specific pronouncements on whether innovation would be higher or lower can be made. But even if the direction could be determined this does not of course resolve the issue of how the relevant magnitudes of additional innovation foregone or enjoyed compare against the magnitudes of other relevant factors such as the efficiencies promoted by the Alliance.

41 Kamien, M. and N. Schwartz 1976, 'On the degree of rivalry for maximum innovative activity', *Quarterly Journal of Economics* 90(2): 245–260.

42 Arrow, K. 1962, 'Economic welfare and the allocation of resources for innovation' in R. Nelson, *The rate and direction of inventive activity: Economic and social factors.*

### *Empirical evidence of the link between market structure and incentives to reduce costs and innovate*

Empirical studies of the relationship between both cost efficiency and market structure and innovation and market structure have provided mixed and ambiguous results. Studies which have found a negative relationship between cost efficiency or innovation and a concentrated market structure suffer from methodological problems such as the endogeneity of traditional measures of market concentration. The few studies that are careful to correct for this problem arrive at statistically insignificant relationships between internal efficiency or innovation and market structure. However, some studies support the empirical significance of 'stylised facts' that would support some positive relationship between concentration and innovation such as the internal financing of research and development.

### *Conclusions*

According to both the theoretical and empirical literature, the relationship between the level of product market competition and incentives to reduce costs and innovate is, at best, an ambiguous one. In particular, the most popular and plausible arguments for a positive relationship between competition and internal efficiency depend on the effects of competition on corporate governance incentives, primarily through better information. However, the literature acknowledges that in this respect, the market for corporate control and product market competition are substitutable means of dealing with corporate governance incentives.

The theoretical literature has also demonstrated that given some plausible assumptions, there can be too much competition in the sense that competition can lead to disincentives to pursue internal efficiencies. This disincentive can arise either from something analogous to the 'ratchet effect' suffered by a regulated utility or something analogous to the disincentive of firms in a competitive market to pursue innovation because there are no post-innovation rents (in the latter models, pursuing internal efficiency is analogous to investing in a process innovation).

Though the theoretical literature does offer other avenues by which greater product market competition can enhance incentives to pursue internal efficiencies, these are not determinative of the issue faced by the NZCC because, applying these arguments to the facts of the Alliance, the additional effects on internal efficiency are only at the margin. Again these must be weighed against the benefits foregone by disallowing the Alliance.

Similar assessments can be made about both the theoretical literature which examines the relationship between market structure and incentives to innovate. Though the literature has formulated models which result in a straightforward positive relationship between concentrated market structure and incentives to innovate and models which result in a straightforward negative relationship, both kinds of models seem to rely on a simplistic picture and special assumptions. Most models of innovation which try to encompass more general cases or a broader range of assumptions tend to arrive at more complex results – typically a curvilinear relationship and frequently as well, tradeoffs between different forms of innovation and particular market structures.

Finally the empirical literature in relation to both cost efficiency and innovation and market structure also provides mixed results and no clear support for the contentions made by the NZCC about market structure and cost efficiency or innovation.

# Attachment F: Studies of airline efficiency, operational characteristics and industry concentration

The NZCC[43] considered that the range of 1-10% that it used to calculate a productive efficiency detriment fell within the range of efficiency gains implied by the study of Oum and Yu[44]. It also considered that an OECD study by Gonenc and Nicoletti[45] provided support for the NZCC's assessment of productive inefficiencies associated with the alliance. It is notable also that the NZCC used an upper estimate (8%) as its preferred estimate of productive efficiency detriments.

This attachment will show that:

- the NZCC has not interpreted the Oum and Yu study correctly in the sense of identifying a relevant specific competitive influence and that a more careful reading of the Oum and Yu study highlights the strong performance of Qantas;
- the findings in the OECD study also do not support the detriment calculation of the NZCC as it can be shown that:
  - using the OECD equations that there is no statistically significant difference between the predicted outcomes of the factual and the counterfactual for the efficiency measures in the OECD study; and
- the economic literature on airline efficiency and the influence of operational characteristics, competition measures and government ownership does not support the contention that increasing concentration has a significant adverse impact on productive efficiency.

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43 Draft Determination, pp.170-1.

44 Oum, T. H and C. Yu, 1998, Winning Airlines: Productivity and Cost Competitiveness of the World's Major Airlines, Kluwer Academic Publishers.

45 Gonenc, R., and G. Nicoletti, 2000, Regulation, Market Structure and Performance in Air Passenger Transportation, OECD Economics Department Working Papers No. 254.

### *Oum and Yu*

Oum and Yu[46] investigate the cost competitiveness of 22 major international airlines in North America, Europe and Asia. The study measures overall productivity using total factor productivity indexes and stochastic production functions and calculates efficiency measures after adjusting for key factors beyond an airline's control (specifically stage length and output mix). The study also estimates a translog variable cost function and decomposes costs into various sources including size, output mix, input prices, operating characteristics, time effects and residual efficiency. The study also reviews general trends, changes in regulatory arrangements and yields, and financial performance.

In relation to the study by Oum and Yu the NZCC[47] claims that:

> Competition was found to be a significant factor explaining the differences in productive efficiency across carriers, measured by total factor productivity (where TFP is an index of productivity taking account of the growth). Those carriers in more competitive markets had higher productivity or cost competitiveness, in that they were not only on a lower cost function, but also at a lower cost point on that cost function. The latter is achieved through innovative pricing and service strategies. Oum and Yu found that over the period 1986-93, three major European carriers improved their productive efficiency by 11 percent, and three Asian carriers improved their efficiency by 16 percent. In both cases these carriers were subject to increased competition in the markets they served.

This interpretation of Oum and Yu is misleading because their study does not include explicit measures of competition or liberalisation as explanatory variables in any of their regressions explaining productivity or cost, so that formally no statistical significance can be ascribed to competition or liberalisation. The study draws inferences about the impact of deregulation simply by comparing growth differences between regions and informally associating growth differences to some liberalisation of regulatory arrangements.

In this respect it is notable that Oum and Yu do not state that competition is a significant factor in explaining productivity differentials. What they say is that:

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46 Op. Cit. Oum and Yu, 1998.

47 Draft Determination para 706.

> Major regulatory and institutional changes in the European aviation market since 1986 may have contributed to European carrier improvements. [48]

In relation to the Asia-Pacific region Oum and Yu note that:

> Protectionist attitudes still prevail among governments in their policies towards aviation regulation. [49]

And:

> The Asia-Pacific international air service market is traditionally dominated by monopolistic air carriers. [50]

The period of analysis for TFP, stochastic production functions and cost functions was 1986 to 1993. Most of the increase in residual TFP in both Europe and Asia occurred in the period from 1986 to 1990. The regulatory changes identified in Oum and Yu[51] in this period included a series of more liberal bilateral agreements between the US and a number of European countries, and a series of more liberal bilateral agreements between European governments. However some of these agreements retained certain capacity and fare controls. The first of a series of wider liberalization measures was introduced in the European community in 1987. However this reform still retained a number of exemptions that provided immunity of many collusive packages for a three year period. Further reforms were introduced in 1990 and 1993, such that by 1997 the regulatory framework was similar to that prevailing in the US domestic market. The point is that while these regulatory changes may have facilitated more competition, it was not clearly established that these partial regulatory reforms led to a high or even moderate increase in competition in the period from 1986 to 1990. However most of the residual TFP increase (after adjusting for stage length and output mix) for the sample period for European carriers as a whole occurred in this earlier period of the time frame studied by Oum and Yu. Residual TFP weakened in 1991 in all

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48 Ibid, p.97.

49 Ibid, p.28.

50 Ibid, p.28.

51 Ibid, p.27.

regions before recovering slightly in 1992 and increasing further in 1993.[52] Oum and Yu attribute this weakening to the effects of economic recession and the Gulf war.

Oum and Yu calculate a residual TFP index by removing the effect of uncontrollable variables, that they define as average stage length and output mix variables (revenue shares for freight, non-scheduled and incidental services). Although Oum and Yu[53] treat load factor as a controllable variable, it is included as an explanator of total factor productivity in their regressions but it is not corrected for when calculating residual total factor productivity, although it is statistically significant and economically important.[54] This has the implication that part of the difference in residual total factor productivity is likely to be related to differences in load factors which could in turn be the result of better management but also the result of the natural advantages of operating in busier markets that better enable the realisation of economies of density.

Load factors for European carriers showed an upward trend on average in the 1986 to 1993 period while load factors for Asian carriers increased and then declined in the same period back to similar levels at the start of the period. Thus at least part of the reported improvement in residual TFP for European carriers could be explained by rising load factors. In contrast the preferred efficiency measure derived from the stochastic production function did adjust for load factors. Similar profiles were reported for residual efficiency from both approaches but it does appear from inspection of the graphs that residual efficiency based on the stochastic frontier method increased at a slower rate than for the TFP method for European airlines.

Oum and Yu also investigate unit cost competitiveness. They note that:

> When an airline competes in a given market, particularly in an inter-continental market, what is relevant is the marginal cost of providing a given level of service in

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52 Ibid, p.104

53 Ibid, p.78, "In this study, load factor is regarded as being controllable".

54 As noted by Oum and Yu some researchers argue that load factor is largely determined by the type of markets an airline is allowed to operate in as well as other regulatory constraints while others argue that load factor is a controllable variable.

> that market. What determines cost competitiveness is input prices paid by the airline and how efficiently the airline produces and markets their services. [55]

They estimate a cost function that includes output, input prices, output mix, stage length, time effects and a residual efficiency measure being the residual TFP measure or the technical efficiency measure from the stochastic production frontier that they estimated earlier in their study. They then use the parameters from the cost function to construct a measure of cost competitiveness which comprised input price and efficiency differences.

Nowhere in their study do they discuss or investigate allocative efficiency effects that would be expected if one were trying to determine where firms were on a cost function. Also there is no statistical investigation of "innovative pricing and service strategies" or demonstration that such strategies lead to cost minimization as suggested by the NZCC. The study does show that US carriers were more efficient than European carriers and Asian carriers and that both European carriers and Asian carriers closed the efficiency gap with the US in the sample period. But the study has nothing to say about the intensity of competition in the US in the sample period, it does not isolate the impact of specific regulatory and competition variables in any of the regions, and it finds that residual efficiency improved the most in a market that was characterized by the study as the most protectionist and dominated by what the study refers to as monopolistic flag carriers.

It is relevant to summarise the key findings of Oum and Yu about the relative efficiency of Qantas. This can help in determining whether the productive efficiency cost reductions that are contended by the NZCC have credibility (but only if it is assumed that wider forces and profit incentives are ineffective in providing adequate incentives to pursue good efficiency outcomes).

Oum and Yu found that in relation to residual total factor productivity and after adjusting for output mix and stage length:

- Over the period 1986 to 1993 Asian carriers improved their efficiency from 18% less to about 5% less than the US and most of the improvement in their performance was attributable to the strong performance of Qantas, Korean Air and Thai International.
- Over the period 1986 to 1993 European carriers improved their efficiency from a level about 20 percent less to about 12 percent less than the US.

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55 Ibid, p.162.

- The measure of residual TFP for Qantas was the second highest of the Asian carriers in 1993 (only slightly below the leading Asian carrier Singapore International airlines) and above the average for North American airlines.

Oum and Yu defined cost competitiveness as cost differences arising from input price and residual efficiency differences after adjusting for output mix and stage length and found:

- Asian carriers (with the exception of Japan Airlines Limited and All Nippon Airways) were generally more cost competitive than major US carriers with lower input prices being the dominant reason.
- Qantas had a clear input cost advantage over 5 out of 8 North American carriers (and was in a similar position to one other), all 7 European carriers and 3 out of 7 Asian carriers.
- Qantas had a residual efficiency advantage over 3 Asian carriers, 3 North American carriers and 3 European carriers.
- Qantas had an overall cost competitiveness advantage over all 7 European carriers, over 2 Asian carriers and over 3 North American carriers.
- Qantas had an overall cost competitiveness disadvantage of 2.7% relative to the benchmark American Airlines and about 2% relative to a weighted average (using operating expenses as weights) of US airlines.

It should also be recognised that Oum and Yu did not specifically correct residual TFP or the cost competitiveness measure for hubbing, load factor, points served and aircraft airframe and engine fuel efficiency improvements. And, as suggested by the literature review on airline efficiency improvements, such corrections could narrow the advantage of US airlines relative to non-US airlines, particularly for hubbing (but not necessarily for aircraft efficiency improvements given the availability of a similar technology).

Recognising these considerations it is reasonable to conclude that the Oum and Yu results suggest a very good performance by Qantas with little scope for the interpretation of a significant difference between its efficiency levels (adjusted for factors largely beyond the control of management) and best practice.

It is also important to recognise, in contrast to the interpretation by the NZCC, that these results show that the strongest residual efficiency growth occurred in the region which Oum and Yu characterized as protectionist and dominated by monopolistic flag carriers.

Oum and Yu also found that majority government ownership had a significant negative impact on the productive efficiency of an airline.[56] However no attempt was made to isolate developments in relation to government ownership or changed governance arrangements from regulatory developments.

### *The Gonenc and Nicoletti OECD study*

The NZCC[57] refers to an OECD study by Gonenc and Nicoletti[58] that it claims supports a negative link between airline productive efficiency and market concentration. The Gonenc and Nicoletti study examines the relationship between various measures of firm performance and indicators for regulatory arrangements and market structure, while controlling for certain operating and environmental variables.

Gonenc and Nicoletti examine data at both the national level and at the level of specific routes for 27 OECD countries for the period circa 1996–97. They develop 21 regulatory and market structure indicators at the country level and 23 similar indicators for 102 routes connecting 14 major international airports. They combine these individual indicators into summary measures of market structure and regulatory conditions to overcome potential multicollinearity problems, using the statistical technique of factor analysis. The measures are constructed in such a way that a lower value indicates a less concentrated market structure or more liberal regulatory arrangements.

At the national level the efficiency of air travel is measured by two separate indicators. One is a measure of the efficiency of all factors of production, measured by means of data envelopment analysis. This was calculated by specifying total passengers transported and total passenger-kilometres as outputs and total personnel, capacity, fleet, fuel and average stage length as inputs. The second measure of efficiency was the average aggregate load factor defined as a weighted average of carriers' percentage share of seats occupied in total aircraft seat capacity on international routes. The measures of efficiency for the regressions

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56 Ibid, p.114.

57 Draft Determination, para 704.

58 Gonenc, R., and G. Nicoletti, 2000, *Regulation, Market Structure and Performance in Air Passenger Transportation,* OECD Economics Department Working Papers No. 254.

were the distance from the efficiency frontier expressed as a percentage and the inverse of the load factor measure (which is interpreted as the average inoccupancy rate). Fares were not examined at the national level.

At the route level, the performance measures were average inoccupancy rates and business, standard economy and discount fares.

Gonenc and Nicoletti then estimate the relationship between these measures of performance, the summary indicators of market structure and regulatory arrangements and variables such as average aircraft size, average aircraft age and propensity to air travel. The analysis is done at both the national level and at the route-specific level.

Table F1 is a copy of Table 6 from Gonenc and Nicoletti showing the results of their regressions at the national level. The results in panel A for each regression model refer to regressions when an overall summary measure of the regulatory and market environment is used. The results in panel B for each regression model refer to regressions when separate regulatory and market environment summary measures are used.

The results shown in Table 6 indicate that the average fleet size and the propensity to travel have a negative and significant statistical effect on the DEA measure of efficiency (distance from the efficient frontier). That is larger aircraft size or higher propensity to travel are both consistent with higher efficiency. This reflects the extent to which these variables are reasonable proxies of economies of density and other scale effects, which the economic literature has confirmed as important in explaining productive efficiency. The results shown in Table 6 also confirm that a less concentrated market structure and more liberal regulatory arrangements also have a positive and significant statistical effect on the DEA measure of efficiency. The average aircraft age variable was not statistically significant and did not have the expected sign in the DEA regressions. The results for the inoccupancy regressions were similar but the statistical significance of most variables was marginal.

The OECD regressions have been used here to predict the impact of the Alliance in the factual and the counterfactual scenarios. The OECD data were obtained and an attempt was made to replicate the results in Table 6. It was possible to replicate the means and standard deviations of all the variables reported in Table 5 of Gonenc and Nicoletti and to also replicate the t statistics and other statistical measures as reported in their Table 6. However, it was not possible to replicate the size of the coefficients, indicating that they may have scaled the data when estimating the regressions.

**Table F1: Sourced from Table 6 of Gonenc and Nicoletti**

| Dependent Variable | Distance of domestic industry from efficiency frontier (DEA measure) | | Average inoccupancy rate on international routes served by domestic carrier | |
|---|---|---|---|---|
| **Regressions** | **A** | **B** | **A** | **B** |
| **Explanatory variable** | | | | |
| **Constant** | 0.53<br>*3.77* | 0.48<br>*3.71* | 0.75<br>*7.78* | 0.91<br>*6.38* |
| **Average aircraft size in fleet** | -0.51<br>*-5.45* | -0.51<br>*-5.32* | -0.32<br>*-1.97* | -0.31<br>*-1.90* |
| **Average aircraft age in fleet** | -0.03<br>*-0.29* | -0.03<br>*-0.28* | 0.08<br>*0.44* | 0.07<br>*0.39* |
| **Propensity to air travel** | -0.43<br>*-4.65* | -0.43<br>*-4.11* | -0.31<br>*-1.94* | -0.34<br>*-1.87* |
| **Overall regulatory and market environment** | 0.53<br>*5.18* | | 0.49<br>*2.78* | |
| **Regulatory environment** | | 0.25<br>*2.08* | | 0.16<br>*0.79* |
| **Market Environment** | | 0.36<br>*3.25* | | 0.39<br>*2.03* |
| **Statistics:** | | | | |
| **Observations** | **27** | **27** | **27** | **27** |
| **Degrees of freedom** | **22** | **21** | **22** | **21** |
| **$R^2$** | 0.83 | 0.83 | 0.48 | 0.48 |
| **Adj. $R^2$** | 0.79 | 0.79 | 0.38 | 0.36 |
| **F** | 26.12 | 19.95 | 5.04 | 3.89 |

Note the constant was not provided in Table 6 of Gonenc and Nicoletti but was derived given the data and the other parameter estimates (constant = actual dependent variable less forecast (excluding constant) averaged over all observations).

t statistics are in italics.

## Table F2: Replication of regressions reported in Table 6 of Gonenc and Nicoletti

| Dependent Variable | Distance of domestic industry from efficiency frontier (DEA measure) | | Average inoccupancy rate on international routes served by domestic carrier | |
|---|---|---|---|---|
| **Regressions** | **A** | **B** | **A** | **B** |
| **Explanatory variable** | | | | |
| **Constant** | 0.69<br>*3.07* | 0.69<br>*2.82* | 0.82<br>*6.09* | 0.84<br>*5.74* |
| **Average aircraft size in fleet** | -0.92<br>*-5.45* | -0.92<br>*-5.32* | -0.20<br>*-1.97* | -0.20<br>*-1.90* |
| **Average aircraft age in fleet** | -0.05<br>*-0.29* | -0.05<br>*-0.27* | 0.04<br>*0.43* | 0.04<br>*0.39* |
| **Propensity to air travel** | -0.53<br>*-4.65* | -0.53<br>*-4.11* | -0.13<br>*-1.94* | -0.14<br>*-1.87* |
| **Overall regulatory and market environment** | 0.74<br>*5.17* | | 0.24<br>*2.78* | |
| **Regulatory environment** | | 0.39<br>*2.08* | | 0.09<br>*0.79* |
| **Market Environment** | | 0.35<br>*3.24* | | 0.13<br>*2.02* |
| **Statistics:** | | | | |
| **Observations** | **27** | **27** | **27** | **27** |
| **Degrees of freedom** | **22** | **21** | **22** | **21** |
| **$R^2$** | 0.83 | 0.83 | 0.48 | 0.48 |
| **Adj. $R^2$** | 0.79 | 0.79 | 0.38 | 0.36 |
| **F** | 26.12 | 19.95 | 5.03 | 3.89 |

**NB: Calculated using Eviews 4.1** t statistics are in italics.

Table F2 contains the results of the re-estimated regressions. As can be seen by comparing with the results in Table F1, all the coefficients have the same sign as in Table F1 but are generally numerically larger in the DEA regressions and smaller in the inoccupancy regressions.

Statistical tests confirmed the presence of heteroscedasticity in the regressions, which can increase the standard errors, lead to erroneous indication of statistical significance and affect confidence intervals for coefficients and forecasts. Table F3 contains the results when heteroscedasticity was corrected for. Most of the coefficients continue to be statistically significant in the DEA regressions, but only marginally so for the regulatory measure in the DEA regression B. However, most of the coefficients are not statistically significant in the inoccupancy regressions and the statistical significance of the market environment variable is marginal in the inoccupancy regression B. Log likelihood ratio tests indicated that regression B was the preferred regression for both the DEA and inoccupancy regressions. This accords with the intuition that the separation of the summary measure into market structure and regulatory environment measures has economic meaning and is statistically significant.

Preferred regressions for forecasting purposes were obtained by progressively removing variables from the equations (that were corrected for heteroscedasticity) that were not statistically significant at the 5% level of significance. This entailed the dropping of the aircraft age variable in the DEA regressions and all variables except the constant and the overall regulatory and market environment variable in the inoccupancy regression A and the constant and the market environment variable in the inoccupancy regression B. The results for the preferred regressions for forecasting are presented in Table F4.

The regression equations were used to predict the impact of the Alliance on the efficiency measures in the regressions. This required estimation of the independent variables in the equations including the calculation of the summary market and regulatory environment variables. Table F5 contains a summary of the relevant variables for the factual and the counterfactual scenarios. The individual variables in Table F5 were combined into the summary measures shown in the last 3 rows of the Table using the weights obtained from the factor analysis results reported by the OECD.

Table F6 contains forecasts and confidence intervals based on the OECD coefficients from Table F1. Table F7 contains forecasts and confidence intervals based on the preferred regressions in Table F4.

## Table F3: Replication of regressions reported in Table 6 of Gonenc and Nicoletti, with correction for heteroscedasticity.

| Dependent Variable | Distance of domestic industry from efficiency frontier (DEA measure) | | Average inoccupancy rate on international routes served by domestic carrier | |
|---|---|---|---|---|
| **Regressions** | **A** | **B** | **A** | **B** |
| **Explanatory variable** | | | | |
| **Constant** | 0.69<br>*2.59* | 0.69<br>*2.36* | 0.82<br>*6.73* | 0.84<br>*6.91* |
| **Average aircraft size in fleet** | -0.92<br>*-5.38* | -0.92<br>*-5.31* | -0.20<br>*-1.66* | -0.20<br>*-1.59* |
| **Average aircraft age in fleet** | -0.05<br>*-0.26* | -0.05<br>*-0.25* | 0.04<br>*0.51* | 0.04<br>*0.46* |
| **Propensity to air travel** | -0.53<br>*-5.64* | -0.53<br>*-5.01* | -0.13<br>*-1.56* | -0.14<br>*-1.59* |
| **Overall regulatory and market environment** | 0.74<br>*4.85* | | 0.24<br>*3.35* | |
| **Regulatory environment** | | 0.39<br>*1.97* | | 0.09<br>*0.79* |
| **Market Environment** | | 0.35<br>*3.01* | | 0.13<br>*2.04* |
| **Statistics:** | | | | |
| **Observations** | **27** | **27** | **27** | **27** |
| **Degrees of freedom** | **22** | **21** | **22** | **21** |
| **$R^2$** | 0.83 | 0.83 | 0.48 | 0.48 |
| **Adj. $R^2$** | 0.79 | 0.79 | 0.38 | 0.36 |
| **F** | 26.12 | 19.95 | 5.03 | 3.89 |

**NB: Calculated using Eviews 4.1** t statistics are in italics.

**Table F4: Replication of regressions reported in Table 6 of Gonenc and Nicoletti, with correction for heteroscedasticity and omission of insignificant variables.**

| Dependent Variable | Distance of domestic industry from efficiency frontier (DEA measure) | | Average inoccupancy rate on international routes served by domestic carrier | |
|---|---|---|---|---|
| Regressions | A | B | A | B |
| Explanatory variable | | | | |
| Constant | 0.64<br>*3.89* | 0.64<br>*3.32* | 0.67<br>*14.33* | 0.75<br>*20.99* |
| Average aircraft size in fleet | -0.92<br>*-5.26* | -0.92<br>*-5.19* | 0.0 | 0.0 |
| Average aircraft age in fleet | 0.0 | 0.0 | 0.0 | 0.0 |
| Propensity to air travel | -0.52<br>*-6.40* | -0.52<br>*-5.66* | 0.0 | 0.0 |
| Overall regulatory and market environment | 0.75<br>*6.02* | | 0.27<br>*3.98* | |
| Regulatory environment | | 0.40<br>*2.15* | | 0.0 |
| Market Environment | | 0.36<br>*3.30* | | 0.17<br>*2.97* |
| **Statistics:** | | | | |
| Observations | **27** | **27** | **27** | **27** |
| Degrees of freedom | **23** | **22** | **25** | **25** |
| $R^2$ | 0.83 | 0.83 | 0.32 | 0.25 |
| Adj. $R^2$ | 0.80 | 0.79 | 0.29 | 0.22 |
| F | 36.25 | 26.01 | 11.65 | 8.28 |

**NB: Calculated using Eviews 4.1** t statistics are in italics.

## Table F5: Regulatory and Market Environment Variables in the Factual and the Counterfactual

| | 1997 | Actual | Factual | Counterfactual |
|---|---|---|---|---|
| Number of major airlines | 2.00 | 2.00 | 2.00 | 3.00 |
| Number of ICAO-registered airlines | 2.00 | 2.00 | 2.00 | 3.00 |
| Number of airlines carrying more than 500,000 passengers a year | 1.00 | 2.00 | 2.00 | 3.00 |
| Domestic market share of the largest airline (incl. subs.) (%)* | 1.00 | 0.68 | 0.71 | 0.55 |
| International market share of the largest airline (incl. subs. (%)^ | 1.00 | 0.47 | 0.72 | 0.44 |
| Share of 100 international routes with more than 3 carriers. | 1.00 | 0.00 | 0.00 | 0.00 |
| Market Share Airline 1 (%) | 1.00 | 0.54 | 0.78 | 0.50 |
| Market Share Airline 2 (%) | | 0.31 | 0.12 | 0.37 |
| Market Share Airline 3 (%) | | 0.03 | 0.02 | 0.02 |
| Market Share Airline 4 (%) | | 0.02 | 0.01 | 0.02 |
| Market Share Airline 5 (%) | | 0.02 | 0.01 | 0.02 |
| Market Share Airline 6 (%) | | 0.02 | 0.01 | 0.02 |
| Market Share Airline 7 (%) | | 0.02 | 0.01 | 0.01 |
| Market Share Airline 8 (%) | | 0.01 | 0.01 | 0.01 |
| R2d | 0.00 | 0.00 | 0.00 | 0.00 |
| R2i | 0.00 | 1.00 | 1.00 | 1.00 |
| R2os | 0.00 | 0.00 | 0.00 | 0.00 |
| R2reg | 0.00 | 0.00 | 0.00 | 0.00 |
| Tos | 0.00 | 1.00 | 1.00 | 1.00 |
| Treg | 0.00 | 1.00 | 1.00 | 1.00 |
| O(comp) | 1.00 | 2.74 | 2.09 | 2.74 |
| Ogs | 0.00 | 0.74 | 0.09 | 0.74 |
| Ggs | 1.00 | 1.00 | 1.00 | 1.00 |
| Ogd | 0.00 | 1.00 | 1.00 | 1.00 |
| Opso | 0.00 | 0.00 | 0.00 | 0.00 |
| Total number of air passengers transported per year (Million) | 9.60 | 10.68 | 12.49 | 13.16 |
| Size of commercial fleet(no. of aircraft) | 45.00 | 65.00 | 38.00 | 39.00 |
| total number of commercial aircraft less than 100 seats | 4.00 | 26.00 | 0.00 | 0.00 |
| Total number of commercial aircraft 100-200 seats. | 19.00 | 22.00 | 21.00 | 22.00 |
| Total number of commercial aircraft 200-300 seats | 12.00 | 9.00 | 9.00 | 9.00 |
| Total number of commercial aircraft more than 300 seats | 10.00 | 8.00 | 8.00 | 8.00 |
| Flstu. Average aircraft size (aver. nb. of seats per airc.) | 0.82 | 0.58 | 0.84 | 0.83 |
| Average age of all commercial aircraft less than 100 seats | | 8.90 | 0.00 | 0.00 |
| Average age of all commercial aircraft 100-200 seats | | 11.40 | 4.86 | 4.86 |
| Average age of all commercial aircraft 200-300 seats | | 6.90 | 9.84 | 9.84 |
| Average age of all commercial aircraft more than 300 seats | | 8.80 | 11.72 | 11.72 |
| Flage. Average age of aircraft fleet. | 0.77 | 0.66 | 0.61 | 0.60 |
| Proair. Propensity to Air Travel. | 0.56 | 0.62 | 0.70 | 0.74 |
| Mhed. Domestic Herfindahl Index. | 1 | 0.56 | 0.57 | 0.47 |
| Mhei. International Herfindahl Index. | 1 | 0.33 | 0.53 | 0.33 |

| | 1997 | Actual | Factual | Counterfactual |
|---|---|---|---|---|
| Overall regulatory and market environment | 0.57 | 0.59 | 0.61 | 0.53 |
| Regulatory environment | 0.42 | 0.58 | 0.61 | 0.57 |
| Market environment | 0.36 | 0.28 | 0.29 | 0.23 |

| | |
|---|---|
| R2d | Existence of a domestic (pure domestic) air liberalisation reform package (yes =0, no = 1) |
| R2i | Openness of international market to competition: ((R2os+Tos)+(R2reg+Treg))/2 |
| R2os | Existence of an 'Open Skies' air service agreement with the US (yes = 0, no = 1) |
| R2reg | Existence of a Regional Single Aviation Market (yes = 0, no = 1, cabotage exception = 0.5) |
| Tos | Maturation mark-ups (= 0 if R2os and R2reg established before 1993, and = 1 if established after 1993, and = 2 if no liberalisation yet) |
| Treg | Maturation mark-ups (= 0 if R2os and R2reg established before 1993, = 1 if established after 1993, = 2 if no liberalisation yet) |
| O(comp) | A composite "continuous" indicator which cumulates (from 0 to 4): = 4 if Ogs>50% (effective government control of the largest airline), = Ogs+Ggs+Ogd+Opso otherwise |
| Ogs | Share of government in the equity capital of the largest airline(<1) |
| Ggs | Presence of a special voting right (I.e. golden share) for government in a major airline (no = 0, yes = 1) |
| Ogd | Government loss make-ups in major airlines in the past five years (no = 0, yes = 1) |
| Opso | Formal public service obligations of the larges airline (no = 0, yes = 1) |
| Flstu: | [(no. comm. aircraft < 100 seats)*50+(no. comm. aircraft,100-200 seats)*150+(no. comm aircraft, 200-300 seats)*250+(no. comm aircraft > 300 seats)*350]/Size of comm. Fleet (no. of aircraft). |
| Flage: | [(ave. age < 100 seats)x(no. comm. Aircraft<100)*50+(ave. age 100-200 seats)x(no. comm. Aircraft 100-200)*150+(ave. age 200-300 seats)x(no. comm. aircraft 200-300)*250+(ave. age >300 seats)x(no. comm. aircraft>300)*350]/[(no. comm. Aircraft<100)*50+(no. comm. Aircraft 100-200)*150+(no. comm. aircraft 200-300)*250+(no. comm. aircraft>300)*350] |

*Refers to market share based on seat capacity.

^Refers to market share based on seat capacity.

### Table F6: Forecasts and Confidence intervals based on OECD regression coefficients

| | Lower | Point estimate | Upper |
|---|---|---|---|
| **DEA** | | | |
| RegA | | | |
| OECD 1997 | 0.055 | 0.146 | 0.237 |
| Actual 2002 | 0.189 | 0.261 | 0.333 |
| Factual | 0.010 | 0.103 | 0.196 |
| Counter factual | -0.042 | 0.048 | 0.138 |
| RegB | | | |
| OECD 1997 | -0.053 | 0.025 | 0.102 |
| Actual 2002 | 0.075 | 0.147 | 0.219 |
| Factual | -0.103 | -0.012 | 0.078 |
| Counter factual | -0.146 | -0.056 | 0.033 |
| **Inoccupancy** | | | |
| RegA | | | |
| OECD 1997 | 0.625 | 0.656 | 0.687 |
| Actual 2002 | 0.691 | 0.717 | 0.743 |
| Factual | 0.580 | 0.613 | 0.647 |
| Counter factual | 0.532 | 0.564 | 0.597 |
| RegB | | | |
| OECD 1997 | 0.665 | 0.719 | 0.772 |
| Actual 2002 | 0.715 | 0.768 | 0.821 |
| Factual | 0.599 | 0.662 | 0.726 |
| Counter factual | 0.557 | 0.622 | 0.686 |

**Table F7: Forecasts and Confidence intervals based on replication of OECD regressions, with correction for heteroscedasticity and omission of insignificant variables.**

| | Lower | Point estimate | Upper |
|---|---|---|---|
| **DEA** | | | |
| RegA | | | |
| OECD 1997 | -0.028 | 0.023 | 0.074 |
| Actual 2002 | 0.190 | 0.232 | 0.275 |
| Factual | -0.092 | -0.035 | 0.022 |
| Counter factual | -0.165 | -0.109 | -0.053 |
| RegB | | | |
| OECD 1997 | -0.168 | -0.116 | -0.065 |
| Actual 2002 | 0.072 | 0.121 | 0.170 |
| Factual | -0.215 | -0.150 | -0.086 |
| Counter factual | -0.266 | -0.201 | -0.136 |
| **Inoccupancy** | | | |
| RegA | | | |
| OECD 1997 | 0.817 | 0.831 | 0.845 |
| Actual 2002 | 0.820 | 0.834 | 0.848 |
| Factual | 0.826 | 0.840 | 0.854 |
| Counter factual | 0.804 | 0.818 | 0.832 |
| RegB | | | |
| OECD 1997 | 0.790 | 0.805 | 0.821 |
| Actual 2002 | 0.778 | 0.793 | 0.809 |
| Factual | 0.780 | 0.795 | 0.810 |
| Counter factual | 0.769 | 0.785 | 0.801 |

The confidence interval estimate of the forecast has the interpretation (for the specified level of confidence) that under repeated sampling such intervals will contain the true value of the forecast estimate with a probability consistent with the level of confidence that has been specified. The intervals in Tables F6 and F7 have been constructed at the 95% level of confidence. Thus under repeated sampling on average the estimated intervals will enclose the true population forecast with a 95% probability.

The interval estimates were calculated for the 1997 data in the OECD study, for the actual situation circa 2002 , and for the factual and counterfactual scenarios. Given the definition of the dependent variable, a smaller value indicates a higher level of efficiency for both the DEA measure and the inoccupancy rate. Strictly speaking an estimate of 0 for the DEA measure indicates that the estimate is on the DEA efficiency frontier. It is possible to forecast a negative DEA measure as the forecasts are not constrained to be non-zero. A larger negative DEA estimate has the intuitive interpretation of a higher level of efficiency given changes in explanatory variables.

An important feature of the results is that there is an apparent deterioration in efficiency between 1997 and the actual current situation, implied by the regression forecasts for all equations. However this deterioration is reversed in both the factual and counterfactual scenarios in all regressions. These observations apply to the forecasts using the OECD equations (Table F5) and the revised equations with corrections for heteroscedasticity and the omission of insignificant variables (Table F6). Generally the results indicate a higher level of efficiency in the counterfactual compared to the factual. However an important finding is that in most cases the confidence intervals overlap substantially for the factual and counterfactual scenarios, implying in such cases that there is likely to be a low level of confidence that the forecast estimates are significantly different in a statistical sense. The overlap is particularly noticeable in regression B for both the DEA and inoccupancy regressions in both Tables F5 and F6. Simply put it is not possible to determine that the forecasts are significantly different at the level of significance that is normally specified.

These findings also need to be considered in the context of the general findings in the economic literature on airline alliances, airline industry concentration, government ownership and airline efficiency. The economic literature on airline alliances identifies a range of opportunities where alliances are likely to enhance efficiency and generally confirms that alliances entailing major cooperation are associated with improvements in productive efficiency. Importantly no studies identify an adverse impact from alliances on productive efficiency. The economic literature on airline industry concentration generally finds that there is an ambiguous or at most small adverse impact of increased industry concentration on productive efficiency and that lower government ownership is associated with improvements in productivity.

In summary the OECD study identifies a positive link between a measure of market structure that is interpreted as friendlier to competition and measures of airline efficiency. For the route level regressions the OECD also finds that government control over route carriers has a marginally statistically significant effect in explaining inoccupancy rates i.e. higher government control implies lower inoccupancy (a result which is in contrast to the general findings of the economic literature). However closer examination of the results identifies a number of possible weaknesses in the OECD results that caution against using the results to conclude the alliance would be adverse. In particular, the use of the equations to forecast efficiency measures relating to the factual and counterfactual scenarios shows that it is not possible to clearly distinguish between the outcomes in a statistical sense.

Put more directly, any differences in efficiency between the factual and the counterfactual, when evaluated using the OECD model, are not statistically significant. It would consequently be erroneous to infer from this model that the Alliance would result in losses in productive efficiency.

### *Evidence of the importance of economies of density in airline productive efficiency*

The economic literature provides clear support for the importance of traffic density in determining airline cost efficiency. These economies should not be confused with the concept of overall economies of scale. Economies of density arise as a result of increased output holding constant: points served, average stage length, average load factor and input prices but allowing other inputs to increase. Whereas economies of overall scale refer to an increase in output and points served holding constant: average stage length, average load factor and input prices but allowing other inputs to increase.

Formally returns to density can be defined as the inverse of the elasticity of cost with respect to output and returns to scale as the inverse of the sum of the elasticities of total cost with respect to output and points served as follows:

$$RTD = 1/\varepsilon_y$$

$$RTS = 1/(\varepsilon_y + \varepsilon_p)$$

where $\varepsilon_y$ is the elasticity of total cost with respect to output and $\varepsilon_p$ is the elasticity of total cost with respect to points served.

The economic literature also supports an inverse relationship between unit cost and average stage length and between unit cost and average load factor. However these are not factors that necessarily relate to the overall scale of airline operations.

Caves, Christensen and Tretheway[59] investigate economies of density and economies of scale based on a panel data set for the years 1970 through 1981 comprising all trunk and local service airlines in the United States. There are 15 airlines in the sample for the full period and six additional airlines for shorter periods.

They note that there are several studies that have found approximately constant returns to scale for airline systems that have reached the size of the US trunk carriers but there are beliefs that unit costs decline rapidly within any city-pair market and that there are scale economies to be exploited by carriers smaller than the trunks.

They estimate a translog cost function and control for average stage length and average load factor and use the number of points (airports) served as an indicator of the size of the airline network.

Key results are as follows:

- Returns to density were statistically significant and economically large. RTD were 1.24 at the sample mean in a total cost function and 1.18 in a variable cost function (that treats capital as fixed input).
- Approximately constant overall returns to scale were confirmed.

Kumbjakar[60] also investigates returns to scale, returns to density and technical change in US airlines for a panel of 31 trunk and local service airlines for the period 1970-84. He estimates a system of input demand functions consistent with a form of a Symmetric Generalized McFadden cost function to overcome violations of concavity assumptions in earlier studies.

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59 Caves, D.W., L. R. Christensen, and M. W. Tretheway, 1984, 'Economies of Density Versus Economies of Scale: Why Trunk and Local Service Airline Costs Differ', *Rand Journal of Economics,* 15 (4): 471-89.

60 S. C. Kumbhakar, 2001, 'A Reexamination of Returns to Scale, Density and Technical Progress in US Airlines', *Southern Economic Journal*, Vol. 57 pp. 428-42.

He incorporated average stage length, average load factor and points served into the cost function.

Key results are as follows:

- Returns to density are statistically significant and decline from 1.37 prior to deregulation to 1.20 after deregulation.
- Returns to scale are also statistically significant and decline from 1.23 prior to deregulation to 1.09 after deregulation.
- Neither the trunk nor the local airlines have fully exhausted returns to density or returns to scale and the local carriers have similar economies of density and lower economies of scale than the trunks for the sample period as a whole.

These findings and perspectives are highly relevant to an evaluation of the public benefits of the alliance. Since if there are important economies of density and if associated fixed costs are not of a sunk nature, there could be important cost savings attributable to the alliance that would not otherwise be realised over the longer term. In addition if it is the case that sunk costs are low then the threat of entry could also be as effective as actual entry in exerting pressures to continue to achieve productive efficiencies.

### *Evidence of the importance of technology and other operating characteristics*

Gordon[61] calculated multifactor productivity indexes for the US airline sector as whole (i.e. using sector data rather than firm-specific data) for the period 1948-87 and found that productivity slowed after 1978, implicitly showing no direct efficiency gain from deregulation. His measure of capital adjusted for improvements in the quality of aircraft by using quality-adjusted price deflators that, for example, adjust for improvements in fuel efficiency not reflected by proportional increases in real equipment costs. He identified large welfare effects (3.5% of GNP) from time saved associated with improvements in airframes and engines. However he noted that deregulation led to an unwinding of cross-subsidies of short haul by long haul flights and, together with the economics of hub operations, this stimulated demand for short haul airliners like the B737 and induced improvements by aircraft manufacturers.

61 Gordon, R. J., 1991, 'Productivity in the Transportation Sector', National Bureau of Economic Research Working Paper No. 3815.

Baltagi, Griffin and Rich[62] analyse cost changes in the US airline industry for the domestic operations of 24 trunk and local airlines for the period 1971-1986. They also note the improvements in fuel efficiency in aircraft airframe and engine design and test the importance of vintage aircraft quality measures as well as regulation-driven factors such as load factor and route structure.

Key results are as follows:

- There is evidence of returns to density, particularly in the post deregulation period, but not returns to scale.
- The measure of pure technical change declined from 4.6 for 1981-78 to 3.4 per cent for 1987-86.
- Aircraft quality changes as reflected in the fuel efficiency measure are critical for explaining the long term trend growth in technical change, accounting for 1.37% of the 3.95% increase in pure technical change.
- Secular improvements in load factor accounted for 0.97% of the improvement in pure technical change of 3.95% but load factor declines also contributed to the slow down in productivity growth in the post-deregulation era.
- Hubbing played a minor role in the pre-deregulation era but a major one in the post deregulation era, accounting for 2.03% of the 3.37% increase in technical change over the 1978-86 period.
- Trunk airlines experienced 9.7% lower costs due to deregulation (comparing the difference between 1986 with and without regulation relative to 1976). Output growth and capital increases[63] accounted for a 4.1% cost reduction, reduced wages for 4.6% and higher load factors for 4%. Increased hubbing was the most important factor contributing 15.4%. An increase in points served raised costs by 5.9%. Temporary inefficiencies associated with mergers raised costs by 1.3%. There was

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62 Baltagi, B. H., J. M. Griffin and D. P. Rich, 1995, 'Airline Deregulation: The Cost Pieces of the Puzzle', International Economic Review, 36(1), 245-260.

63 Interpreted as economies of density which in this case need to include capital adjustments as a variable cost function was estimated.

no impact on costs from fuel efficiency improvements associated with deregulation.[64]

- Non-trunk airlines experienced 19.9% lower costs due to deregulation. Output growth and capital increases contributed to a 14.8% cost reduction, highlighting the importance of achieving economies of density for the smaller airlines. Hubbing was the most important factor in reducing costs (as for trunk airlines) and contributed a 20.9% cost reduction.

- Despite these improvements average costs for non-trunk airlines were still 11% higher than for trunk airlines.

Distexhe and Perelman[65] analyse a panel of 33 airlines from Asia and Oceania, Europe and the US over the period 1977 to 1988 using Data Envelopment Analysis and a Malmquist index of productivity to assess the impact on productivity of output and input characteristics, technological change and efficiencies. They also investigate the importance of average weight load factor as a measure of market performance and the average number of aircraft departures per 100,000km (the inverse of average stage length) as an input.

In providing context for their study they note[66] that US carriers took advantage of a more open institutional environment in the 1980s and that under the pressure of US authorities and operators a far reaching liberalization of the international North Atlantic and Pacific aviation markets was obtained, with European and Asian airlines also being subject to open competition in those regions. While in Europe, they noted that deregulation entailed new bilateral agreements between national authorities and multilateral agreements taking the form of EEC directives like those adopted in 1987 (suggesting relatively slow evolution towards deregulation).

Key results are as follows:

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64 It was assumed that the aircraft quality variable was independent of deregulation influences.

65 Distexhe, V., and S. Perelman, 1994, 'Technical Efficiency and Productivity Growth in an Era of Deregulation: the Case of Airlines', *Swiss Journal of Economics and Statistics*, 130 (4), 669-89.

66 Ibid, p. 671.

- Regardless of the approach used, the average levels of technical efficiency reached in the eighties are higher than those obtained in the late seventies.
- The convergence towards efficiency is the most significant among the Far East/Pacific airlines. (It is suggested by the authors that this phenomenon must be interpreted as a catching up effect similar to what has occurred in other industrial activities).
- European carriers are on average technically less efficient than other carriers but some major carriers reach high levels of efficiency.
- The airlines that achieved the best results over all periods are Japan Airlines, Singapore Airlines, American, TWA, Lufthansa, Finnair and Air France followed by a second group with positive but less significant results comprising Qantas, British Caledonian, KLM and Delta Airlines.
- Qantas and Singapore Airlines achieved the best performance from exploiting the attributes of load factors and the inverse of stage length.
- There is great variability in the results for airlines within each regional group.
- Among the US carriers no clear cut results emerge in relation to exploiting the attributes except for the high positive scores attained by Continental, Pan Am and TWA in the 1983-85 period which the authors attribute most probably to be the result of mergers.

When technical efficiency included the attributes of load factor and stage length, they found that Qantas had the equal highest efficiency score in the 1983-85 and 1986-88 periods (along with two other airlines) and well above average scores in earlier years. Furthermore the scores were some 5% above the average for Asian airlines, about 7% above the average for US airlines and about 15% above the average for European airlines in the two latter periods.

Distexhe and Perelman[67] conclude as follows:

> The study presented here brings to light the reasons that pushed several airlines to merge when markets were deregulated. With minor exceptions, only the airlines operating on a worldwide scale have been able to take maximum advantage of

67 Ibid, p.681.

> technological progress. Asian airlines obtained the best results in terms of efficiency gains as the result of technological catching up. Unexpectedly, for US carriers we have not found any clear evidence of productivity gains coming from structural changes in their network organization.

### *Evidence of specific competition effects on productive efficiency*

Ng and Seabright[68] note that it has been hard to find convincing empirical answers to the question of whether competition has significant effects on productive as well as allocative efficiency as follows.

> Does competition have significant effects on productive as well as allocative efficiency? Convincing empirical answers to this question have been hard to find for two reasons. First, data of the quality required for robust estimation of productive efficiency are rarely available. Secondly there is frequently no convincing standard against which the efficiency of an industry or firm may be compared, since when the degree of competition varies many other things (such as technology, network structures and firm sizes) typically vary as well. These problems do not automatically make comparison impossible but they compound the need for high quality data.

However they suggest that the relatively high quality of data available in the airline industry and the deregulation that occurred in the United States in 1978 facilitate assessment of the effects of deregulation. Their study estimates an airline translog cost function that takes account of the key operating characteristics of stage length, load factor and network size (number of city pair routes served) and also incorporates the potential influence of market power and state ownership. Their framework also investigates the impact of market power and operating characteristics on labour rent and the subsequent effect on costs. Labour rent is treated as endogenous but competitive, market based wages are treated as exogenous. Their study is based on a panel of 12 European and 7 US airlines for the period 1982 to 1995.

Two measures of market power are calculated. One is the weighted average market share of each carrier in the international routes in which it operates (%ATK). The second is the proportion of such routes in which there are at most two carriers (%Mono + Duo).

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68 Ng, C. K. and P. Seabright, 2001, 'Competition, Privatisation and Productive Efficiency: Evidence from the Airline Industry', The Economic Journal, 111 (July), 591-619.

Key results are as follows:

- Stage length, load factor and network size all have the expected signs and are significant. The respective cost elasticities are –0.584, -0.01 and 0.077.
- Returns to density are estimated to be 1.19 and returns to scale (after allowing for network size effects) are estimated to be 1.08. Second order terms indicate that returns to scale are exhausted at higher levels of output.
- The cost elasticity with respect to rent is 0.651.
- The market structure variables are significant but have the opposite sign. A 1 percentage point increase in market share of a carrier would translate into about a 3% **reduction** in total costs while a 1 percentage point increase in the proportion of the carrier's routes served by at most two carriers (holding market share of the carrier constant) would increase total costs by about 2 percentage points.
- The market structure variables are not robust to alternative specifications. For example, with the introduction of a lagged dependent variable, the coefficients on both the market structure variables fall to about a quarter of their previous levels and cease to be statistically significant.
- The public ownership variable is statistically significant and economically important and robust to alternative specifications. In the static model an increase in the share of public ownership by 10 percentage points implies a 10 % increase in rents and a 6.5% increase in total costs.
- A dummy variable representing the impact on each airline of the first European Union liberalisation package in 1987 shows no significant effect across the sample.
- When differences in output and network sizes, operating characteristics, ownership and competitive structure are all controlled for, European carriers costs were on average 35% above what they might be under US conditions in 1990 falling to 16 % in 1995.

Ng and Seabright note some concerns about the endogeneity of the market structure variables, which they tried to correct for using lagged variables, and the consequent interpretation. They also note that it is possible that the market structure variables impact on profits over time but were unable to confirm this statistically given the degrees of freedom. They conclude as follows[69]:

> What have we learned from these data? First, the basic cost function is reassuringly well estimated, with the coefficients on output, factor prices and route characteristics in line with those predicted by theory and prior studies. Secondly state ownership has a large upward impact on costs. The effect of competition is harder to disentangle, though openness of routes to competition from third airlines appears to have an overall downward impact on rents and costs, while merely losing market share to existing competitors has the opposite effect.

Liu[70] investigates the effect of state ownership on efficiency of firms by estimating a shadow cost function and associated input demand functions that allow for the separation of technical and allocative efficiency in a dynamic setting. He uses data on 23 international airlines, with varying state ownership, for the period 1973-83 and allows for the influence of average stage length, number of airports served and load factor. Dummy variables are used to test for the effects of deregulation.

The key findings are as follows:

- Allocative inefficiency is present in all firms and worsens with state ownership. But the effect of State ownership on allocative inefficiency is only a level effect raising the level of costs relative to private firms for fully state owned airlines by 5.4%.
- State ownership reduces the rate of cost decline associated with technical efficiency for fully state owned airlines by as much as 1.1 per cent.
- Deregulation had no impact on technical and allocative efficiency.

Baltagi, Griffin and Rich[71] examine the same data set as in their earlier study (described above) to contrast the estimates from a multilateral TFP approach with a measure of

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69 Ibid, p. 615.

70 Liu, Z., 2001, 'Efficiency and Firm Ownership: Some New Evidence', *Review of Industrial Organization*, 19: 483-98.

71 Baltagi, B. H., J. M. Griffin and D. P. Rich, 1995, 'The Measurement of Firm-Specific Indexes of Technical Change', *The Review of Economics and Statistics*, 654-663.

technical change estimated from a cost function and to explore the impacts of fuel efficiency, operating characteristics, route structure, competition and unionization of workers. The measure of competition is the inverse of a Herfindahl index for each of the largest 230 domestic city pair markets weighted by the relative importance of each market to each firm.

Key results (that relate to the whole sample period, unless otherwise indicated, and that control for output effects[72]) are as follows:

- Technical improvements in fuel efficiency and variations in load factor are found to be highly significant in explaining both TFP and the technical cost efficiency index (TCI).
- Hubbing is marginally significant in explaining TCI but not significant in explaining TFP.
- The merger variable (which reflects temporary inefficiency effects) is insignificant in explaining both measures.
- The measure of competition is not statistically significant in explaining TFP and marginally significant in explaining TCI. Although the significance varies across airlines such that at the extreme competition could account for up to a 5% differential in airline efficiency.
- Unionization was found to be significant in explaining TFP but not significant in explaining TCI but to have a positive influence in both cases (which could be consistent with a higher labour quality interpretation or a rent seeking explanation of unions targeting high efficiency airlines).
- In terms of relative importance in explaining TCI, a time trend was the most important factor followed by technical improvements in fuel efficiency. These two variables together explained 3.34% of the 4.15% average annual improvement in efficiency over the sample period. Load factor and hubbing explained an additional 0.47%. The competition variable explained an additional 0.17%, although it was relatively more important in the period 1978-86 when it explained 0.28% of the 3.72%growth in TCI.

72 Including economies of density and stage length.

Windle[73] has similar findings and conclusions as Caves et al (1984). His study analyses efficiency differences for 27 non-US and 14 US airlines in 1983. He uses the cost function results from an earlier study by Caves et al (1987)[74] to decompose costs into effects associated with input prices, output, capital stock, stage length, load factor, points served, government ownership, time and firm-specific effects.

Key results are as follows:

- Unit cost differentials between US and non-US airlines are largely accounted for by two factors: labour price and traffic density. The US mean firm had 51.9 percent higher unit costs because of higher labour prices but 49.7 percent lower costs as a result of higher traffic density. Overall unit costs for the US were 4 percent higher than for non-US firms.

- The East Asian mean firm had a 22.4 percent cost advantage over the US mean firm reflecting a substantially lower factor price advantage and a relatively low traffic density disadvantage relative to the US mean firm.

- The next most important factor was government ownership, leading to US firms having an 8.8 percent cost advantage over non-US firms and a 10.5 percent cost advantage over European firms.

Windle sums up the implications of his findings as follows:

> The above analysis indicates that movements towards greater competition in the form of liberal bilaterals and privatisation can lead to some improvements in productivity, but the greatest improvements in productivity will come from deregulation that enables air carriers to increase their traffic density. Many policies that will improve traffic density are not likely to be popular, particularly merger and failure of firms. It is therefore unlikely that the present deregulatory

73 Windle, R., 1991, 'A Cost and Productivity Comparison of the World's Airlines", Journal of Transport Economics and Policy', XXV (1), 31-49.

74 Caves, D. W., L. R. Christensen, M. W. Tretheway and R. J. Windle, 1987, 'An Assessment of the Efficiency Effects of U. S. Airline Deregulation via an International Comparison', in E. E. Bailey, ed., *Public Regulation: New Perspectives on Institutions and Policies*, Cambridge, MIT Press.

movement will entirely close the productivity gap. However any deregulation that allows pricing and route freedom will be likely to increase traffic density and productivity. [75]

### *Summary*

The economic literature on the relationship between airline efficiency and industry concentration is not consistent with the proposition that increased airline industry concentration has an adverse impact on productive efficiency. In fact it is clear that there is more evidence suggesting that industry concentration entails the realisation of economies of density and other cost savings that lead to improved productive efficiency. The literature finds that operational factors such as stage length, load factors, scope for hubbing, improvements in airframe and engine efficiency, aircraft size and utilisation and government ownership are all statistically significant and economically important factors in explaining productive efficiency. It is notable that several studies find that the extent of government ownership has a substantial adverse impact on productive efficiency, while greater competition has weak, ambiguous or negative effects on productive efficiency. h

Collectively the studies reviewed here highlight the importance of economies of density relative to measures of competition in promoting productive efficiency. They also highlight the adverse impact of government ownership on productive efficiency.

75 Ibid, p. 47.

# Attachment G: Studies of the impact of airline alliances on airline efficiency

This attachment provides a summary of studies of the impact of airline alliances on airline efficiency. As evidenced in the discussion below, the economic literature generally finds that airline alliances generate substantial costs savings through the exploitation of economies of density, cost savings through route rationalisation, and sharing of a wide range of production inputs. Importantly, these cost savings have generally been sufficiently large to offset any impact of increased market power on prices. Also importantly, there are no studies suggesting that alliances lead to deterioration in productivity performance.

The sections below provide an overview of the literature on the net advantages of alliances, a summary of theoretical alliance models and their implications for airline efficiency, and evidence from empirical studies of the effects of airline alliances on airline efficiency.

### *Overview of the literature on the impact of airline alliances on airline efficiency*

As explained by Oum, Park and Zhang[76] the literature on airline alliances has identified two broad categories of advantages to firms from alliances:

(a) Improved operational efficiency or productivity; and

(b) Enhanced competitive position through strategic behaviour and market power.

Both of these can improve profitability but from a public welfare perspective the issue is the extent to which enhanced market power is sufficiently detrimental to lead to a net public detriment.

It is important to note that like the literature on industry concentration and its impact on productive efficiency in the airline industry, the literature on the effects of airline alliances does not suggest that airline alliances will worsen productive efficiency. This is an important point given the NZCC's mis-interpretation of the Oum and Yu[77] study as suggesting that the

76 Oum, T. H., J. Park and A. Zhang, 2000, Globalisation and Strategic Alliances: The Case of the Airline Industry, Elsevier Science Ltd, Oxford.

77 Oum, T. H and C. Yu, 1998, Winning Airlines: Productivity and Cost Competitiveness of the World's Major Airlines, Kluwer Academic Publishers.

alliance would entail substantial productive inefficiencies. It is notable that Professor Oum was a key author for that study as well as the rigorous and comprehensive book on airline alliances co-authored with Park and Zhang.

A good starting point in assessing alliances is the economic reasons as to why airlines are motivated to form alliances. It should be recognised that in a completely open international aviation market one would expect that many alliances would be replaced by mergers and acquisitions. However this continues to be effectively precluded by a host of bilateral air service agreements and associated foreign ownership rules that effectively hinder cross-border mergers and acquisitions. As further liberalisation proceeds, mergers of international airlines may become more prominent as has occurred with the deregulation of telecommunications markets.

However the same underlying economic forces are likely to be relevant for both alliances and mergers of airlines. The main reasons for forming alliances have been identified as follows[78]:

(1) The realisation of economies of traffic density reflected in securing more traffic per unit of capital. This can be reflected in higher load factors, better utilisation of aircraft and other assets and the use of larger aircraft. One channel for increasing traffic density is increased traffic feed as each partner feeds traffic to the other.

(2) A range of opportunities to share the costs of airline facilities and staff leading to better utilisation of all factors of production; for example through route co-ordination and rationalisation; joint purchases of inputs and joint development of systems; or the greater use of the lower cost inputs of one partner e.g. lower labour costs of one partner relative to the other.

(3) Marketing benefits that are related to the sharing of costs but also to the greater attraction of frequent flyer programs that become more valuable to passengers when they have more choice. Alliances also entail multiple and priority listing of code shared flights in

78 Ibid, pp. 11-15; Bamberger, G. E., D. W. Carlton, and L. R. Neumann, 2001, 'An Empirical Investigation of the Competitive Effects of Domestic Airline Alliances,' *NBER Working Paper* 8197; Clougherty , J., 2000, 'US domestic airline alliances: Does the national welfare impact turn on strategic international gains', *Contemporary Economics Policy,* 18 (3): 304-14; Doganis, R., 2001, *The Airline Business in the 21st Century,* Routledge, London, chapter 4; and Nolan, J., P. Ritchie and J. Rowcroft, 2001, 'Open Skies and Open Gates', *Transportation* 28: 119-35;.

computer reservation systems enhancing the likelihood of bookings relative to competitors who are not part of an alliance.

(4) Scope to improve quality through greater flight frequency, more seamless travel, more convenient connections and lower waiting times; all of which increase traffic and contribute to better realisation of economies of density as well.

(5) Greater prospect of improving competitiveness and securing traffic in wider international markets as the advantages of lower per unit cost, brand recognition and greater reach can be more effectively leveraged.

(6) Increased market power on particular routes. This can lead to higher prices and lower quality but depends on the productive efficiencies that are secured, entry barriers and broader competitive influences.

Alliance benefits are expected to rise as the depth of co-operation increases across the functions and assets of the alliance partners.

### *Theoretical alliance models and their implications for airline efficiency*

Alliances can be classified into two types: complementary and parallel alliances. Complementary alliances refer to alliances where firms link up their networks so as to feed traffic to each other. Parallel alliances refer to alliances where firms have overlapping competing routes prior to the alliance. Most alliances will have aspects of both but can be characterised as predominantly complementary or predominantly parallel.

Where there are network complementarities an increase in traffic of one partner in the alliance increases the connection opportunities and marginal profit of the other partner. If an alliance entails joint profit maximisation this network complementarity externality is internalised. This effect tends to increase the output and profits of a complementary alliance relative to a competitor.[79] A complementary alliance improves the quality of connection and this can increase the demand for the alliance by both taking market share from rival airlines

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79 See Park, J., 1997, 'The effects of airline alliances on markets and economic welfare', *Transportation Research,* 33 (3) 181-95 and Op. Cit. Oum et al 2000, Chapter 4 and Park, J., A. Zhang and Y. Zhang, 2001, 'Analytical models of international alliances in the airline industry', *Transportation Research,* Part B 3: 865-86.

and increasing the overall size of the market which in turn leads to overall welfare improvements.

In contrast for parallel alliances, economic models tend to show a reduction in output of the alliance in overlapping markets but can entail an increase in output of the alliance in connecting markets (reflecting network complementarities); however generally overall output is expected to be lower. There are however qualifications to these results, especially when market size and economies of density are taken into account. In particular Park's model suggests that parallel alliances may make society better off if the size of the market is sufficiently small but economies of traffic density are sufficiently high.[80]

Another channel through which airline alliances can lead to both welfare benefits and carrier benefits is through coordination of pricing[81]. In particular the co-ordination of pricing can eliminate the 'double marginalisation' problem, where each airline ignores the impact of its fares on the other airlines fares for interline products. The co-ordination of pricing can in turn lead to lower fares and increased traffic and when combined with the presence of economies of density can lead to further downward pressure on fares.

A final theoretical result is that if economies of scale and imperfect competition are important, then horizontal merger of domestic firms enables them to earn greater profits in international markets.[82] As noted by Oum et al this result is similar to that in the trade literature where trade policy may be welfare enhancing when used as a form of export promotion if there are economies of scale and imperfect competition.

### *Empirical studies of the effects of airline alliances on airline efficiency*

Oum, Park and Zhang have undertaken the most comprehensive study of the effects of airline alliances. They studied a number of aspects of airline alliances, including: the impact

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80 Park, J., 1997, 'The effects of airline alliances on markets and economic welfare', *Transportation Research,* 33 (3) 181-95.

81 See Brueckner, J.K., 2003, 'International Airfares in the Age of Alliances: the Effects of Codesharing and Antitrust Immunity', *The Review of Economics and Statistics,* February, 105-18, and Brueckner, J.K., 2001, 'The Economics of International Codesharing: an Analysis of Airline Alliances', *International Journal of Industrial Organisation,* 19: 1475-98.

82 Op. Cit. Oum et al 2000, Chapter 10.

on productivity, pricing and profitability distinguishing between the effects of major (co-operation at network levels) and minor alliances (co-operation at route levels), the impact on quality as reflected in flight frequency and delays and the effect of alliances that tended to be of a more complementary or more parallel form.

Their key findings for a panel of 22 airlines over the 1986-95 period were as follows:

- A major strategic alliance is estimated to improve Total Factor Productivity (TFP) of the partner airlines by 4.9% and the effect was highly statistically significant. A minor strategic alliance is estimated to improve TFP by 0.9 but the effect was not statistically significant.

- A major strategic alliance is estimated to reduce average yields by 5.5% and improve profitability by 1.3%, with both effects being statistically significant. The effects for minor strategic alliances were not statistically significant.

An important aspect of airline performance is the quality of service. There are various dimensions of quality including on time arrival, frequency of service, check in and in-flight service, safety and comfort. Oum, Park and Zhang note the importance of schedule delay time and the positive association with flight frequency in the airline literature. They examined three major alliances in North Atlantic markets:

- Northwest/KLM — a complementary alliance.

- United/Lufthansa — a mixture of a complementary and no shut down parallel alliance where frequencies on were maintained on competing routes and networks were linked to feed traffic.

- Delta/Sabena/Swissair — a shut down parallel alliance where the partners were competitors before the alliance and only one partner continued to operate non-stop flights after the alliance.

They examined 13 alliance routes for these alliances for the period 1990-96. They found for both the complementary alliance and mixed alliance that the partner airlines linked their networks and either maintained or increased their flights on the alliance routes following the alliances, and this allowed reductions in the scheduled delay time. In contrast for the shut down parallel alliance the partners rationalized their operations on codesharing routes and, although flight frequencies increased, scheduled delay time increased.

Oum, Park and Zhang also examine these alliances and an additional alliance, British Airways/US Air, such that their sample is 17 alliance routes for the period 1990-94. The key findings were:

- For a complementary alliance total traffic increased by an average of 11-17% following the alliance but for a parallel alliance decreased by an average of 11-15% following the alliance.

- For the complementary Northwest/KLM alliance and for the parallel Delta/Sabena/Swissair airfares declined by 22% and 19% respectively. For the other alliances price effects were not statistically significant.

- In both the complementary and parallel alliances market power appeared to increase in gateway markets, following the alliances but the reduction in costs (through joint operations and traffic density effects) dominated, resulting in lower fares.

The benefits of alliances in terms of the co-ordination of pricing was tested by Brueckner[83] who tested the proposition that the lowest interline fares will tend to be set by alliance partners with antitrust immunity while higher fares will be charged by carriers who lack antitrust immunity (in coordinating prices). Brueckner examined a sample of 54,687 observations in international city pair markets for the third quarter of 1999, where at least one route segment is flown on a US carrier and regressed fares on distance, market size, a competition variable, regional effects, fare category, airline-specific effects and cooperation measures. He found that presence of codesharing on an international airline itinerary reduces the fare from 8-17% and the presence of anti-trust immunity reduces the fare by 13-21% with the combined effect ranging from 17 to 30%, suggesting substantial benefits for interline airline passengers.

Bamberger, Carlton and Neumann[84] reviewed the code share, price co-ordination and other benefits of alliances as well as potential anti-competitive effects and examined the effects on fares and traffic of the Continental/America West alliance and the Northwest/Alaska alliance. Their key findings were as follows:

- Both alliances provided substantial benefits to consumers with average fares falling for the respective alliances by 8.4% and 3.9% and found to be highly statistically

83 Op. Cit. Brueckner, 2003.

84 Bamberger, G. D., D. Carlton and L. Neumann, 2001, “An Empirical Investigation of the Competitive Effects of Domestic Airline Alliances’, NBER Working Paper 8197.

significant. Traffic increases were statistically significant in one case but only marginally statistically significant in the other.

- The size of the fare effect depended on the pre-alliance level of competition on a city pair with the fare decline being larger on those city pairs where the level of competition was relatively low.

Finally in terms of the impact on international competitiveness Clougherty[85] examined a panel data set of 21 nations and associated international airline markets over the 1983-1992 period. He confirmed that higher domestic concentration led to improved international performance in terms of international market share, with the estimation taking account of the possibility of a reciprocal relationship.

### Conclusion

The economic literature on airline alliances has identified a number of effects that are relevant to the Alliance. A general finding of the literature is that the exploitation of economies of density and the realisation of cost savings from route rationalisation and sharing of a wide range of production inputs have been important features of airline alliances. Furthermore the cost savings have generally been sufficiently large to offset any impact of increased market power on prices. There are no studies suggesting that alliances lead to deterioration in productivity performance.

There is evidence that in predominantly parallel alliances (where prior to the alliance the partner airlines competed) total traffic has declined and in some cases scheduled delay time has increased. However the review of airline alliances also finds that the extent of cost savings and/or productivity improvements depends on whether the alliance entails major co-operation such that the networks of the partner airlines are substantially integrated. This increases the scope for realising complementary network benefits through increased traffic feed, to co-ordinate operations, avoid double marginalisation in pricing and realise various cost savings. Thus the extent of any adverse effects in terms of for example lower flight frequency depends on the extent to which there are complementary-type benefits to the alliance from increasing traffic feed. And the extent to which prices are likely to rise depends on both the scale of cost efficiencies that can be achieved.

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85 Clougherty , J., 2000, 'US domestic airline alliances: Does the national welfare impact turn on strategic international gains', *Contemporary Economics Policy*, 18 (3): 304-14.

Collectively it is considered that the economic literature provides persuasive evidence that generally major alliances (that involve substantial co-operation) will enhance productivity performance and that the effects will be sufficiently strong to more than offset the influence of increased market power on prices. So not only will a major alliance be likely to increase productive efficiency, the extent of the efficiency improvement will be likely to lead to lower prices.

# Attachment H: How the Alliance will generate improved governance and productive efficiency

This attachment draws on the economic literature on governance and productive efficiency to show how two key features of the Alliance will ensure improved governance and productive efficiency.

The first of these features is the major cooperation between Qantas and Air New Zealand under the proposed Alliance. Consistent with the findings of the literature this should lead to a range of cost savings, better utilisation of facilities and improved service quality.

The second feature is the substantial reduction in government ownership of Air New Zealand and enhanced the scope for further reductions in government ownership. Consistent with the findings of the literature this should also lead to improved performance over time.

The sections below outline how these two features will generate improved governance and productive efficiency.

### *How major co-operation between the parties will lead to improved governance and productive efficiency*

Clearly the Alliance can in the terminology of Oum et al[86] be classified as a major alliance since it entails full integration of the Air New Zealand and Qantas networks for all their flights to, from and within New Zealand (except for New Zealand/USA while United Airlines agreements are in place). The alliance will involve the coordination of all business activities in respect of JAO networks, including the scheduling and pricing of all services.

The objective of joint profit maximisation will be pursued by the commitment to a formula for comparing the net positions of each party, which may lead to a transfer from one party to the other. Air New Zealand will manage the commercial aspects of the JAO network (subject to input from a Strategic Alliance Advisory Group (SAAG) which will consist of an equal number of Air New Zealand and Qantas representatives). This includes inter alia management of pricing, network capacity and scheduling, co-ordination of sales, implementation of business plans and preparation of performance reports. Each party will

86 Op. Cit. Oum et al 2000.

remain responsible for the day-to-day flight operations of their respective networks. Qantas will also acquire a 22.5% 'cornerstone' shareholding in Air New Zealand reinforcing the commitment of the co-operative arrangement to the pursuit of joint efficiency and joint profit maximisation.

As demonstrated in the economic literature on airline alliances major alliances provide scope for a range of productivity enhancing measures to be implemented and have generally been found to lead to significant overall productivity improvements.

***Incentives to achieve efficiency benchmarks***

It is relevant to note that a key advantage of forming this Alliance as opposed to a full merger is that the Alliance will entail particularly strong incentives to achieve efficiency benchmarks. This follows as a result of the contractual arrangements and profit incentives of two independent commercial entities. Although the two entities will fully co-operate in terms of co-ordinating flights and sharing capacity and costs, there are still two management teams, two separate boards and two sets of shareholders eager to ensure profits for their respective entities are maximised. In order to ensure that joint profits are maximised while not disadvantaging one partner over the over, there is a need to establish: detailed performance documentation; a well defined agreement for sharing profits and payments by one party to the other where less efficient capacity is used; and an effective enforcement mechanism. Such arrangements are an important part of the JAO.

A manual is to be prepared that will enable line-by-line comparisons of performance of the Alliance partners and establish the net position of one relative to the other for all JAO operations. A draft manual is available specifying in detail how revenue and costing items will be related to the accounting ledgers of the airlines.

More specifically, the agreement on capacity provision specifies that the party with the highest margin should supply the operating capacity.[87] If this is not done the party with the lower margin must subsidise the margin for that flight so that after such subsidy the relevant Sector is producing profit for the Alliance partners at a level at least equal to the highest margin available to the parties for the Sector.

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87 Strategic Alliance Agreement: Air New Zealand Limited and Qantas Airways Limited, Schedule 2, Part 1, Clauses 5 (c) and 5 (d).

The SAAG will operate as joint advisory group to monitor, review and oversee the performance of the JAO networks, including the endorsement of subsidy payments to ensure joint profit maximisation. As the Alliance partners will be equally represented on SAAG and all decisions of SAAG are required to be unanimous[88] this will help ensure that the measurement of performance and the calculation of subsidies is rule based and objective. As cheques will be exchanged based on the net position of the airlines on a quarterly basis, the methodology will need to be clear and precise.

In relation to the subsidy mechanism the NZCC claimed[89] that: the existence of this mechanism demonstrated that the Alliance partners were aware of the potential for a loss of competition to promote productive inefficiency; and that it would seem doubtful that the provision would be rigorously enforced, given tolerances attached to comparative costings between airlines and because the Alliance agreement also provides for the pre-existing market shares of the parties to be maintained.

There are several specific responses to these claims of the NZCC. Firstly the existence of the mechanism is likely to be largely based on the commercial reality of a need to ensure that profits will be maximised and not as a substitute for any loss of competitive pressures to achieve productive efficiency. The primary concern and responsibility of the respective boards and management teams for the two entities will be to ensure that profits are maximised and that the other partner is not receiving an undue share of profits. However it is not necessarily the case that direct competition would be superior to the arrangements in facilitating good performance outcomes. As demonstrated earlier, at most only 15% of the Qantas operations will be part of the JAO network, a significant portion of Air New Zealand operations will still be subject to third party competition and both entities will be subject to a range of competitive pressures affecting the global aviation market. If for example, Qantas were to innovate more than Air New Zealand, as a result of its greater exposure to international markets, Air New Zealand would also face significant pressure to innovate as well. This is because it would only be entitled to recover the costs that Qantas could recover within the Alliance and as it would provide 70-80 % of the capacity[90] it would face significant

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88 Ibid, Clauses 1.1 to 1.4.

89 Draft Determination, para 698.

90 Strategic Alliance Agreement: Air New Zealand Limited and Qantas Airways Limited, Schedule 2, Part 1, Clause 5 (a).

exposure. It is reasonable to contend that this degree of exposure together with the terms of the agreement would appear to exert stronger pressure to improve performance than if the Alliance did not proceed.

Secondly the detailed arrangements for calculating the net positions of the airlines and the role and structure of the SAAG collectively suggest that calculations will provide little scope for the "tolerances" claimed by the NZCC. Rather the calculations will be rule based and precise in terms of determining the net payments that will be made and effectively enforced given the structure and incentives of the SAAG.

Thirdly even if the overall market shares are to be maintained as part of the Alliance this does not preclude changes in market shares in particular sectors, or pressures to reduce costs emanating from the subsidy margin arrangements. In relation to the latter point if one airline is generally characterised by lower margins and market shares are to be maintained it will end up paying widespread subsidies.[91] . This will exert pressure for it to reduce costs otherwise the result will be lower profits.

***Other mechanisms in the Alliance for achieving efficiency improvements***

In addition to the sharing of information and monitoring of performance of the JAO networks, the Alliance partners have agreed to co-operate on activities in relation to non-JAO networks in accordance with a number of governance principles.[92] These principles cover a wide range of business functions. They include cooperation in relation to: sharing and exchanging assets; integrating staff; sharing best practices and taking advantage of economies of scale by co-ordinating activities; and establishing relevant performance measures and joint steering groups to identify opportunities for performance improvement. Under the Alliance SAAG will operate as a joint advisory group to monitor and review these activities.

These arrangements will help to ensure that lessons learned across the operations of the Alliance parties are quickly transmitted to the operations of JAO networks.

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91 The commercial and legal teams at both airlines believe this is the effect of the agreement as currently specified

92 Strategic Alliance Agreement: Air New Zealand Limited and Qantas Airways Limited, Schedule 2, Part 2.

### *Benefits of lower government ownership*

Several studies have confirmed that government ownership of airlines has a strong negative impact on airline performance. It is worth highlighting these here as follows:

- Windle,[93] found, in a study of 27 non-US and 14 US airlines, that after traffic density the next most important cost advantage that US firms had related to private ownership. For example, this gave them a 10.5% advantage over European firms.

- Liu[94] confirmed, in a study of 23 international airlines, that as a result of allocative inefficiency, costs of State owned firms were 5.4% higher, while as a result technical inefficiency, the rate of cost decline for State owned was as much as 1.1 percentage points lower than for private airlines.

- Oum and Yu[95], in the study used by the NZCC to justify its estimates of productive efficiency detriments, also found that majority government ownership had a significant negative impact on the productive efficiency of an airline. They reported an average efficiency difference of 3 to 13 % between airlines with majority government ownership and other airlines depending on the measure of efficiency.

- Ng and Seabright[96] studied 12 European and 7 US airlines for the period 1982 to 1995. They found that state ownership has a large upward impact on costs, for example in their static model they found that an increase in the share of public ownership by 10 percentage points implies a 6.5% increase in total costs.

In addition the economic literature highlights that it is difficult to confirm that higher concentration or other measures suggestive of lower competition has an adverse impact on productive efficiency and that such factors as economies of density and government ownership are clearly more important factors in evaluating alliances.

93 Op. Cit. Windle 1991.

94 Op. Cit Liu , 2001.

95 Op. Cit. Oum and Yu, 1998, p.113.

96 Op. Cit. Ng and Seabright, 2001.

If we apply these findings from the literature it would be reasonable to contend that lower government ownership will be a far more important factor than increased market concentration in influencing performance. Furthermore, consistent with the literature one would expect that the lower government ownership share arising as a result of the Alliance (reflecting improved corporate governance arrangements) would also be conducive to a stronger performance for Air New Zealand.

# Attachment I: Qantas' Total Factor Productivity Performance

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