The Effect of the Alliance on Passenger Traffic

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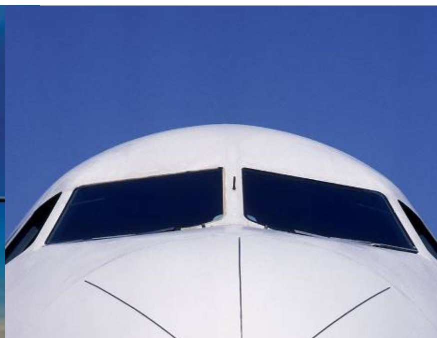


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Introduction

InterVISTAS Consulting was asked by Virgin Australia to estimate the likely effect of the proposed Alliance on passenger traffic numbers and levels of service on Australia/New Zealand-Singapore passenger routes. We were asked to provide estimates for each route and for individual carriers.

While econometric models of consumer demand and firm supply are often used to predict quantity changes in aggregate markets, these models often have limited success in forecasting traffic on individual routes, especially if such forecasts are to be disaggregated by carrier. In the industry, forecasts of traffic and passenger shares by route and carrier have generally been done using a methodology referred to as the Quality Service Index (QSI) model. This has emerged as a standard methodology and is widely used by carriers, airports and consulting firms. This report utilises the QSI methodology.

Methodology: the QSI model

QSI is a tool for analysing market share and traffic levels. QSI model results will indicate

a) the change in total traffic on individual routes and in aggregate,

b) the change in quality of service on each route and for individual carriers operating on the route, and

c) the level of traffic carried by individual carriers on each route and in aggregate. This allows computation of passenger share changes for an origin-destination route, the total number of tickets sold by each carrier and how the carrier's ticket sales consist of existing traffic, traffic diverted from competitors due to improved service quality, and the share of newly generated traffic that the carrier captures.

The QSI model was originally designed for regulatory use by the U.S. Civil Aeronautics Board (CAB) in the 1970s. At the time, the CAB was required to implement a public convenience and necessity (PCN) test when considering applications for increased air service. The CAB had also been facing endless requests for fare increases in what it perceived to be an endless quality – fare spiral. If a carrier added a flight in an authorised market,[1] its costs increased. It would then seek authorisation for a fare increase. This in turn made addition of further capacity profitable and the cycle repeated. In response to PCN and fare increase evaluations, the CAB developed a model to predict traffic levels on a route, and the division of passenger shares among carriers on the route. The model was based on the level of service offered by carriers (number of flights, aircraft type) and other factors (essentially brand loyalty factors). The development of the model enabled a

[1] In the regulated era in the U.S., the CAB did not regulate flight frequency or seat capacity.

policy where both PCN and fare increases were based on a CAB specified level of service for each route. Fare increase requests based on additional service (such as higher frequency or seat capacity) above what the CAB deemed as an appropriate level of service for the route generally would not be authorised.

While the QSI methodology was originally developed for regulatory purposes, for decades it has been adopted widely by carriers and route analysts (e.g. for airport marketing purposes) around the world for assessing the effect of any changes to service levels on a route. QSI is a route level tool. It is not designed to optimise a carrier's route network, but rather to predict what traffic and passenger share it will achieve on any particular route when it commits or withdraws capacity, engages in code-sharing, etc. The QSI methodology is appropriate for the specific request put to us by Virgin Australia to estimate the traffic changes and passenger shares of the carriers with the proposed Alliance.

The QSI model uses what economists refer to as a Cobb Douglas specification. That is, the model is multiplicative.[2] Such models are commonly used in economics. While classroom economics often uses straight lines to represent economic relationships, such as a supply curve, it is more common in empirical research to use multiplicative models, as they often better reflect actual economic behaviour.

The QSI model assigns a score to each carrier based on a range of factors. While the original QSI model developed by the CAB was based, in part, on econometric analysis, in practice over the thirty plus years it has been in use, researchers have instead used a calibration approach whereby most of the model parameters (e.g., the effects of frequency and aircraft types) are established on a trial and error basis for a general market so as to produce forecasts which are reasonably consistent with actual traffic and market shares. Some model factors are then calibrated to individual routes (e.g., city presence) when actual traffic shares differ in a systematic way from the predictions of the general parameters.

Sabre Profit Essentials QSI

The QSI analysis in this report was undertaken using Sabre's Profit Essentials QSI model. Sabre is one of the world's largest information technology providers to the aviation industry. Profit Essentials is a commercial network planning software package developed and maintained (updated) by Sabre. It is used by airlines, airports, aircraft manufacturers, governments and consultants around the world. Current and past airline users include Delta Air Lines, Alaska Airlines, Gulf Air Oman Air and others. Airport users include Zurich, Abu Dhabi, and Vancouver.

[2] Mathematically such models are expressed as linear in the logarithms. A multiplicative model such as Traffic = $a*Frequency^{b1} * Capacity^{b2}$, can be expressed logarithmically as Traffic = a + b1*Frequency + b2*Capacity. In practice the QSI model establishes the coefficients by calibration, not estimation. But the calibration process is based on decades of experience. As well the log-log model treats factors as continuous whereas in practice only a few outcomes are possible (turboprop versus regional jet versus narrow body versus wide body) and QSI generally is simplified to the product of bi*Xi for the discreet values.

Bombardier is a customer who uses Profit Essentials to do route profitability analysis for potential customers. The U.S. Department of Transportation is also a user.[3]

The model is designed to identify valid flight itineraries on given origin/destination city-pairs, and to quantify the 'quality' of each itinerary by applying coefficients to a number of factors which influence consumer choice between carriers. The methodology is one which models the consumer's choice of carrier on an origin-destination pair. The Profit Essentials model's coefficients and parameter files are calibrated by Sabre on a regular basis. The long period of time which this model has been in commercial use is testimony to the reliability of its predictions.

Model Factors

An overall QSI score has been calculated for each itinerary based on up to ten factors. For the analysis of the Australia/New Zealand-Singapore/beyond market, six of the model's factors were utilized:

- **Directness of service.** This reflects passenger preference for non-stop flights over stopping or connecting flights. Non-stop flights receive a QSI coefficient of 1.0 in the model. One-stop flights receive a coefficient of **[restriction of publication claimed]** (i.e., they are approximately **[restriction of publication claimed]** as attractive as a non-stop flight). Single connection flights receive a coefficient of **[restriction of publication claimed]** (approximately **[restriction of publication claimed]** as attractive as a non-stop flight).

- **Elapsed travel time.** This reflects passenger preference for itineraries with shorter total travel time (including connecting time, where applicable). The model applies a coefficient of **[restriction of publication claimed]** for the itinerary with the shortest elapsed travel time within each category of flight (i.e., the fastest non-stop flight receives **[restriction of publication claimed]**, the fastest one-stop flight receives **[restriction of publication claimed]**, and the fastest connecting flight receives **[restriction of publication claimed]**). Flights with longer elapsed times are penalised if their elapsed times exceed defined thresholds: itineraries with elapsed times more than 90 minutes greater than the 'best' itinerary receive a coefficient of **[restriction of publication claimed]** penalty), while those with times more than 180 minutes greater than the 'best' itinerary receive a coefficient penalty of **[restriction of publication claimed]** penalty).

- **Aircraft type.** This factor reflects that passengers generally prefer the speed, comfort and baggage capacity of larger aircraft to smaller aircraft. Coefficients for each itinerary are based on seat capacity ranges; aircraft with more seats receive higher coefficients. Although not relevant for long haul routes, we note that jet aircraft receive higher coefficients than turboprop aircraft, even if seat capacities are the same. A narrowbody jet with 121-140 seats receives a coefficient of approximately **[restriction of publication claimed]**. By comparison, a 50-seat regional jet receives a coefficient of **[restriction of publication claimed]**, while a 300-seat widebody jet receives a coefficient of **[restriction of publication claimed]**. We note that the

[3] After the CAB was sunset, its remaining regulatory functions were transferred to the U.S. Department of Transportation.

range of scores for aircraft type is much smaller than for a factor such as directness of service. Essentially, the multiplicative model is calibrated to give greater weight to differences in directness of service than to differences in aircraft type.

- **Day-of-week.** Certain days are more popular for air travel than others. Friday and Sunday are popular days for business travellers, while Saturday is generally the least popular travel day. Day-of-week coefficients are defined such that itineraries which operate on a daily basis receive a coefficient of **[restriction of publication claimed]**. Those which operate on a less-than-daily basis receive a coefficient less than **[restriction of publication claimed]** or greater than **[restriction of publication claimed]**, depending on the attractiveness of the specific days operated.[4] Note that this coefficient is subsequently multiplied into the number of flights, so a daily flight would receive a score of **[restriction of publication claimed]** per week, while a flight operating only on Saturday would receive a score of **[restriction of publication claimed]** and a Sunday and Friday set of flights might receive a score of **[restriction of publication claimed]**.

- **Time of departure.** This factor reflects the fact that passengers prefer to travel during certain times of the day, but that the attractiveness of different departure times will vary according to the presence (or lack) of alternate departure time options, as well as the 'perceived' flight time (actual flight time, adjusted for time zone differences). Sabre has developed time-of-day demand profiles for different flight lengths, and applies coefficients to the different itineraries so as to distribute traffic based on departure time attractiveness.[5]

- **Flight frequency.** Passengers value the increased scheduling flexibility of high-frequency air service (daily flights are preferable to less-than-daily, double daily are preferable to daily, etc.). As a result, the model adjusts the QSI scores for each itinerary based on scheduled flight frequency. All else being equal, a carrier operating twice as many flights as its competitor will receive double the QSI score.

As described earlier, the QSI score for a given itinerary is simply the product of the coefficients (C) for that itinerary and the frequency of the service: QSI score = C_1(directness of service) x C_2(elapsed travel time) x C_3(aircraft type) x C_4(day of week) x C_5(time of departure) x monthly frequency.

The following example illustrates the QSI scoring for one of Singapore Airlines' Sydney-Singapore flights using Profit Essentials coefficients. The flight departs at 08:05 and arrives at 14:30, and is operated non-stop with an Airbus A380 seven days/week. The applicable coefficients are as follows:

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[4] Specific day-of-week coefficients are as follows: **[restriction of publication claimed]**. To calculate the coefficient for a specific itinerary, Profit Essentials applies the average coefficient for the days of week that itinerary operates.

[5] Note that the model applies time-of-departure coefficients to non-stop itineraries only. All connecting itineraries receive a time-of-departure coefficient of **[restriction of publication claimed]** (note that **[restriction of publication claimed]** is not a maximum. Many direct flights will have scores well above unity. We understand that Profit Essentials assigns unity to connecting flights (which will be weighted low in any event by the directness of service and elapsed times factors) due to an inability to develop a consistent set of factors for the myriad of potential connecting flights.

[restriction of publication claimed]

Profit Essentials QSI includes four additional factors which have not been utilised for our estimate of the Australia/New Zealand-Singapore analysis. The exclusion of all of these is based on the fact that Profit Essentials calibrates these factors using the U.S. Department of Transportation data and therefore these factors would not be appropriate for the Australia/New Zealand-Singapore/beyond market. Route or city specific calibration is critical if these factors are to be used. Calibrating the model for these factors would require a significant amount of time, and for the reasons we set out below, we do not expect that excluding them would overstate either traffic stimulation or the passenger share increase of the Alliance. The four non-utilized factors are city presence, carrier preference, yield and share gap.

- City Presence
  This factor is used when results consistently over or under predict a carrier's passenger share on most routes from a particular city. Recall that Profit Essentials predicts traffic on a given route. However, if that route originates or is destined to a city where a particular carrier has a strong presence, or a high degree of loyalty of the travel industry (agents and tour operators), then actual passenger share on those routes may be higher than otherwise predicted by the other QSI factors. The base value for a carrier on a route is unity. Often, but not always, routes to and from a carrier's principle hub will have city presence factors greater than unity. A carrier operating a route to another carrier's hub may be assigned a factor less than unity.
  It is not possible to predict what the effect of the exclusion of the City Presence factor will be on our Australia/New Zealand-Singapore forecast. We would expect that Singapore Airlines will have high city presence factors on routes from Asian points. Similarly, Virgin Australia might be expected to have an above average city presence factor for routes from its base in Brisbane, and Qantas from Sydney. Given that the new Alliance itineraries would generally involve markets where Singapore Airlines and/or Virgin Australia have strong market presences, excluding the City Presence factor from our analysis would tend to underestimate the Alliance's passenger share and market stimulation.

- Carrier Preference
  This factor is similar to the City Presence factor, but it applies generally to routes of a specific carrier rather than only to the carrier's routes from a particular city. Some carriers are strongly preferred by passengers (and vice versa), and all other things being equal, will be somewhat favoured by travellers with a choice of carriers on an origin-destination pair.
  It is not possible to predict what the effect of the exclusion of the Carrier Presence factor will be on our Australia/New Zealand-Singapore forecast. Each of the carriers on a route has a strong following among certain customers. Generally, carriers with high levels of service on a route will tend to be calibrated to a carrier presence factor somewhat greater than unity. However, Australia/New Zealand-Singapore routes necessarily involve both sides of the Australia/New Zealand-Singapore relationship. Qantas might have a high carrier presence factor for Australian originating passengers on a route and perhaps Singapore Airlines on the other end. We suspect that carrier presence factors may tend to be similar, on balance, for the major carriers competing in the long haul market. If that is the case, then the exclusion of this factor will result in little or no bias in our results.

- Yield
  This factor is used to measure the sensitivity of passenger share to differences in average fare between airlines. Again, this is a factor which takes considerable effort to calibrate to individual carriers and city pairs. As we have done the analysis, it essentially assumes there is no yield response to the service changes with the Alliance.
  However, as the non-aligned carriers begin to lose passenger share on routes, it is highly likely that they will explicitly respond by reducing price, or implicitly as their seat management systems, responding to a loss of traffic, open up greater quantities of seats in the lower price fare buckets. The likely reduction in yield (not assumed in our analysis below) will have two effects. First, total traffic in the market will grow as yields decline. Second, a yield response by the non-aligned carriers will assist them in recovering some of their traffic loss.

- Share Gap
  The final factor that has not been activated in our analysis of Australia/New Zealand-Singapore/beyond market shares and traffic is the share gap. This is merely a final calibration factor. After applying all the other QSI factors, Profit Essentials observes that some carriers on some routes consistently have higher passenger shares than predicted by the model, and accordingly adjust the predicted shares as necessary. It is not clear why this is, but historical market development may be a factor. Consider a U.S. example. Going back into the 1950s to 1970s, United Airlines heavily marketed itself as *the* carrier for service from the mainland to Hawaii. That has resulted in United being a "carrier of first thought" when flying to the market. While other carriers have entered the market, United appears to have been able to capture a somewhat higher share than predicted on a range of routes to Hawaii.

The QSI model does not capture all potential passenger stimulation and transfer effects. It only captures those that relate to the six model factors set out above. We note that under the Alliance the parties intend to engage in reciprocal frequent flyer and lounge benefits. If implemented, such features would be expected to be valued by passengers and to result in increased passenger numbers. To the extent that this is the case, the QSI results would underestimate the total passenger numbers under the Alliance.

Further, the stimulation estimates below relate only to the modelled 'quality of service stimulation'. No change in average fare is assumed to result from the code-sharing; therefore, fare stimulation has not been included. If the Alliance resulted in reduced fares, further stimulation could be expected.

Profit Essentials QSI provides four "sets" of coefficients, which can be applied, based on the geography of the route(s) in question: United States domestic, Transatlantic, Transpacific and Other International.[6] The first three sets of coefficients were designed for analysis of service to/from the United States whereas the Other International coefficients were designed for analysis of services outside the United States that involve medium to long-haul international routings.

[6] Profit Essentials QSI allows new coefficient sets to be created, but in the absence of market specific analysis for the Australia/New Zealand-Singapore, we have elected to use the most appropriate established coefficient set.

The four different coefficient sets reflect the fact that the attractiveness of certain factors can differ depending on the type of market. For example, in short haul markets with abundant air service, non-stop flights and optimal departure times may be more highly valued than on long haul or thin traffic routes with infrequent air service, where passengers are more accepting of sub-optimal itineraries.

For the Australia/New Zealand-Singapore analysis, the "Other International" coefficients have been used. It is felt that these coefficients best reflect the nature of the market, which involves predominantly long-haul connecting traffic with similar stage lengths to the average international itinerary. Furthermore the "Other International" coefficients have been calculated using global demand data as well as U.S. Department of Transportation data and are therefore most appropriate for a long-haul international analysis such as the Australia/New Zealand-Singapore/beyond market.

Applying QSI to the Alliance

The QSI scores are used to calculate passenger share and passenger volumes for Virgin Australia/Singapore Airlines before and after the Alliance.

The addition of code-sharing impacts Australia/New Zealand-Singapore/beyond QSI scores in two ways. First, Profit Essentials treats a non-stop code-share itinerary as a duplicate travel option, with a QSI score equivalent to **[restriction of publication claimed]** of the score for the primary itinerary. Thus, a flight operated by SQ and carrying a VA code will receive a relative QSI score of **[restriction of publication claimed]** for SQ and **[restriction of publication claimed]** for VA, resulting in a total SQ/VA score that is **[restriction of publication claimed]** of the value of a non-code-shared flight. This increases the combined passenger share of SQ/VA.

Second, with reciprocal code-sharing, additional online connecting flights can be built, resulting in new itineraries which receive a QSI score accordingly (e.g., a domestic Australian DJ flight connecting to a SQ Australia-Singapore flight). Connecting code-share flights are scored at **[restriction of publication claimed]** of the value of an online connecting itinerary.[7]

Changes in SQ/DJ itineraries resulting from code-sharing can also impact the QSI scores of competitor airlines. This is because coefficients for certain factors (e.g., Time of Departure and Elapsed Travel Time) are determined by both absolute and relative considerations. For example, a competitor's Time of Departure coefficient (and therefore overall QSI score) could increase if an Alliance introduced a new code-share itinerary with a less attractive departure time. Similarly, where a new code-share itinerary represents the most efficient connecting option for a given city

[7] Note that it is possible for the improved connections to result in some traffic stimulated onto non-aligned carriers. Perhaps the carriers had no means to connect passengers from A to D in a single day and vice versa. The Alliance might enable an A to C to D connection arriving mid day, with the two legs on different Alliance carriers. The Alliance might not be able to offer a return flight at the end of the day, but a non-aligned carrier might have a D to C to A connection at the end of the day. A passenger seeking a same day service, or a service out one day but with a return which must be late on a following day, may book outbound and return flight on different carriers, but it is the Alliance which facilitated the itinerary. Note that the passenger is not doing interline flights in either direction. While connections are involved they are within the Alliance outbound, and on the same carrier for the return.

pair, a competitor's elapsed travel time coefficient could decrease. In general, the impact of a new service on competitor QSI scores is small. But there are cases where the way an Alliance is implemented can give the existing service of competitors a bit of a positive effect.

Consider the following example:

- Qantas flight QF81 is a non-stop flight from Adelaide to Singapore departing at 12:30, arriving at 18:20. This flight receives a Time-of-Day coefficient of **[restriction of publication claimed]**.

- DJ/SQ code-sharing creates a new connecting Adelaide to Singapore connecting itinerary (via Perth) departing at 12:15, but not arriving until 21:20. For passengers wishing to depart around 12 pm, the Qantas flight will appear even more attractive compared to the Alliance's long connecting itinerary. As a result, Qantas' Time-of-Day coefficient increases to **[restriction of publication claimed]**.

The improvement in Time-of-Day coefficient increases QF81's QSI score by a small amount from **[restriction of publication claimed]** to **[restriction of publication claimed]**. At the same time, the Alliance's codeshare increases the total ADL-SIN QSI score from **[restriction of publication claimed]** to **[restriction of publication claimed]**. As a result, QF81's QSI share on Adelaide to Singapore decreases from **[restriction of publication claimed]** to **[restriction of publication claimed]** following the Alliance. Although the mechanics of the QSI model produced a higher QSI score for one QF flight (as it was superior in terms of time of day to the newly enabled Alliance connection), the Alliance's overall score increased by a greater amounts, with the result that QF's predicted market share falls. Another way of putting this is that a small increase in a raw QSI score for a non-Alliance carrier does not imply the non-Alliance carrier's passenger share increases. If the non-Alliance carrier maintains the same services, its passenger share will always fall.

It should be noted that connecting itineraries with a trip distance greater than 30% of the non-stop distance have been excluded from the analysis as they are generally not considered by passengers as desirable itineraries given that considerably less circuitous options often exist. For example, a Sydney-Singapore-Newark itinerary would not be seen as an acceptable itinerary because the vast majority of travellers would select a more direct Sydney-Los Angeles-Newark itinerary. In terms of how the model works, a Sydney-Singapore-Newark has a trip distance of 13,442 miles which is 35% greater than the non-stop distance of 9,950 miles, and therefore has been excluded.

Additionally, routes where Virgin Australia currently code-shares with Etihad have been excluded from the analysis as we have been instructed that Virgin Australia does not intend to place its code on these routes. These are: routes to Abu Dhabi, Athens, Brussels, Dublin, Frankfurt, London, Manchester, Moscow, Munich and Paris and the Brisbane-Singapore route. Furthermore, given that Virgin Australia already has its own services to the U.S. and a code-share agreement with Delta, all itineraries to/from the U.S. have been excluded from the analysis. All other potential routes have been included in the analysis without regard to whether the parties currently have the right, under existing bilateral agreements, to place their code on these services.

However, as a result of limitations in the available data regarding passenger numbers, services and current market shares on some possible city pairs, some potential routes have been excluded from the analysis. Around 2,259 out of 2,896 potential individual city pairs have been excluded from the analysis. These are mainly small routes (for example Broome to Siem Reap, Cambodia and Cairns to Da Nang, Vietnam), but some, like Adelaide-Hong Kong, would have a material number of annual passengers. The exclusion of these routes from the analysis is likely to underestimate the total stimulation and passenger transfer effects of the Alliance.

Market Stimulation

InterVISTAS experience is that quality improvements in airline markets do stimulate traffic. This is based on four elements. First, and perhaps most important, our years of experience doing route analysis in many markets has led to empirical observation that service quality, including code-sharing without increased route capacity, does increase total traffic on the route.

The second reason is that code-sharing stimulates traffic by providing additional itinerary options, which improve the quality and convenience of air service between two points. Same day business return flights may be enabled on non-stop routes, or three day business trips might be shortened to two. Improved connections are observed to stimulate traffic.

Third, code-shared flights are marketed by both airlines in the partnership, increasing awareness amongst the travelling public of flight options, thus encouraging travel.

A fourth reason is one of logic. Assuming there is no stimulation from service quality improvements necessarily leads to a conclusion that code-sharing cannot create a passenger share advantage. One effect cannot exist without the other. Yet empirically we and other analysts find passenger share gains from improved service quality. The only way that enhanced quality can shift passenger share but not stimulate traffic is if consumers were rigidly divided into two groups – those that travel, who respond to relative service quality of carriers, and those consumers who do not ever fly and thus will not be stimulated to travel if it becomes more convenient. We do not observe such rigidness in our practice and are firmly of the view that traffic is stimulated by service quality improvements.

Thus, InterVISTAS estimates traffic stimulation for each city pair, resulting from the combined increased/decreased QSI factor.[8] The stimulation module we use has been developed internally by

[8] We note that Profit Essentials has 4 different stimulation modules. 1) User defined market stimulation rates. This allows airlines/analysts to specify the stimulation rate to be used. 2) Coupon stimulation rates. There are pre-set stimulation rates that are used if the new service results in a change in "coupons" required for travel. For example, a route currently served by connecting flights only requires 2 coupons. If a non-stop flight is introduced, that requires only 1 coupon. Profit Essentials has pre-set stimulation rates for this occurrence, and has different rates based on stage length (in 400-mile increments) and current market size. Stimulation rates are generally smaller for large markets, and vice versa. This methodology cannot be applied to our analysis, as the addition of a code-share results in no change in coupons required. However, we note that our methodology also generally results in smaller stimulation rates for large markets, and vice versa. 3) Carrier stimulation rates. Profit Essentials has pre-set stimulation rates based on the entry/exit of specific airlines on routes of different stage lengths. E.g., if AA enters a 900-mile market, stimulation is **[restriction of publication claimed]** %. If they enter an 1,100 mile market, simulation is **[restriction of publication claimed]** %. These stimulation factors are clearly calibrated for specific US carriers only, so cannot be

InterVISTAS. City pair stimulation is estimated based on the percentage change in the square root of industry total QSI scores before and after the code-sharing using the following formula[9]:

% stimulation = [sqrt(QSI score after) / sqrt(QSI score before)]-1

This methodology implies that the effect of service quality improvement on market stimulation is less than the effect on diversion between carriers. It also implies that the effect of service quality improvements declines as traffic grows or passenger share increases. The stimulation benefit of adding two code-share flights to a route is less than double the effect of adding two code-share flights.

Other Comments on the Methodology

It should be noted that the model does not apply an S-curve benefit to QSI scores. An S-curve indicates that carriers with high market frequencies typically get a share of traffic greater than their frequency share. Conversely, carriers with small frequency shares receive lower traffic shares than their frequency shares. E.g., if there are only two carriers in a market, a carrier with a 60% share of flight frequency may typically be associated with a 65% share of traffic, while the carrier with the 40% flight frequency share may receive only a 35% traffic share.

Profit Essentials QSI's coefficients for the flight frequency factor are based on the absolute flight frequency of each itinerary, and does not incorporate an S-curve effect. Thus, any additional traffic benefit an airline or Alliance might enjoy from a higher frequency share is not reflected in the QSI analysis.

The impact on individual Australia/New Zealand-Singapore flight load factors has not been examined. This is because the analysis relates to city-pair origin/destination passenger volumes, and not individual flight sector passenger volumes. QSI analysis looks only at passengers travelling from a specific origin in Australia/New Zealand and specific destination (and vice versa). Australia/New Zealand-Singapore flights will carry origin-destination passengers for the non-stop origin-destination city pair, and they will carry passengers on connecting services for other international origin destination pairs. As the purpose of the analysis is to assess traffic and service quality changes in the market as a whole, we did not undertake the more complex network modelling to determine individual flight load factors.

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applied to our analysis. 4) Capacity stimulation rates. These rates reflect changes to the capacity offered on a route. E.g., a 50% capacity increase results in **[restriction of publication claimed]** stimulation. A 200% increase in capacity results in **[restriction of publication claimed]** % stimulation. This methodology cannot be applied to our analysis, as the addition of a code-share results in no change in capacity offered. Profit Essentials applies only one stimulation rate to each market, in the order shown above. That is, if user defined rates are provided, they are used. If not, coupon stimulation rates will be used, if applicable. If not, carrier stimulation rates, will be used, and so forth. Unfortunately none of Profit Essentials' modules directly relates to stimulation from code-sharing specifically, or from QSI improvements generally. Hence InterVISTAS, like other route analysts, has developed its own stimulation model, based on experienced observation.

[9] Stimulation is capped at a maximum rate of 100% for any given city pair.

That is, the QSI Australia/New Zealand-Singapore results reflect potential "unconstrained" incremental passenger volumes and shares, and are not adjusted for possible traffic spill.[10] The results should not be used to draw conclusions about individual sector load factors. However, generally, airlines can be expected to deploy more capacity in response to high load factors to avoid possible traffic spill.

Results of the QSI Analysis

Based on data supplied to InterVISTAS by Virgin Australia, the existing Australia/New Zealand-Singapore/beyond market that would see an improvement in service by the Alliance consists of an estimated 5.7 million origin/destination passengers for the year ended Q1 2010.

The QSI analysis shows that with code-sharing, roughly **[restriction of publication claimed]** passengers would divert from other carriers to SQ/DJ. This is a market share transfer of **[restriction of publication claimed]** %.

We can break this result down by carrier. The QSI analysis indicates that DJ will *sell* roughly an additional **[restriction of publication claimed]** "DJ/VA" tickets, while SQ would *sell* roughly **[restriction of publication claimed]** more "SQ" tickets. This does not imply that Virgin Australia will carry more passengers on its network. Even though the tickets are sold under the DJ/VA code the new itinerary is operated by both carriers (each carrier operates at least one sector of the new DJ/VA connecting itinerary).

However, the selling carrier for some of these seats will change. International passengers travelling on Singapore Airlines will be able to buy domestic Australian connections on SQ code, rather than as a separate ticket from Virgin Australia or another domestic Australian carrier. So, the QSI model would expect that many of these passengers would simply purchase a single ticket with SQ. In contrast, for passengers originating their trip in Australia who previously purchased an SQ ticket, the QSI model would expect that some of these would buy seats on the same SQ operated flight from Virgin Australia under the DJ code. This is because if given a choice, some Australians who do a significant amount of domestic travel within Australia on Virgin Australia, may choose to purchase their Australia-Singapore/beyond tickets from Virgin Australia. Empirically, we observe that those passengers who take multiple trips each year will tend to book on a favourite carrier, even if it is a code-share flight, when that carrier can offer the service at the same price as the operating carrier.

InterVISTAS' analysis also considered market stimulation from the Alliance. It is our view that an improvement in service quality does increase total traffic. For example, code-sharing typically enables new or better connecting services that lead to some increase in total travel. Further, assuming there is zero stimulation from service quality improvements necessarily leads to a

[10] Traffic spill is when there is more demand for seats on a given flight than are available. Spilled demand may appear on other flights of the carrier on the same route, connecting services on the carrier, on flights of other carriers, or the passenger may simply choose not to travel as alternative services may not meet the travellers' requirements (e.g., a business traveller who is unable to undertake a same day trip if the preferred flight is not available).

conclusion that code-sharing cannot create a market share advantage. One cannot exist without the other. Our analysis indicates that the Alliance will increase total market size by roughly **[restriction of publication claimed]** passengers, an increase of **[restriction of publication claimed]** The Alliance is expected to capture **[restriction of publication claimed]** of the stimulated traffic.

The passenger gain for the Alliance is largest on the thin markets which are currently served with limited connecting service. For example, the Alliance gains **[restriction of publication claimed]** on Melbourne-Cochin, India and **[restriction of publication claimed]** on Mackay-Singapore, whereas the gain on Sydney-Singapore is only **[restriction of publication claimed]** and **[restriction of publication claimed]** on Adelaide-Singapore.

Non-Alliance carriers gain from their **[restriction of publication claimed]** share of market stimulation (**[restriction of publication claimed]** passengers) but lose market share to the Alliance (**[restriction of publication claimed]** passengers) for a net loss of **[restriction of publication claimed]** passengers, or **[restriction of publication claimed]** of their original traffic.

As already described, the analysis does not include any yield changes. Our experience is that when an Alliance is formed which transfers net market share to the Alliance, non-Alliance carriers typically respond, including a response through their seat management systems to sell more tickets in the lower fare classes. This increased availability of seats at low air fares will have some additional stimulation impact on the market. It will also mitigate the net traffic loss of the non-Alliance carriers.

A table summarising the key results follows:

[restriction of publication claimed]

About InterVISTAS

The InterVISTAS Consulting is a transportation and tourism consulting practice based in Vancouver, Canada, with subsidiary and other offices in London, Washington DC, the Hague Netherlands, and regional offices in Ottawa, Winnipeg, Chicago, Toronto, Bath UK and San Juan Puerto Rico. The Group consists of 80 team members. In the aviation sector our expertise is in aviation economics, forecasting airline management, airport management and financing, air traffic control and air navigation, border and security facilitation, airport planning, airport commercial development, airport customer satisfaction measurement and benchmarking and environmental impacts and strategies.

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