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Strategic Management of Integrated Public Transport and its Value in the Air Bus Service Context

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TITLE: **Strategic Management of Integrated Public Transport and its Value in the Air Bus Service Context**

ABSTRACT:

While there is a well-developed body of academic literature on how to procure ground transport services and how to integrate those services, there is virtually no literature on how to do this in the context of air services (in combination with ground services). This paper aims to substantially contribute to the area of strategic management of integrated transport based on the concept of mobility as a service including revenue management, marketing operations management and also policy making. All these areas relate to improving efficiency, acceptability and profitability of air services to regional and remote areas (but also air services more generally) that can benefit significantly from any form of integration (integrated fares, timetables, customer information, marketing etc.). We show that customer-centric public transport integration with aviation as the highest priority can create competitive advantage of the air bus transport value chain as particularly in the regional aviation context the total trip travel experience is of high importance given the potential competition from private car travel, except for island air services. The public ground transport experience will therefore not only impact on the perceived flight product quality but also on other products along the aviation value chain. In terms of the demand analysis and travel choice literature, we reveal that integrated planning and management efforts such as joint timetabling and joint pricing are most likely to have an impact on competitive advantage, demand (passenger numbers plus yields, measured in the customers' willingness to pay) and hence the profitability of regional air services. We use stated choice experiments for flights from Sydney to regional NSW, Australia to establish the willingness to pay for integrated add-ons to scheduled regional air services.

KEY WORDS: ***Integrated transport strategy, aviation, choice analysis, willingness to pay, mobility as a service***

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1. Introduction

Aviation has a very significant positive impact on economies, businesses and communities which is estimated to be in the region of US$2.4 trillion worth of wider economic benefits to the global economy (Oxford Economics and ATAG, 2014). That impact and importance is even more evidenced in the regional context (Baker et al., 2015), where air services are often considered to be life line services. However, regional air services often don't generate high enough revenues to make them a commercially viable business proposition, which in many cases results in either some form of public support, regulation or perhaps more unfortunately, in the suspension of services. Previous research has shown why large carriers and particularly low cost carriers have suspended routes (e.g. de Wit and Zuidberg, 2016; Dobruszkes, 2013). In the regional air service context where the situation is often even worse a number of regional carrier have even gone into financial administration (Merkert and O'Fee, 2016). Lohmann and Vianna (2016) recently established that stakeholder engagement (e.g. lack of location-specific market research by airports or destination management organizations) and non-aviation factors (e.g. seasonality) play an important role in route suspension. Arguing more positively in the sense of business development, Allroggen et al. (2013) established that incentives such as airports offering time-limited rebates on standard charges are an effective tool to attract traffic. Merkert and O'Fee (2013) show from the public transport authority perspective that route business development can be improved for example by cooperating closer with local tourism agencies. Merkert and O'Fee (2016) confirm that view by adding the regional airline management perspective and showing that both sides are willing to explore new avenues to put customers at the centre of their strategies, grow patronage and eventually reduce the reliance on subsidies. Integrated transport strategies are so far not part of that policy and management discussion in the (regional) aviation context and also not part of the integrated public transport management literature, largely because aviation is until this date by many not recognised as public transport. We propose that air transport should be treated as any other mode of transport when considering strategic management and planning of integrated public transport. We go even further by proposing that through integration the air bus transportation value chain can gain a competitive advantage over its more competitive alternative in the regional transport context that is individual travel by car. Through achieving full integration at the air bus interface based on the concept of mobility as a service we argue that management and policy makers can get travellers out of their cars and into using public transport.

This paper aims to add to the discussion on what customer-centric strategies stakeholders can implement to improve the commercial viability of regional air services. We aim to show that integrated transport management strategies (such as integrated ticketing or integrated shuttles), which have proven to be successful in other public transportation modes, have the potential to make the door to door air service travel experience more efficient, commercially viable and attractive to consumers and should because of that potential/latent competitive advantage be considered more seriously by airline and public transport authority (government) management. This requires all stakeholders to think beyond the traditional transport mode boundaries and also to gain some first insights into the value of integrated air bus services in the regional transport context (where air services often represent "life line services" and/or significantly contribute to economic and social regional development). We argue that in the regional aviation context the total trip travel experience is of high importance given the potential competition from private car travel, except for island air services. The public ground transport experience will therefore not only impact on the perceived flight product quality but also on other products along the aviation value chain. Despite its potential, literature on public transport integration between scheduled (public) air and ground transport is non-existent. To establish first evidence on the willingness to pay for such integrated regional air bus services will thus contribute substantially to the revenue management, policy, strategy, marketing and operations management literature in the regional aviation context. Perhaps more importantly, our findings have not only the potential to change how public air services are planned, procured and operated, but can also have a real impact on the viability of these vital services globally. An interesting aspect of the methodological part of the evaluation in this paper is business travel time savings, as this has also never been studied at the air/bus interface.

The remainder of the paper is structured as follows. The following section provides a brief literature review. Sections 3 and 4 introduce the methodology, the sample and the survey instrument deployed in our study. In sections 5 and 6 we discuss the descriptive and choice analysis results respectively which is followed by our conclusions and recommendations for further research in section 7.

2. Literature review and setting the scene

Three streams of literature are of relevance to our research question and hence considered in this paper. Firstly, there is a growing body of literature on how to make public support and management of scheduled regional air services more viable and efficient. Given that public support for regional air services (RPT) occurs in many parts of the world (for an economic policy discussion on this see for example, Nolan, et al., 2005), it is hardly surprising to find evaluations of schemes for a number of regions most noteworthy being the Essential Air Service (EAS) program in the United States (e.g. Wittman, 2014; Matisziw et al., 2012), the Public Service Obligation (PSO) air service scheme in Europe (e.g. Merkert and Williams, 2013; Calzada and Fageda, 2014; Bråthen and Halpern, 2012), the Remote Air Services Subsidy (RASS) Scheme in Australia (e.g. Merkert and Hensher, 2013) as well as similar schemes in India and Canada (e.g. Metrass-Mendes et al., 2011; Ouellette et al., 2010). All these studies share the common view that scheduled air services are usually regarded as merit goods (that provide freedom and opportunities for individuals and communities) in regions where such services are not commercially viable. This in turn can result in governments procuring or regulating such transport services (as opposed to producing them internally), and generally a significant involvement of government authorities in the planning of air services. Merkert and O'Fee (2013; 2016) have shown from the public transport authority and airline management perspective that there is generally a strong desire on both sides to grow patronage but it is often a matter of lack of incentives and innovation, inappropriate governance and risk structures as well as insufficient stakeholder cooperation. While these papers aimed more at the airline / tourism interface, the argument can be extended to the airline / ground transport provider context, which brings us to our original approach of customer-centric air / bus integrated transport management. What the existing literature is essentially suggesting is that authorities should take more responsibility over publicly supported and perhaps also scheduled commercial air service routes, in the sense of becoming more involved in the full transportation value chain and service planning (without mentioning integration). Whilst airline managers, air service planners and ground service operators and ground service planners will rarely be part of the same organization, they could cooperate much closer with regards to integrating air/ground transport services. Presenting transport authorities with a fresh approach but proven approach (as in bus/rail/ferry integrated transport) is something that is potentially very attractive and impactful. Private airlines and bus operators should be interested too as these strategies have the potential to growth patronage growth, customer satisfaction and yields.

The second relevant strand of literature has studied integrated transport management solutions and their benefits to both the public and the involved operators, usually with the aim to promote mode switch from private car to public transport. It is a common view in the existing literature that this mode switch is achieved through the convenience, comfort, accessibility (of particular importance to our regional context), safety, affordability and speediness of travel within the integrated (usually referring to the bus / train interface) public transport system (e.g. Luk and Olszewski, 2003; Ulengin et al., 2007). Relevant and most useful to this paper Chowdhury (2016) recently published a comprehensive literature review of studies focusing on integrated transport strategies and mode switch to public transport with emphasis on factors influencing travellers to willingness to ride an integrated public transport system (with special focus on the willingness to transfer between modes). This literature review covered 32 studies on willingness to pay (WTP) for integrated public transport between 2006 and 2015 and we argue that Chowdhury (2016) is not even aware of the main finding of this review that is the non-consideration of aviation in any of the reviewed studies. This is a major gap not only in the academic literature but also in the policy making and management practice. The Chowdhury (2016) paper is still relevant for our context as it provides a framework and identifies five main categories of integration (in the operational sense which has been the focus in the majority of previous papers), namely (a) network integration, (b) fare and ticketing integration, (c) information integration, (d) physical integration of stations, and (e) integrated timed-transfers. It further summarises from the previous literature key themes/aspects around the discussion on integration of public transport systems which are safety and security, reliability, transfer time (walking and waiting), information systems for users, ticketing and fare systems, comfort and amenities at interchanges/stations. In terms of definitions, network integration appears only partially applicable to the air/bus context as the aim of this integration is not a reduction of wasteful service duplication but instead resource optimisation and public transport coverage of an adequate area (Hidalgo, 2009). Fully integrated fare and ticketing systems are characterised by costless transfers, and a single ticketing system across all modes in question (Sharaby and Shiftan, 2012). Integrated time transfer aims at minimising waiting/transfer time at the multimodal interface and information integration is characterised by presenting travel and fare information in the same standard which assists consumers in their multimodal trip planning (Zografos et al., 2008). Again, while all these definitions have been so far exclusively used in the surface public transport integration management context, we see no reason for not applying

them to the public air service context too. One of the reason for why there is no previous literature on integrated public transport strategies for the air / bus context is that aviation is often not seen as public transport. We argue, however, that particularly scheduled regional aviation should be seen as a form of public transport given that it is happening on a regular basis and more importantly that is often financially or regulatory supported by public transport authorities (perhaps not the same department but often still the same authority or ministry that governs and procures surface public transport).

The third and methodologically most relevant strand of literature has investigated ways of measuring the willingness to pay (WTP) for air transport services. It is worth noting that no study has so far attempted to estimate the WTP to pay for integrated transport measures at the air / bus interface, and we therefore rely on WTP studies that have exclusively focused on one mode of transport. The literature on WTP and its key component Value of Time Travel Savings (VTTS) for transport (i.e. ground transport) are well established (for a review see for example; Wardman, 2014). What all of these studies have in common is the assumption that consumers behave rationally by choosing according to their preferences which can be expressed as a utility function that allows estimation of demand and price elasticities. In other words, consumers are assumed to act as if they are utility maximisers subject to their income, preferences and time constraints. Whilst some of the often cited national transportation VTTS studies specifically exclude aviation (such as the studies in Denmark or Sweden (e.g. Börjesson and Eliasson, 2014) others include it at the inter-urban (>100km) level (such as the Netherlands or the UK (Wardman, 2014) and Norway include it at both the inter-urban levels of less than 50km and more than 50km (Ramjerdi, Rand and Sælensminde, 1997). Most VTTS studies in the aviation context have focused on the choice between large airlines, large airports or generally long haul travel (e.g. Hess, 2008; Collins et al., 2012). A recent paper by Merkert and Beck (2015) has provided first evidence for the VTTS in regional aviation but failed to go beyond the air service context and has as all previous studies not considered potential WTP for integrated air/bus measures. Those management tools can go beyond VTTS and it is hence important to acknowledge that previous papers have looked beyond travel time savings such as Balcombe et al. (2009) who revealed WTP for in-flight entertainment or Choi and Ritchie (2014) who investigated WTP for flying carbon neutral or Stone (2016) who has shown that reliability matters in the small community air passenger choices.

In sum, our literature review has shown that there exists no evidence on the WTP for integrated transport strategies/measures in the context of the interface of scheduled air services and public ground transport. This paper aims to close this gap in the literature and to contribute to management practice by establishing first evidence on this potential game changer in regional aviation commercial viability and efficiency.

3. Methodology

A key aim of this paper is to reveal first evidence on the VTTS/WTP for integrated air / bus services in the regional context in order to establish whether proven and increasingly popular strategic integrated transport management strategies from ground transportation modes (e.g. OPAL card in Sydney) also add value when implemented at the air service / public ground transport interface. Building on Merkert and Beck (2015), we estimate the VTTS/WTP for integrated transport add-ons (such as integrated ticketing) by analysing our stated preference choice data (see section 4) via the Mixed Multinomial Logit (MMNL) model (cf. Revelt and Train, 1998; Hensher and Greene, 2003; Train, 2003). The main advantage of this model is that it allows for a better representation of reality, where every respondent has their own systematic and random components for each alternative in their choice set; that is to say the assumption of constant marginal utilities across all individuals is relaxed.

Let U_{nsj} be the utility of alternative j perceived by respondent n in choice situation s. This utility can be divided into two separate components, and observed utility V_{nsj} which is modeled and an unobserved random component component ε_{nsj} which is unmodelled, such that

$$U_{nsj} = V_{nsj} + \varepsilon_{nsj} \quad (1)$$

The observed component of utility is assumed to be a linear relationship of observed attribute levels x which describe each alternative j which are weighted by some amount β which represents the marginal utility or parameter weight associated with attribute k for respondent n

$$U_{nsj} = \sum_{k=1}^{K} \beta_{nk} x_{nsjk} + \varepsilon_{nsj} \quad (2)$$

The unobserved component ε_{nsj} is assumed to be independently and identically (IID) extreme value type 1 (EV1). As well as containing information on the levels of attributes, x in Equation (2) may also be comprise of up to J-1 alternative specific constants (ASCs) which capture the

residual mean influence of the unobserved effects associated with that particular alternative. The utility specification in Equation (2) is flexible in that it allows for the possibility that different respondents may have different marginal utilities for each attribute being modelled. In practice, however, it is not generally feasible to estimate individual specific parameter weights, as such it is common to estimate parameter weights for the population moments of the sample ignoring subscript *j*

$$\beta_{nk} = \overline{\beta}_k + \eta_k z_{ns} \tag{3}$$

where β_k represents the mean for the distribution of marginal utilities held by the sampled population and η_k represents the spread or deviation of preferences among the sample around that mean. The resulting model structure has no closed form solution, thus the integrals are found via simulation wherein z_{ns} in Equation (3) represents random draws taken from an analyst specified distribution (e.g. normal or log-normal among others) for each respondent *n* and choice task *s*. The above model is referred to as a cross-sectional random parameters logit, however it is common in the literature to estimate a model such that the marginal utility has some distribution over *n* only and not *s*, such that z_{ns} become z_n. In this version of the model preferences are assumed to vary over respondents but not within a respondent taking into account the pseudo-panel nature of repeated choice observations (Revelt and Train 1998, Train 2009).

The panel random parameters logit not only differs in how the random draws are taken, but also in how the log-likelihood function is estimated. In the cross-sectional version of the model choices made over *S* choice tasks are assumed to be independent both between and within respondents, resulting in a simulated log-likelihood function of

$$\log E(L) = \sum_{n=1}^{N} \sum_{s=1}^{S} \sum_{j=1}^{J} y_{nsi} \log E(P_{nsj}) \tag{4}$$

where y_{nsi} equals 1 if the alternative *j* is the chosen alternative in choice situation *s* for respondent *n* and 0 if otherwise. $E(P_{nsj})$ is the expected choice probabilities calculated over the random draws z_{ns}. In the panel version of the model the S choice tasks completed by respondent j are no longer assumed to be independent and the simulated log-likelihood function becomes:

$$\log E(L) = \sum_{n=1}^{N} \log E(P_n^*) \tag{5}$$

where

$$P_n^* = \prod_{s=1}^{S} \prod_{j=1}^{J} (P_{nsj})^{y_{nsj}} \quad (6)$$

where the draws are taken over *n*. See Train (2009) or Bliemer and Rose (2010) for a more detailed discussion of the panel and cross-sectional random parameters logit.

4. Survey Instrument

The survey was designed to examine travel within regional New South Wales (NSW), specifically travel to regional NSW destinations. The beginning questions in the survey involved collected information on frequency of travel to places regional NSW, how often via different modes, the purpose of the last trip made, duration of stay and travelling companions. Questions about business travel for interstate or international travel were also asked. A series of questions then examined aviation travel to regional NSW in more detail asking about the last time a person might have flown, to which airport, how the transferred from the airport to the final destination, purpose of the trip, and duration of the trip.

The survey then presented respondents with a stated preference experiment to examine regional travel preferences. The context which respondents were asked to imagine they were making a possible trip from the Greater Sydney metropolitan area to a regional destination in NSW that would take approximately 4.5 hours to make if they were to drive by car with an arrival time of around 9.30am. While a flight of this duration maybe considered a medium haul flight in Europe, in the Australian context this is regional given the distances involved in travelling in this country. This trip was chosen because, again in the Australian (i.e. NSW) context, shorter trips would likely be dominated by car and longer trips (such as those in regional Queensland or Western Australia) dominated by air. A 4.5 hour car journey is a travel time that could approximate a number of actual trips from Sydney to a popular regional destinations, but is also a distance that would put a person in a context where they would face a real trade-off between different modes of travel; an ideal situation for a stated preference experiment. An example of the stated preference task is shown in Figure 1.

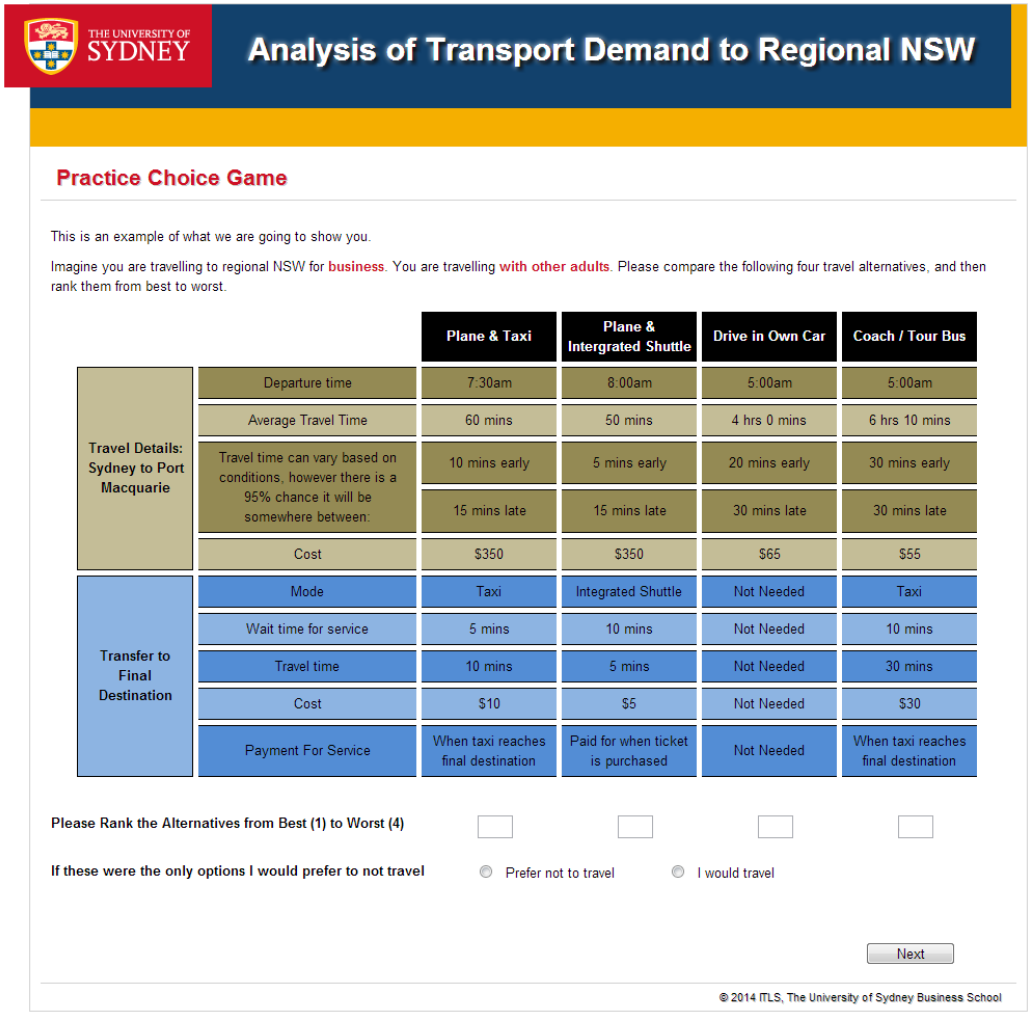

Figure 1. Example Stated Preference Task

Each alternative was designed to be as realistic as possible. With respect to travel via air or bus, it is typical that an additional transfer is required from the airport or terminus in order to reach the final destination.[1] Consequently, the coach / tour bus and one of the plane alternatives both require the respondent to consider such a transfer via taxi (which varied over the waiting time for the taxi, the travel time and the travel cost). As travel via a private motor vehicle does not require a transfer to the final destination, no attribute levels were presented for this alternative. The remaining alternative is travel by plane with a transfer via an integrated shuttle service, the alternative of particular interest to this study. Given that an integrated shuttle does

[1] The Sydney to Port Macquarie trip was used only as an example when introducing the stated preference section of the survey. In each of the choice tasks used for data collection, the choice was framed as to require the respondent to ""imagine you are travelling to regional NSW…". We acknowledge that focusing on the transfer time at the destination is a limitation of our research. We judged that the choice task could potentially become too burdensome (and result in the car being the simple/dominant option) by also including detailed information about the transfer to the airport at the origin (how far away is home from airport, what mode etc.).

not yet exist in the Australian context, the concept was introduced to respondents prior to completing the choice tasks. An integrated shuttle was described as "a shared service (could be arranged by the airline, airport or local council) that is designed to make the final transfer cheaper and perhaps more timely and the entire journey a more integrated one. It could either be available for you as soon as you land or there might be a short wait. You could have an integrated "all in one" ticket for both the plane and shuttle, or you might be required to organise it when you land." With respect to the design of this alternative for the experiment itself, it was designed to have less wait time and lower costs relative to the taxi.

While the experiment did not specify one particular destination to respondents, it was based on a real underlying trip; the journey from Sydney to Port Macquarie (230,451 passengers in 2014 on 5,934 flights operated by two airlines which is representative for regional NSW airports; air passenger inflows were mainly from Sydney and Brisbane; CAPA 2015). A benefit of basing the choice task of an actual trip is that it enabled us to pivot the attribute levels for travel time, travel time variability and travel cost around values experienced in a real market where no one alternative is strictly dominant or strictly dominated. The attribute levels used in the design are shown in Table 1.

In examining the different levels for each attribute across the different alternative modes, the different strengths and weakness that exist within each mode are reflected. Travelling by plane has the advantage of being faster but is often more costly. Upon arrival it was possible that in some cases a taxi was almost immediately available but that in other instances you may have to wait for a period of time. The car allows you to travel from origin to destination without needing a final transfer and is a cheaper option, but it takes longer so you have to leave earlier to arrive at the same time and there is more variability in travel times relative to the plane. The coach / tour bus has the advantage over the car in that it is the cheapest alternative and you do not have to driver yourself, but it is the slowest alternative with the most potential variability in travel times and you do need to make the final transfer via a taxi.

The rationale behind presenting wider ranges for travel time variability for car and coach / tour bus (defined as a 95% of being either X minutes early or Y minutes late) was to represent the larger level of uncertainty in road traffic conditions relative to airport timetables. With respect

to the ranges for the transfer to the final destination bus terminals are typically located in more central areas relative to regional airports, thus the values for waiting time for a taxi and the length of time needed to travel in the taxi to reach the final destination (and thus cost) are narrower for the coach alternative than the plane. The shuttle from the airport is a service designed to be cheaper and timelier than the taxi, thus the cost and waiting time of this alternative are less.

Table 1. Attribute Levels for Stated Preference Experiment

Details of the Initial Journey	Departure Time	*Plane & Taxi*	6.30am, 7.00am, 7.30am, 8.00am
		Plane & Shuttle	
		Car	4.00am, 4.30am, 5.00am
		Coach / Tour Bus	
	Travel Time	*Plane & Taxi*	50min, 60min, 70min
		Plane & Shuttle	
		Car	4hr 30min, 5 hr, 5hr 30min
		Coach / Tour Bus	6hr 10min, 6hr 30min, 6hr 50min
	Minutes Early	*Plane & Taxi*	5min, 10min, 15min
		Plane & Shuttle	
		Car	10min, 20min, 30min
		Coach / Tour Bus	
	Minutes Late	*Plane & Taxi*	5min, 10min, 15min
		Plane & Shuttle	
		Car	10min, 20min, 30min
		Coach / Tour Bus	
	Travel Cost	*Plane & Taxi*	$150, $200, $250, $300, $350
		Plane & Shuttle	
		Car	$55, $65, $75
		Coach / Tour Bus	
Transfer to Final Destination	Wait Time	*Plane & Taxi*	5min, 10min, 15min, 20min
		Coach & Taxi	5min, 10min
		Plane & Shuttle	0min, 5min, 10min
	Travel Time	*Plane & Taxi*	10min, 15min, 20min
		Coach & Taxi	5min, 10min
		Plane & Shuttle	10min, 15min, 20min
	Travel Cost	*Plane & Taxi*	$10, $15, $20
		Coach & Taxi	$10, $15
		Plane & Shuttle	$0, $5, $10
	Payment	*Plane & Shuttle*	0 = When purchasing plane ticket,

In establishing the choice profiles shown to respondents, a D-efficient design was used (Rose and Bliemer 2008). An efficient design is one which seeks to maximise the Fisher information which, as the reciprocal of the covariance matrix, is equivalent to minimising the (co)variance. Designs which reduce the estimated variances allow for the more efficient estimation of model parameters. In this experiment the priors for the design were initially sourced from relevant

literature and for values that were unknown, best guesses by the analysts were used. The final design was generated from priors which were updated using results from a pilot survey.

5. Descriptive Results

5.1 Sample Characteristics

A final sample of 1,128 respondents was collected from the Greater Sydney metropolitan region. The socio-demographics of the sample are shown in Table 2. There is small over sampling of females in our sample relative to the population in Sydney (51%), while average age of Sydney residents is 37.7 our sample only includes respondents older than 18, explaining why the average age in our sample is higher. The average income in Sydney is $57,980 ($74,724 fulltime average; see ABS, 2015); our sample compares well to this population statistic. Overall our sample is considered to be widely representative of the Greater Sydney metropolitan population.

Table 2. Socio-Demographics of Sample

Average Age	45.5 (14.9)
Male	44%
Female	56%
Full-time employed	50%
Part-time employed	19%
Other employment	31%
Average work hours/week	33.4 (13.7)
Average adults in h/hold	2.2 (1.7)
Average children in h/hold	0.6 (1.0)

Personal Income		Household Income	
Under $10,000	9%	Under $30,000	7%
$10,001 to $20,000	10%	$30,001 to $60,000	14%
$20,001 to $40,000	15%	$60,001 to $90,000	15%
$40,001 to $60,000	16%	$90,001 to $120,000	15%
$60,001 to $80,000	12%	$120,001 to $150,000	13%
$80,001 to $100,000	11%	$150,001 to $200,000	12%
$100,001 to $120,000	6%	$200,001 to $250,000	4%
Over $120,000	5%	Over $250,000	3%
Not given	16%	Not given	18%

5.2 Describing Regional Travel

Eight out of ten respondents (79%) reported making at least one trip to a regional destination in NSW in the last year, for a total of 2,881 trips across the sample. The average number of trips made per respondent overall is 2.6 ($\sigma = 3.8$) and among those who did report at least one trip, the average is 3.6 trips ($\sigma = 4.1$). The median is 2.0 in both instances. For those who reported making a trip in the last year, Table 3 describes the use of each mode of transport. It is evident that the car is the dominant form of transport, with 85.9% of respondents who travel using this mode for an average of 2.7 trips per year. Just over a quarter of travel to a regional destination occurs via air.

Table 3. Mode of Travel to Regional NSW

	Car	**Coach/Tour Bus**	**Plane**
Made a trip using this mode	85.9%	12.8%	26.6%
Average trips using mode	2.7	0.13	0.42
Standard deviation	3.6	0.65	1.1
Median trips using mode	2.0	0.0	0.0

Table 4 shows the purpose of these trips, the predominant reason being to visit family or friends, followed by a weekend trip or a holiday. The average number of days at the destination is 4.0 ($\sigma = 5.6$, median = 3.0), indicating that the majority of trips are likely planned and for a reasonable duration. Eighty-three percent of those who travelled to a regional destination did so with another person; with 92% of this group travelling with at least one adult ($\mu = 1.9$, $\sigma = 2.9$) and 30% at least one child ($\mu = 0.5$, $\sigma = 1.0$).

Table 4. Reason for Travelling to Regional NSW

Visit friends or family	30.6%
Weekend	25.1%
Holiday	24.6%
Long Weekend	13.5%
Business	5.1%
Commute	1.1%

Figure 2 shows how the likelihood of traveling either by air or by car change depending on who the respondent would be travelling with. The car is more popular in both instances, but flying is particularly more likely when travelling alone.

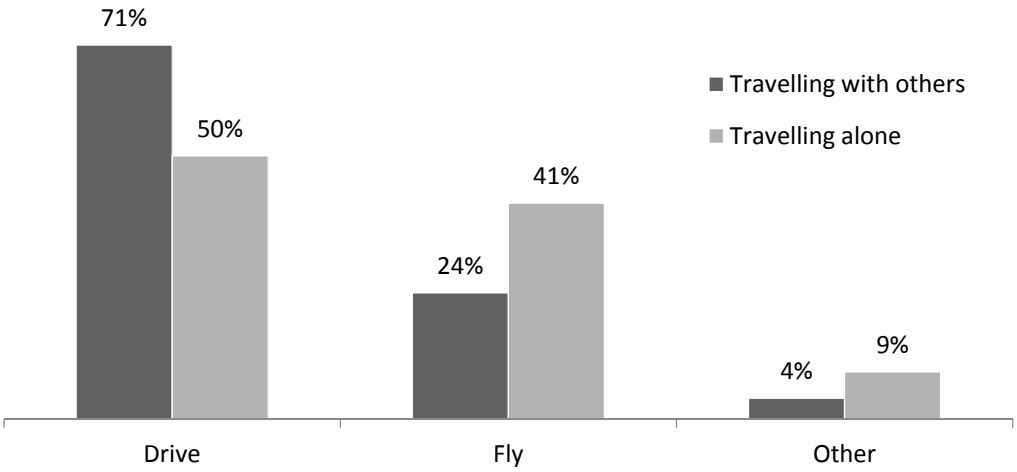

Figure 2. Most Likely Mode Based on Travel Companion

Briefly investigating travel for business travel, 15% of the sample travelled for a business purpose. Overall, 7.3% of people travelled to a regional destination in the past year (46.6% of just those who travelled for business; average of 2.0 trips in the last year), 3.8% of people have travelled interstate (24.4% of those who travel for business; average of 3.7 trips in the last year) and 9.9% of all respondents have travelled internationally on business in the previous year (63.6% of respondents who travelled for business; average of 1.1 trips in the last year). With respect to how people access regional destinations while travelling for business, 41.5% of those who have travelled for business drove and 37.5% flew.

5.3 Flying to Regional Destinations

The majority of respondents stated that they had never flown to a regional destination in NSW (57.6%). A total of 24.6% stated that it had been more than a year since they had last flown, 8.8% had flown with the last six months to a year and the remaining 8.9% had travelled in the last week, month or previous three months. With respect to which destination was flown to, the most popular airports were Coffs Harbour (12.1%), Ballina Byron (10.0%), Port Macquarie (10.%) and Albury (9.0%). Table 5 displays the main purpose for the last trip to a regional NSW destination. Similar to general travel to regional NSW, the most common purpose was to visit family or friends; however travel for a holiday and travel for business are more prevalent reasons when flying than they are when travelling to a regional destination in general. Lastly, Figure 3 shows the modes of transit with respect to how a traveler transfers from the airport to

their final destination after arriving at a regional airport. Car-based modes of transport dominate, with the majority transferring via a car (hire car or a pick up) or taxi.

Table 5. Reason for Flying to Regional NSW

	All Respondents	Those Who Have Flown
Visit friends or family	14.4%	33.3%
Holiday	9.4%	22.2%
Business	8.3%	19.7%
Weekend	5.4%	12.8%
Long Weekend	4.5%	10.7%
Commute	0.5%	1.3%

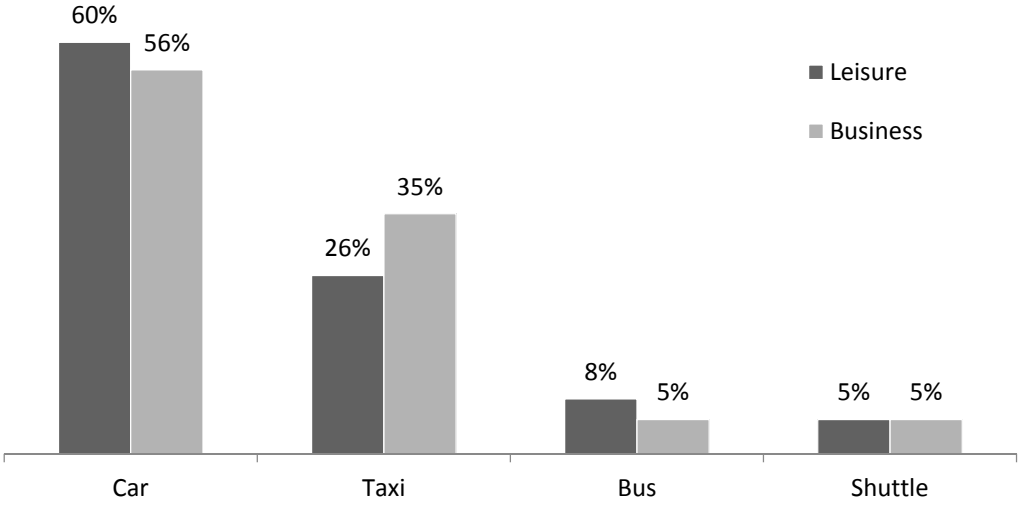

Figure 3. Mode of Transfer After Flight to Regional NSW

5.4 Use and Payment for Integrated Shuttles

A series of questions were asked to provide insight into how the concept of an integrated shuttle might be evaluated by travelers. It is worth recalling that respondents were told that an integrated shuttle is a shared service that is arranged to meet your flight when you land (or provide you with a convenient transfer before departure) so that waiting times were reduced, and that for convenience the ticket for a shuttle could be integrated with the airline ticket or purchased upon arrival. In this context, two third of respondents would use and be prepared to pay for such a service, if it matched their arrival or departure time and would also use and pay for an integrated or all-in-one ticket.

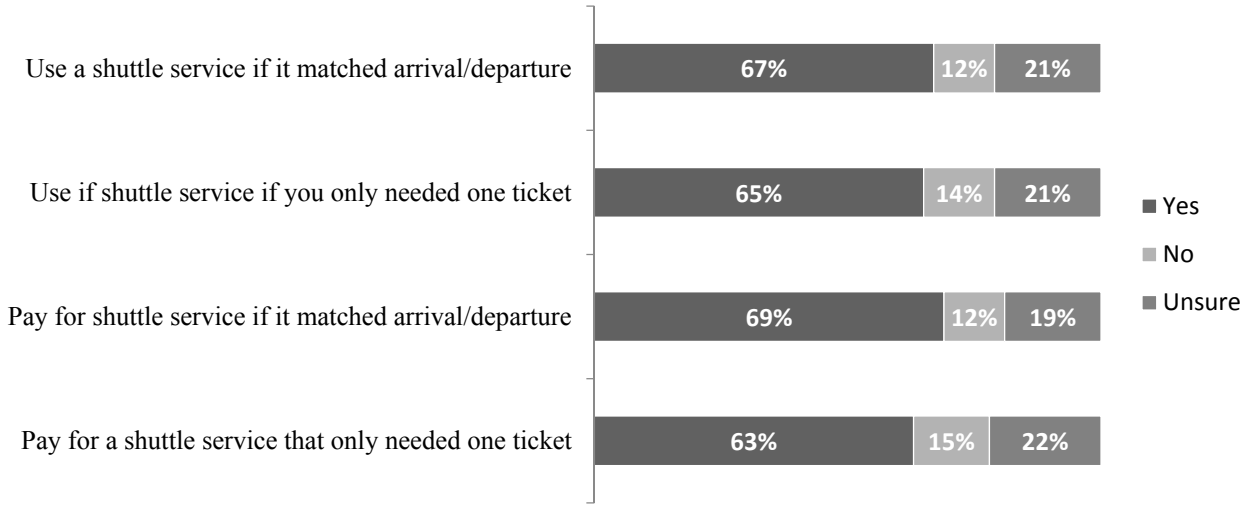

Figure 4. Potential Use of and Payment for an Integrated Shuttle Service

Differences in opinion between different demographic groups were also explored. With respect to use of an integrated shuttle service that matched flight times: females (71% compared to 64% for males) are significantly more likely to use an integrated shuttle (χ^2 = 7.189, sig = 0.027); leisure travelers (69%) are significantly more likely than business travelers (51%) to indicate they would use an integrated shuttle (χ^2 = 34.478, sig = 0.000); stated integrated shuttle use is higher (χ^2 = 22.831, sig = 0.000) among those who are more likely to travel to a regional destination with others including children (72%) than those more likely to travel alone (64%). There are no differences based on personal income, household income or age. The average number of times travelled to a regional destination is lower (F = 4.523, sig = 0.011) for those people who are unsure about using an integrated shuttle (1.884), than for those who are more definite in their attitude for integrated shuttles (2.775 trips for those who would use a service) or against (2.838 trips for those who would not).

There are no differences in use of a shuttle if a only a single ticket was needed, however leisure travelers (68%) are again more than business travelers (46%) to state that yes they would use such a service (χ^2 = 25.140, sig = 0.000) and those who travel with others including children (72%) are significantly more likely to use such a service than those who travel alone (57%; χ^2 = 26.585, sig = 0.000). On average, the respondents who are unsure about using such a single-ticket service have significantly lower incomes than those who say either yes or no at both an individual (unsure = $50,625, yes = $57,800, no = $62,445; F = 4.030, sig = 0.018) and household (unsure = $106,364, yes = $114,738, no = $128,577; F = 4.024, sig = 0.018) level

and have travelled to regional destinations less often in general (unsure = 2.0 trips, yes = 2.7 trips, no = 3.1 trips; F = 3.720, sig = 0.025) and by plane (unsure = 0.2 trips, yes = 0.5 trips, no = 0.6; F = 5.181, sig = 0.006).

With respect to being prepared to pay to use an integrated service that matches arrival/departure times, females (73% compared to 65% for males) are significant more likely to state that they would pay for such a service (χ^2 = 8.437, sig = 0.015). Leisure travelers (yes = 71%, no = 10%, unsure = 19%) are significantly more likely than business travelers (yes = 49%, no = 36%, unsure = 15%) to indicate they pay for an integrated shuttle (χ^2 = 52.034, sig = 0.000), and as a corollary those who are more likely to travel with others including children (yes = 71%, no = 10%, unsure = 19%) are also more likely to indicate they would pay than those who travel alone (yes = 63%, no = 23%, unsure = 14%; χ^2 = 27.893, sig = 0.000). The average number of times someone has flown to a regional destination is significantly higher for those who state they would not pay for an integrated shuttle (μ = 0.747) than those who would (μ = 0.395) or who are unsure (μ = 0.275; F = 5.706, sig = 0.003). There are no differences based on age or income.

Lastly, with respect to paying for a service if it offers an integrated, single ticket for flight and shuttle transfer, again leisure travelers (65% compared to 50% for business) are significantly more predisposed to say yes to paying (χ^2 = 25.663.437, sig = 0.000) and those who travel with others including children are also more likely to say be in favour of such a service (yes = 67%, no = 10%, unsure = 24%) than those who travel alone (yes = 60%, no = 23%, unsure = 17%; χ^2 = 16.756, sig = 0.000). Those who are unsure about the service had travelled to regional destinations significantly less than those who either agree or disagree with paying for an integrated service (F = 4.509, sig = 0.011) and have also flown less (F = 4.722, sig = 0.009). There are no differences based on gender, age or income.

6. Choice Results

Prior to completing the choice tasks, respondents were asked to indicate whether a trip (via any mode) to a regional destination was more likely to represent a business or leisure trip for them. This was done so that we would have better insight into how respondents perceived the experiment and model the choice results accordingly. Given that each of the 1,128 respondents completed 10 choice tasks, the final sample for the choice analysis was 11,280 observations. Of these, 8% of the sample indicated that a regional trip such as the one described in the experiment was mostly likely to be a business trip giving a total of 890 choice observations, and 92% of the sample felt such a trip was more likely to be for leisure giving a total of 10,390 observations. Note that in estimating the models the total cost (cost of main mode + cost of transfer to final destination) and total travel times (time of main mode + time of wait + time of transfer travel time) were used to estimate coefficients for time and cost.

Table 6. Choice Percentages for Alternatives

	Overall	**Business**	**Leisure**
Plane & Taxi	14%	33%	12%
Plane & Shuttle	21%	18%	22%
Car	24%	11%	25%
Coach / Tour Bus	16%	9%	17%
No Travel	25%	29%	25%

To give some preliminary insights, Table 6 shows the observed choice frequencies across the stated preference experiment overall and from within the business and leisure sub-samples. Overall the plane is the most popular form of transit, either with a taxi or an integrated shuttle transfer, followed by the car and then the bus. In the business context the plane is chosen relatively more often and the car grows in popularity in the leisure traveler sub-sample. For the purpose of this paper, however, it is interesting to note the choice frequencies with respect to the plane and integrated shuttle. Overall it is chosen more often than the plane and taxi alternative. The traditional plane with a taxi transfer after arrival at the airport is the most chosen alternative in the context of business travel, however among leisure travelers the plan and integrated shuttle combination is particularly attractive.

In modelling the choice responses, it was decided that two separate models would be estimated: a random parameters logit for leisure and a separate model for travelers who stated they were

more likely to make a regional trip for business purposes. A panel specification was used in both models to account for correlations in the random effects within each respondent. The parameter estimates for both models are of the expected sign and seem logically consistent with what one might deem to be real market behaviour. In this regard we are confident that the valuations expressed are representative of how travelers might perceive an integrated shuttle service.

With respect to business travel, the preference for travel via plane and taxi is evident, with that alternative specific constant being significant and positive. The premium placed on this alternative over other modes is $146.98 on average, indicating that there is a very strong preference for this mode. Our intuition for this is that business travelers are probably unlikely willing to share a transfer, preferring the exclusivity or privacy of transferring alone. Perhaps there is a perception that a shuttle is not "business like" or may be less price sensitive given it is a business trip and they are unlikely to be the one paying for the transfer.

With respect to the other parameters in the model, there is also a preference to choose to travel via any mode rather than to not travel at all as per the significant negative coefficient for the no travel alternative specific constant. How late or early each mode of transport is likely to arrive at the destination is not significant in influencing choice. This results is largely intuitive in that business travel to regional destination needs to be undertaking irrespective of the amount of variability in travel time that exists (and given the distances of regional travel such variability, particularly in road based transport modes, is likely experienced regularly). There is a preference for shorter travel times across all modes; coach / tour bus trips which are longer have a bigger detrimental impact on choice of that mode, followed by sensitivity to travel time with respect to plane travel, followed by car. There is significant heterogeneity with respect to how sensitive business travelers are to travel time. On average, departure time has no impact on choosing motor vehicle, whereas later departure times are significantly preferred for plane and bus travel, although preferences vary significantly. Overall it appears that those for whom regional travel is likely to represent a business trip are trading across a reduced set of attributes; cheaper and faster journeys, with more convenient (i.e. later) departure times.

Turning to leisure travelers, in the context of this paper there is a significant alternative specific constant for the plane and integrated shuttle alternative, indicating that there is significant preference for this alternative in the largest market of travelers to regional destinations. In particular, travelers are willing to pay $45.88 to use this mode of travel over other modes. Within the plane and integrated shuttle alternative the average preference is for tickets for the shuttle to be purchased when the plane ticket is booked, with leisure travelers willing to pay $23.97 on average to avoid having to purchase the ticket when they arrive at the airport.

With respect to the remaining choice parameters, shorter journey times are preferred across all modes of transport however when considering mean values travel time has a larger impact within the bus alternative, followed by the plane and then the motor vehicle. For all modes there is significant heterogeneity in preferences in this regard. Later departure times are preferred for both the plane and the bus alternatives; however there is significant heterogeneity in the sample with respect to departure time preferences for plane. With respect to travel via motor vehicle, on average respondents prefer to depart earlier rather than later, but again the heterogeneity in preferences is significant and the spread quite large.

Interestingly arriving to schedule is particularly important for travel via plane, with travel arriving closer on schedule time being preferred whether arrival be late or early. For motor vehicle, arriving late is not significant, but arriving much earlier than scheduled has a negative impact on driving on average; there is again a large amount of preference heterogeneity in this regard. For bus, the more early the bus has a chance of arriving relative to schedule the better, and this preference is uniform in the sample. This result is intuitive as the bus represents a particularly long journey so any savings in time are bound to be appealing; however with respect to arriving later than scheduled the sample average is that a chance of arriving later than scheduled is preferred. This counter intuitive result may be explained by those who opt into the longer bus journey are doing so because of other reasons (such as a budget constraint or they are touring in a large group) so an even longer journey is no less appealing. It may also likely be a function of the length of the bus journey in that selecting this alternative is opting into one that is uncompetitive with respect to time, so taking longer is of little consequence (where as the chance of arriving much earlier may be an added bonus). The relatively large standard deviation parameter also indicates that preferences are extremely varied in this regard.

Table 7. Random Parameters Model Estimates

		Leisure Travel				**Business Travel**			
		Parameter	(t-value)	Std. Dev.	(t-value)	Parameter	(t-value)	Std. Dev.	(t-value)
Alternative Specific Constant	Plane & Taxi	---	---	---	---	0.8966	5.92	---	---
	Plane & Shuttle	0.4955	10.47	---	---	---	---	---	---
	Motor Vehicle	---	---	---	---	---	---	---	---
	Coach / Tour Bus	---	---	---	---	---	---	---	---
	No Travel	-2.5696	-8.74	---	---	-1.9467	-2.17	---	---
Departure Time	Plane	0.0017	2.73	0.0048	11.60	0.0011	0.54	0.0077	7.73
	Motor Vehicle	-0.0030	-2.92	0.0111	25.58	-0.0067	-1.58	0.0038	2.50
	Coach / Tour Bus	0.0112	8.01	---	---	0.0093	1.70	0.0022	2.09
Total Travel Time	Plane	-0.0147	-5.72	0.0200	13.48	-0.0148	-2.09	0.0122	4.57
	Motor Vehicle	-0.0035	-3.49	0.0011	2.45	-0.0092	-1.92	0.0145	7.55
	Coach / Tour Bus	-0.0168	-14.03	0.0081	25.28	-0.0160	-3.71	0.0063	6.30
Total Travel Cost (generic across modes)		-0.0108	-15.68	0.0131	25.10	-0.0061	-4.23	0.0071	6.10
Minutes Early	Plane	-0.0266	-3.18	---	---	---	---	---	---
	Motor Vehicle	-0.0054	-1.30	0.0426	8.45	---	---	---	---
	Coach / Tour Bus	0.0173	4.00	---	---	---	---	---	---
Minutes Late	Plane	-0.0126	-2.15	---	---	---	---	---	---
	Motor Vehicle	---	---	---	---	---	---	---	---
	Coach / Tour Bus	0.0137	2.88	---	---	---	---	---	---

Payment (0 = booking, 1 = arrival)		-0.2589	-3.17	1.3645	14.60	-0.1768	-0.56	1.7485	5.12
Model Fit	LL - Base	-18154.460				-1432.398			
	LL - Model	-12621.893				-995.583			
	Pseudo Rho-Squared	0.305				0.305			
	Observations	10390				890			

7. Conclusions

This paper aimed at establishing first empirical evidence for successful management strategies of integrated public transport in the context of willingness to pay for integrated regional air bus services. A high WTP for integrated public transport with regional aviation at the highest priority would indicate a potential competitive advantage of the regional air bus transportation value chain over its main competitors and in particular over the use of the private car. By treating the air bus transportation value chain as a customer-centric business proposition and by applying strategic management ideas to this context we argue that it may be possible to get travellers out of their car and into public (air bus) transport which will improve the much needed commercial viability of scheduled regional aviation.

Our results suggest that the sample of leisure travelers like the concept, as they exhibit a significant willingness to pay for that feature, particular a fully integrated ticket that is accessed/purchased at the time of booking the flight (WTP premium of $23.97). Interestingly, the concept is most popular with women. We conclude that an integrated shuttle service shows great promise (WTP premium of $45.88) and that airports/airlines should look to negotiate an arrangement, particularly in the context of regional travel and getting leisure travelers into town. As the relative costs (per passenger) of including such integrated elements to the air bus service experience are much lower than the identified WTP premiums of combined $69.85 it is easy to see their commercial potential to airlines and the other stakeholders involved in regional transport. If the integrated services are offered at the WTP premium price levels, the airlines providing the services will enjoy healthier yields and margins (compared to the situation without the integrated add-ons) and if they are offered below WTP premium price levels patronage is likely to increase notably which will not only benefit the airlines commercially but also regional airports, bus/shuttle operators, tourism and the regions more generally. As such integrating regional airline offerings into the concept of mobility as a service appears to be a meaningful strategy not only in the regional but also in the metropolitan public transport management context.

Given the strategic management focus on integrated transport services, particularly at regional airports which are typically poorly served by land transport alternatives, this study has focused on the transfer of passengers to the final destination. The justification for this is that, in

Australia, inbound travel to regional airports represents the majority of activity. An obvious corollary is that integrated services may be implemented for those journeys originating in these locations; though if airport decision makers see the value of such a service for arrivals as shown in this paper, extending an integrated service to include outbound passengers would simply be a matter of course. One potential limitation of this study is our focus on the transfer at the destination with the inclusion of what is currently a hypothetical transfer alternative. We felt that by also including detailed information about the transfer to the airport at the origin the choice task would potentially have become too burdensome. Future research may want to include a more detailed door to door analysis.

In terms of successfully implementing such a strategy we would argue that some initial marketing would be useful as we found that in the Australian context travelers are not familiar with the concept. What is more, our results indicate that the general attitudes point towards business travelers is not being as supportive as leisure travelers. In fact, business travelers are prepared to pay a premium of $146.98 on average for the air/taxi alternative, indicating that there is a very strong preference for this mode We interpret this as business travelers already having their established travel patterns/habits in place. It is also likely that the leisure travelers view a shuttle as easier than trying to get a taxi if traveling in a large group or a cheaper alternative than hiring a car. We feel that more work needs to be done on the business traveler front and perhaps the way that the shuttle is presented (in order to get them out of their cars and away from the aircraft / taxi alternative). It appears that smaller, more boutique, packaged air / bus services are required to appeal and present value to the business traveler community.

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