Tourism Management 33 (2012) 1209–1219

Contents lists available at SciVerse ScienceDirect

Tourism Management

journal homepage: www.elsevier.com/locate/tourman

Dispersal of visitors within destinations: Descriptive measures and underlying drivers

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ARTICLE INFO

Article history:
Received 8 September 2010
Accepted 7 November 2011

Keywords:
Tourist dispersal
International visitor survey
Multidestination travel
Visitor dispersal measurement
Visitor dispersal propensity

ABSTRACT

Promoting greater dispersal of tourists and their spending is important to the regional economic development goals of both developed and developing economies. However, while the concept of dispersal is not complex, in practise existing approaches towards dispersal measurement are largely confined to dispersal description (such as dispersal ratios) without the consideration of causal structure. Using Australia as a context, the goal of this paper is to bridge the gap between descriptive and causal approaches to dispersal, using a publicly available, secondary source of data – the International Visitor Survey (IVS). In so doing, the paper empirically validates factors associated with tourist dispersal, and constructs individual dispersal propensities which are structurally linked with, and provide supplementary information to, dispersal ratios. This research shows that, suitably manipulated, existing surveys of international visitors can be a rich source of information about dispersal.

1. Introduction

Dispersal of visitors in a given destination is important for the regional economies that comprise it. Promoting greater dispersal of tourists and their spending is an important item in the Australian government's policy agenda. The government-commissioned Jackson Report (2009: 10) acknowledged that "tourism provides opportunities for regional and remote communities to grow jobs, diversify their economic base, and generate higher standards of living. Nearly half of total tourism expenditure (47 percent) occurs in the regions." Hence, it is not surprising that along with increased visitor arrivals and increased spend, greater regional dispersal is one of three strategic goals of Tourism Australia, the National Tourism Office. In fact, increased regional dispersal is embedded in Tourism Australia's Key Performance Indicators (Tourism Australia 2009).

In the tourism research literature, the concept of dispersal relates to the tendency of visitors to travel beyond the main gateways of the host destination. An earlier work on dispersal can be found in Cooper (1981). The study noted that a general spatial pattern of tourists involves a movement outward from a touring centre, and towards locations with declining tourism facilities. He adds that a "wave-like pulse of visits outward from a touring centre and down the hierarchy" (p. 369) is probably a general phenomenon that can be observed in a variety of places and locations. More recently, Becken, Wilson, Forer, and Simmons (2008) in their analysis of spatial yield proposed a framework to classify spatial itineraries of visitors. Of relevance is their classification of 'stationary' itinerary, which was defined as travellers staying only in gateways. In this context, dispersal represents 'non-stationary' travellers, and it encompasses an idea of a trip moving away from gateways to other destinations towards the lower end of the urban–rural destination hierarchy.

Visitor dispersal determines the locations of tourist spend, which affects the economic contribution of tourism in sub regions of a destination. The more visitors spend in different locations the wider is the economic contribution that tourism makes to regions outside the major tourism gateways. Since some of these regions may be experiencing lower levels of income and employment than the urban areas that are generally associated with tourism gateways, the dispersal of tourists and their spending can benefit the distribution of income in the wider economy. This is particularly the case where tourist attractions are located in the more remote areas of a destination as they often are.

While the concept of dispersal is not a complex one, its measurement presents difficulties. A number of dispersal measurement approaches have been proposed in the tourism

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0261-5177/$ – see front matter
doi:10.1016/j.tourman.2011.11.010

research literature, although they have not been explicitly called dispersal *per se*. Broadly, there are two distinct approaches: descriptive and causal.

An early example of descriptive measurement is the Trip Index of Pearce and Elliot (1983) that shows the number of nights spent in a given destination as a proportion of total number of nights in the trip. If destinations of interest are those outside the gateways, then the Trip Index can show the average tendency of a particular group of visitors to travel beyond gateway cities. A similar approach was proposed by Leiper (1989). Leiper's main destination ratio (MDR) measures the extent to which a destination (or a country) is a sole destination (or the main destination in the multi-destination trip cases) of total arrivals. Leiper (1989) suggests that the MDR will be a useful addition to the existing inventory of tools for researchers and managers, and also adds that the MDR should be viewed as a descriptive tool rather than a technique with explanatory capabilities.

Some researchers have attempted to incorporate a variety of trip variables correlated to dispersal in dispersal measurement, which paved some way into extending the measurement of dispersal from purely descriptive to a more causal analysis. Oppermann (1992) proposed a travel dispersal index (TDI) that improves on the Trip Index and MDR, namely by extending the focus from measuring the level of significance of a destination in relation to an entire trip, to a range of trip factors related to the dispersal behaviour of tourists. Oppermann included variables such as number of overnight destinations, number of nights, number of different types of accommodation, number of different types of transportation and travel organisation (package, individual) in the TDI. It was argued that these were general variables in accounting for the variation in the intra-national dispersal behaviour of visitors. Oppermann operationalised the TDI as below.

$$\mathrm{TDI} = \sum A_i B_i \quad (1)$$

where A is a weight for variable B (e.g. number of nights, number of overnight destinations, etc.). For the TDI defined by Oppermann (1992), there were five variables correlated to dispersal (i.e. $i = 5$ in Eq. (1)).

While the TDI was a new way of examining dispersal, it was also subject to some limitations. Allcock (1996) applied the TDI to an Australian context with International Visitor Survey (IVS) data for the year 1989–1994. The study concluded that the variables defined by Oppermann (1992) (the five variables outlined above) lacked the power to explain the variation in distribution of visitors within Australia, and some questions were raised as to the generalisability of the five variables in different contexts. Another limitation of the TDI approach, which was not mentioned by Allcock (1996), was the fact that the weight given to each of the five factors in constructing the TDI (i.e. A, the relative importance of each factor in determining the overall travel dispersal) was not based on empirical evidence; rather it was determined by Oppermann (1992) and Allcock (1996) on an *ad hoc* basis. These two limitations illustrate the need for more empirical research to estimate the relative importance of dispersal factors with a wider range of potential explanatory factors of dispersal.

Several studies have examined a range of factors relevant for dispersal, concerned to explain the variation in multi-destination travel patterns. Based on the theoretical framework of multi-destination travel developed by Lue, Crompton, and Fesenmaier (1993), Tideswell and Faulkner (1999) examined the relative importance of factors that proxy risk and uncertainty reduction, travel mobility, travel purpose, travel party characteristics, travel arrangement and destination familiarity. Using least-squares regression they found that these variables explained close to 65% of the variation in the number of stopovers made by international visitors in Queensland, Australia. Tideswell (2004) and Collins (2006) in subsequent analyses examined the importance of these factors in explaining the variation in different multi-destination travel itinerary patterns by international visitors in the context of Australia, using the International Visitor Survey data. The above factors were found to be significant in their ability to account for the variation in itinerary choice. Becken et al. (2008) created visitor profiles to discern differences in travel patterns of key inbound countries in New Zealand using a similar set of factors. They concluded that these differences have significant influences on the spatial itineraries and the resultant financial yield from tourism. Furthermore, preceding studies revealed significant differences in multi-destination travel behaviour across country of origin (including, Becken et al., 2008, Collins, 2006 and Tideswell, 2004), supporting results from earlier research such as Pizam and Sussman (1995), which found significant variation in tourist behaviours across nationalities. Although the studies examined multi-destination travel itineraries, as it will be shown in this paper, the factors examined are relevant for accounting for the variation in dispersal as well.

In the context of tourism in Australia, Tourism Australia defines dispersal of international visitors as a proportion of visitors or/and nights spent outside the four major gateways of Australia (Sydney, Melbourne, Brisbane and Perth) (Tourism Research Australia, 2009). This approach (we will call this 'dispersal ratio' hereafter) is a simple and effective tool for dispersal measurement at the national level, and it is also an approach akin to the Trip Index of Pearce and Elliot (1983) referred to above. To date, measuring dispersal at the national level has not progressed beyond the use of simple dispersal ratios, which neglect information about the various trip factors correlated to dispersal. This is a limitation because, while the ratio provides a snapshot of inbound countries (and market segments), it does not embody the capacity to explain dispersal.

Thus, research that demonstrates the level of linkage between dispersal and dispersal factors will be an important step towards obtaining more information from the International Visitor Survey (IVS). While the TDI has made some progress towards this, as discussed previously, the index is limited first, in that the selection of variables has been *ad hoc*, raising concerns as to the generalisability of the variables; and second, the weight given to each variable is pre-determined without theoretical or/and empirical justification.

Against this background, this paper aims to make progress towards bridging the gap between descriptive and causal approaches to dispersal, using a publicly available, secondary source of data – the IVS. The paper first outlines the descriptive approach currently used in practise. Following this, a causal structure between the dispersal ratio and dispersal factors is imposed. This is done by an application of probit and two-step sample selection model. Through the application of these models, the two limitations identified above are addressed. The paper also illustrates how the probit component of the two-step model can structurally link dispersal ratios with individual dispersal propensity, which is a measure of dispersal that supplements the existing dispersal ratio approaches. Implications for tourism policy are suggested where appropriate.

2. Descriptive approach to dispersal measurement: dispersal ratios

At the national level, the method used to measure regional dispersal of international visitors involves segmenting Australian tourism regions into two categories: major gateways and dispersed regions. There are 85 tourism regions identified for Australia

(Australian Bureau of Statistics, 2009b). Four tourism regions (Brisbane, Melbourne, Perth and Sydney) are included in the major gateways category (Tourism Research Australia, 2009), whereas all remaining tourism regions (the remaining 81 tourism regions) are included in the dispersed region category. Dispersal is measured as a proportion of total visitors, or proportion of total visitor nights in the 81 other tourism regions compared to total visitor nights in Australia.

The dispersal ratio approach is highlighted by the proportion of dispersed visitors or dispersed nights in Table 1.'Head-count' shows the proportion of visitors with at least one over-night stopover in regions beyond the four gateways. 'Night-count' shows the proportion of nights spent in regions other than the four gateways. Note that these ratio approaches are akin to the Trip Index of Pearce and Elliot (1983). We focus on the inbound origins defined by Tourism Australia as Tier 1 in 2007, which are the seven countries shown in Table 1. Before proceeding further, however, we describe the data used for illustration and analysis in this paper.

International Visitor Survey (2007) data were used. IVS is managed by Tourism Research Australia (TRA) and collects information on various aspects of trips and socio-demographic characteristics of survey respondents and respondents' travel companions. We confine our analysis to the dispersal of international visitors with trips up to ten stopovers (excludes transit). Of over 40,000 samples, trips up to ten stopovers amounted to 95% of the sample. Given that Australia is a geographically large country with multiple entry points for international visitors (some entry points are over 3000 km apart), it was necessary to further confine our analysis to a particular entry point. Thus, the samples analysed were limited to those trips with first stopover in Sydney, Australia's major tourism gateway. Furthermore, we were interested in leisure, or more specifically, holiday travels to Australia. When the sample of interest was narrowed down to trips which have made at least one stopover for holiday, we had 6476 valid sample trips to analyse (thus even if a trip to Australia was 'visiting friends and relatives' or 'business' in its main purpose, it could still be included in our sample if the trip has taken an intra-national stopover that has a holiday motive).

Dispersal ratio is a simple and effective measure of dispersal because comparisons can be made in cross-section (across a particular destination) and across time to evaluate market performance, and is simple to calculate. Dispersal ratios are useful for comparing markets and market segments, as well as to obtain a general picture of dispersal patterns. Potentially, there are numerous alternative dispersal measures. Distance is one of these measures. Distance, however, can be problematic for a number of reasons. First, dispersal is not always a monotonically increasing function of distance (greater distance travelled does not always mean greater dispersal – consider a trip from Sydney to Perth vs. Melbourne to Cairns – both trips involve similar distances but only the latter is considered a dispersed trip). Second, distance is not easily measured from IVS without georeferencing. Third, even in situations where georeferencing is provided, it is difficult to identify routes taken or time spent travelling on various transport modes. For these reasons, although it is an important factor moderating tourism demand (McKercher, Chan, & Lam, 2008), distance based dispersal measurement has not been pursued in this paper. Other descriptive measurement tools exist, such as the coefficient of variation and Gini indices. However, the dispersal ratio approaches described above are the most common in practise (if not the only measure actually used in the industry). As explained below, based entirely on the existing data, we can build upon the dispersal ratio to generate more information about dispersal behaviour of visitors.

Table 1
Dispersal of international visitors 2007 (compiled from International Visitor Survey data).

	Dispersal ratio (head-count)	Dispersal ratio (night-count)	Sample (trip)
Korea	0.27	0.09	475
Japan	0.41	0.15	841
China	0.65	0.06	369
GER	0.63	0.36	235
UK	0.59	0.26	266
US	0.63	0.28	784
NZ	0.31	0.21	565
Other	0.57	0.24	2941

3. Towards a causal approach to dispersal behaviour

Dispersal ratios in Table 1 – head-count and night-count – can be disaggregated into individual decision to 'disperse or not' and 'how much to disperse, given the decision to disperse', respectively. On these measures, individual trip characteristics information can be linked to provide greater details about the underlying processes and structure that may be of significant value in understanding dispersal behaviour. In other words, the 'aggregate' measures of dispersal ratios need to be examined at a 'disaggregated' level (ideally, at an individual trip level) for a causal analysis. A number of approaches are available to extend the descriptive measures to embody the capacity to explain dispersal. As indicated earlier, the TDI was one way to incorporate trip characteristics information in dispersal ratio. However, we noted that the weights used to operationalise the TDI were not empirically validated, and that a more comprehensive range of dispersal factors need to be considered. One way to implement a causal structure is to link the dispersal ratio (head-count) with factors influencing dispersal. Given the binary nature of the head-count ratio, the following binary response model may be appropriate:

$$p(y = 1|x) = g(x) \quad (2)$$

where the probability of a response (e.g. dispersal) occurring is dependent on x. The probit model is

$$g(z) = \Phi(z) \quad (3)$$

where $\Phi(z)$ is the standard normal cumulative distribution function (cdf), which is an integral of the standard normal density, $\phi(z)$,

$$\phi(z) = (2\pi)^{-1/2}\exp(-z^2/2) \quad (4)$$

Please see, for instance, Wooldridge (2006), for more information on the probit model. The g function guarantees that the probability ranges from 0 to 1. Now, recall Oppermann's Travel Dispersal Index introduced earlier (Eq. (1)),where A is a weight for variable B. Both Oppermann (1992) and Allcock (1996) attached a pre-determined weight, an integer such as 1, 1.5 or 2 to each variable. In this paper we estimate these weights. In the case of probit, if these weights are multiplied by the values in B, summed, then transformed by the function $g(z)$ (see Eqs. (2)–(4)), we obtain the dispersal propensity of each trip. The resultant dispersal propensities range between '0' and '1'.

Individual dispersal propensities (IDPs) highlight different information to other dispersal measurement approaches such as the previously discussed dispersal ratio approach, which is a descriptive dispersal measure. IDPs help us to appreciate the *likelihood* of an individual trip dispersing, as well as the variability of this likelihood across individual trips. This changes our perspective from a dispersal ratio, which gives us the average tendencies of dispersal of a segment or population of interest, to IDP, which illustrates the dispersal tendency of an individual within a segment. The difference is illustrated thus: if a dispersal ratio equals 0.4, then this means 40% of the sample disperses, whereas if an IDP is 0.4, then this means the probability of an individual dispersing (influenced by a set of trip factors) is 0.4. Thus, IDPs convey a different kind of information. Moreover, it reveals more information because it can highlight the distribution of individual dispersal propensities within a market segment, whereas the dispersal ratio (by head-count) is information on the first moment (e.g., the mean).

The probit model and the maximum likelihood estimation of it, result in properties that structurally link individual probabilities with market share. In the context of this paper, this means that IDPs and the dispersal ratio are more or less (but not exactly – see Cameron & Trivedi, 2005 for details) linked as the following:

$$\sum Y = \sum \text{IDP} \quad (5)$$

where Y takes the value of '1' for a dispersed trip, and '0' otherwise. In other words, when each decision-making unit's 'propensity to disperse' is summed, it equals the number of dispersed trips. We will revisit IDPs below. While the predominant focus of this paper is the use of probit since it introduces an additional measure of dispersal (the IDP) that supplements, and is structurally linked with, the dispersal ratio (head-count), we also recognise the non-discrete nature of dispersal measure (e.g., dispersal ratio by night-count). A natural extension is to link a 'continuous' dispersal measures with dispersal factors via a model that directly ascribes a causal relation such as:

$$Y = \beta X + \varepsilon \quad (6)$$

where 'Y' is a measure of dispersal (e.g. dispersal ratio by head-count, as well as night-count), 'X' the dispersal factors and 'ε' representing the error term. When doing this, however, we run into a problem of left-censored distribution of the 'Y'. A common method to overcome this problem is to decompose the ratios into two parts: (1) the decision with respect to 'disperse or not' (the head-count, denoted by Y_1), (2) the 'degree of dispersal' given the decision to 'disperse' (the night-count – denote this Y_2). Thus, Y has a discrete (Y_1 takes a value of '0' or '1') and a continuous component (Y_2 takes a positive value given $Y_2 > 0$). Given information of the Xs, a discrete choice model (such as probit) can be used to estimate the βs for the former, and an ordinary least-squares (OLS) type estimator can be used for the latter. In fact, a common approach for such a problem is the use of bivariate sample selection model, which is in many respect superior to alternatives such as Tobit or two-part (different from two-step) approaches when the two decisions – Y_1 and Y_2 – are considered non-independent and not strictly normal (Cameron & Trivedi, 2005).

In this paper we apply Heckman's two-step procedure (for further details please refer to Cameron & Trivedi, 2005). This involves the estimation of the 'participation model', for instance, using probit (Y_1), and then using these results toregress on Y_2 using OLS. This procedure is ideal for linking dispersal measures with the causal factors because it accounts for (1) the distributional characteristics of Y, and (2) the fact that the decisions to 'disperse or not' and 'how much to disperse' are not made in isolation from one another – both of which will induce misleading estimations if ignored. Before reporting results, the key factors associated with dispersal (the Xs) are discussed below.

4. Factors influencing the dispersal of tourists

Tourism research has shown that psychographic concepts can provide insights into understanding the variation in tourism behaviour. Plog's typology-allocentricism/psychocentricism, or venturesomeness (e.g., Plog, 2002), is a significant example of a psychographic concept. It has been found that greater level of allocentricism is related to spatially expansive behaviour (Debbage, 1991). Related concepts such as sensation and novelty seeking behaviour of tourists, and how individuals vary in their optimal level of stimulations, are relevant in explaining the differences in travel style and activities undertaken (Lepp & Gibson, 2008). Early studies have consistently shown the importance of novelty seeking behaviour as one of underlying causes of travel and destination choice (Lee & Crompton, 1992). These motivations, therefore, should be highly relevant in explaining dispersal. However, the psychographic data necessary to measure tourist motivations are not part of the standard IVS. Given the paper's focus on the use of IVS data, we had to achieve a balance between data availability and the comprehensiveness of factors considered. To achieve this balance, we studied the multi-destination travel research literature to look for ways to utilise IVS data to its full extent.

The review of multi-destination trip factors is a useful starting point for building cause-effect structures of regional dispersal. This is because multi-destination trip propensity is positively related to dispersal, implying that the forces increasing the incidences of multi-destination travel may also be important factors for understanding dispersal of inbound visitors. In fact, previous research on dispersal has recognised the strong connection between dispersal and multidestination travel. For instance, Wu and Carson (2008: p. 311) stated, "dispersal can occur when many visitors travel to a different part of the destination on unique trips, or when a single visitor travels to many parts of the destination within the same trip". Statistics compiled from Australia's International Visitor Survey (2007) show that the dispersal ratio increases with the number of stopovers; for instance, 24% of trips with only one stopover (single-destination trips) are outside Australia's gateways, while 63% of trips with two overnight stopovers are outside the gateways for at least one of the two overnight stopovers, and 76% of trips with three stopovers are outside the gateways for at least one of the three overnight stopovers, and so on. Up to 99% of trips with six stopovers or more include at least an overnight stopover in destinations beyond Australia's major international gateways. It should be noted that stopover numbers may not equal the number of overnight destinations because some destinations may be visited more than once in the itinerary.

The research literature reveals that several characteristics of a multi-destination trip are associated with dispersal behaviour. Following Tideswell (2004) we address some of these below.

4.1. Variety-seeking behaviour

Lue et al. (1993) argued that a tourist might seek a variety of activities from a single place (such as a gateway) or obtain multiple benefits from multiple places. Seeking greater variety of activities will generally increase the need to explore a variety of destinations, including the peripheral and regional destinations.

4.2. Length of stay

Length of stay and dispersal are related. A positive relationship may be expected given that leisure trips are time-constrained, rendering tourists' activity patterns highly time-sensitive (Landau, Prashker, & Hirsh, 1981 as cited by Debbage, 1991). Fennell (1996), in his account of tourists' behaviour over space and time, added that "when time is short, space is conserved" (p. 814). Alternatively, Mansfeld (1990) noted how the effect of length of stay on spatial behaviour may not always be the same, because a time constraint may induce a tourist to wish to see as much as possible in the limited time available. However, for a geographically large country requiring substantial transport cost for inter-regional journeys, limited length of stay is likely to be a significant constraint on dispersal than to be an incentive.

4.3. Packaged and guided tour

Package traveller behaviour can be spatially confined because of the predetermined routes and places of visits; or it can stimulate touring into regions that otherwise will not be exposed to tourists (Tideswell & Faulkner, 1999). In a more recent study, trips with guided holiday tour were negatively related to several multi-destination travel itineraries (Tideswell, 2004). In the context of dispersal, we expect that packaged and guided tours will have positive effects on dispersal, but the positive effects may be limited to destinations with well-established tour-operator preferred sectors, which are often the large regional centres.

4.4. Transport

Visitors not restricted in travel mobility are “more spatially adventurous” (Debbage, 1991: p. 368). Travel modes are important determinants of dispersal because the different modes are related to the different levels of ‘mobility’. Limtanakool, Dijst, and Schwanen (2006) argued that the choice of private car in long-distance journey partly arises from the fact that car offers the flexibility to visit the attractions that have poor accessibility, e.g. residential neighbourhoods and out-of-town recreational areas. The use of private or rental vehicle has been found to be a positive factor associated with dispersal in the multidestination trip context (Collins, 2006; Tideswell, 2004; Tideswell & Faulkner, 1999) and by Prideaux and Carson (2003) in the context of tourism in regional areas.

Other modes such as air and long-distance coach and train services are also likely to be important for regional dispersal of international visitors. This is because (1) Australia is geographically large, and (2) that the traditional concept of distance decay is not directly applicable. As McKercher and Lew (2004) noted, the distribution of tourism attractions and opportunities are distributed unevenly with peaks, plateaus and troughs as distance increases from an origin. For the peaks located far from an origin, air travel will be a key factor associated with dispersal.

4.5. Destination familiarity

With reference to Gitelson and Crompton’s (1984) study of the differences in first time and repeat visitors, Oppermann (1997) has noted that first timers are younger, have greater motivations and purpose for variety and new experiences, and they are relatively distant from travel motivations such as visiting friends or relatives (VFR) or ‘seeking relaxations’.

Oppermann (1997) provides some evidence that first time visitors contribute more to dispersal than repeat visitors. Based on the analysis of international tourists in New Zealand (NZ), Oppermann found that first time visitors were more active and explorative, indicated by the fact that they visited more sites during their stay than repeaters. For instance, first time visitors to NZ listed an average of 6.4 activities or attractions compared with 3.6 destinations by repeat visitors. The results also implied that first time visitors, while representing a greater share in the primary destinations, also visited an average of 5.9 destinations compared to 3.6 by repeat visitors. The results have shown that first time visitors had greater relative share in 95 of the 110 destinations surveyed in NZ, which suggests that first time visitors are also important contributors to dispersal.

Recently, Li, Cheng, Kim, and Petrick (2008: p. 278) provided an overview of the research on first timers and repeat visitors, concluding that “first time visitors may be driven by novelty more than by familiarity”. They noted that relaxation and familiarity are the most important reasons for repeat visitors, while gaining new experiences is the primary motivation for first time visitors. They found that first time visitors were more travel and tourism oriented in comparison to repeat visitors who were more interested in the pursuit of specific activities. Although these authors did not allude to dispersal directly; they noted that first time visitors were more extensive in their destination exploration, while repeat visitors were more intensive in their use of time across smaller range of destinations.

In summary, while first-time visitors will exhibit high dispersal propensity because of their new experiences driven nature, repeat-visitors (or those with greater destination familiarity), with their specific activity focus, can be an important source of dispersal as well.

4.6. Visiting friends and relatives

Various studies support the view that VFR, as a travel purpose, increases the likelihood of a multi-destination trip because stop-over at homes of friends and relatives is a popular form of accommodation (e.g. Lue et al., 1993). In Australia, regional areas, which are areas beyond capital cities, hold a third (or more than eight million people) of the Australian population (Australian Bureau of Statistics, 2009a). Destinations may be more attractive if inbound visitors have friends and relatives in those regions. Having said this, if VFR is a main, or the only, purpose of travel (rather than one of a variety of travel motivations), a trip may exhibit tendencies to stay in one location.

4.7. Group travel

Heterogeneity in preferences of a travel party may increase as the number of people in a travel group increases, which increases the multi-destination travel propensity (Tideswell & Faulkner, 1999). The extent of the heterogeneity also depends on the nature of the travel group; for instance, travelling with ‘family and relatives with children’ may differ from ‘adult couple without children’ because travelling with children might be a constraint (e.g. Becken et al., 2008). Travel party heterogeneity can be a positive or negative influence on multi-destination and dispersal propensity. The former is possible if the preference heterogeneity requires the party to diffuse in search of greater variety of activities, while the latter is likely if the party, for reasons such as logistics and organisational limitations, is constrained by the large travel party size. By the same token, visitors may concentrate in centres where large variety of activities can be found to satisfy the variety of preferences of the travelling group. We expect travel party composition to be related to dispersal, but no clear hypotheses are suggested on the signs of the relationships.

4.8. Country of origin

Theoretically, country of origin is a significant factor influencing tourism behaviour and the spatial manifestation of it. For instance, Pizam and Sussman (1995) noted that “National cultures have a moderating or intervening impact on tourist behaviour, and if properly controlled and/or used with other variables, would add significantly to one’s understanding of tourist behaviour” (p. 905). In particular, country of origin is likely to interact with Hofstede’s cultural dimensions such as ‘uncertainty avoidance’, which varies widely across the key inbound countries examined in this paper (see geert-hofstede.com). Country of origin can also directly affect factors such as international travel costs and relative prices, which influences the travel behaviour of visitors. We use 'country of residence' as a measure of country of origin.

4.9. Geographic patterns of regional destinations and attractions

As expected, spatial distribution patterns of destinations will result in similar patterns of tourist distribution. For instance, a 'node' will draw a concentration of activities, whereas a linear pattern of attractions will yield linear movement of tourists (Weaver, 2006). Tideswell and Faulkner (1999) summarised the influence of spatial configuration on multi-destination travel. The proposition was that "the existence of a range of complementary tourist attractions/destinations within "reasonable proximity" of a region increases the number of stopovers made by tourists" (p. 369). Hwang and Fesenmaier (2003), in their study of domestic trips in the U.S., found that the spatial patterns of travel differed widely between and within the Midwest states, concluding that geographic characteristics influence the spatial behaviour of tourists. Furthermore, geographic characteristics also interact with other dispersal factors discussed previously, such as type of travel modes and length of stay, as highlighted by the results from a stated choice experiment of air leisure arrivals in Cairns (Koo, Wu, & Dwyer, 2010a). Generally, the presence of a variety of activities at a destination causes a spatially concentrated pattern of travel; for example, trips concentrate towards urban areas and gateways for this reason. On the other hand, scattered attractions and destinations cause a spatially expansive behaviour.

While an important factor, the spatial configuration of regional destinations could not be examined in this study. As an extension of the current research, detailed information on 'tourism supply' information and destination characteristics should be collected to account for the spatial configuration factor in analysing dispersal. All other variables mentioned previously are examined in this paper.

5. Analysis of the dispersal factors

5.1. Method

As discussed in Section 2, we use the International Visitor Survey (of the year 2007) data to estimate the two-step sample selection model. In the probit model (the selection model), the dependent variable was a binary variable specified '0' if all overnight stopovers of a trip were in the four gateways (Sydney, Melbourne, Brisbane and Perth). Recall that this was the National Tourism Office definition of dispersal for inbound visitors. A trip was assigned the value '1' if a trip involved at least one stopover in any other regions beyond the four gateways. Of the sample, 52% dispersed while 48% did not. OLS estimator was used for the outcome model, where the dependent variable was logarithmic transformation of the dispersed nights.

Earlier we have discussed the potential factors of dispersal. Not all factors discussed could be examined in our analysis. The factors examined are summarised below.

- Transport modes used to travel from one stopover location to another;
- Variety-seeking behaviour: the number of different travel activities engaged during the trip in Australia;
- Travel constraints: whether or not a trip involved a form of package trip, whether or not a trip in Australia involved a guided holiday tour, and the number of nights stayed in Australia;
- Visiting friends and relatives: whether or not visiting friends and relatives travel purpose was part of the trip in Australia;
- Travel group composition: whether the trip was undertaken in solo, couple, family, friends and relatives, or business associates.
- Destination familiarity: whether or not the traveller has travelled Australia before, and the number of different sources used to gather information about their trips;
- Age-group: the age of the survey respondent (coded in 12 intervals between 18 years and '65 or over')

A substantial number of variables were specified as dummy variables due to the nature of survey data. The coding of these variables is shown in Table 2.

5.2. Results

Two model performance indicators of probit (Table 3) suggest that the model performs well with McFadden's R-squared value of 0.43, which is not equivalent to the Ordinary Least Squares regression's R-squared (see, for example, Cameron & Tripedi, 2005) and prediction success rate of over 80%. In other words, the factors outlined above can describe whether a trip 'disperses or not' with good accuracy (with 80% accuracy). On the other hand, as indicated by the low R-squared, the outcome model (Y_2) does not seem to explain the 'degree of dispersal' (given dispersal) well.

The 'Beta coefficients' columns in Table 4 show the coefficients obtained for variables, x. A useful interpretation is given by the marginal probabilities. Marginal probabilities for the probit are obtained from transforming the Beta coefficients using the standard normal CDF in Eqs. (3) and (4). The 'P-value' column shows the level of statistical significance. In the OLS estimates, an additional term, 'lambda' is estimated. This is an estimate of the coefficient on the error covariance of Y_1 and Y_2. The fact that the coefficient is significantly different from zero indicates that the two decisions are not independent of one another. The marginal probabilities shown

Table 2
Coding of variables.

Variables	Variable type	Coding
Variety-seeking behaviour		
Number of activities	Continuous	1–32
Group tour and package tourism		
Package	Binary	0 or 1
Guided	Binary	0 or 1
Length of stay		
Log(length of stay)	Continuous	log(1–364)
Destination familiarity		
First time visit	Binary	0 or 1
Total number of information sources	Continuous	1–8
Transport		
Private or rental vehicles	Binary	0 or 1
Air travel	Binary	0 or 1
Long distance train/coach	Binary	0 or 1
Visiting friends and relatives		
VFR was a main purpose for travel	Binary	0 or 1
Preference heterogeneity		
Couples	Binary	0 or 1
Family	Binary	0 or 1
Friends and relatives	Binary	0 or 1
Business associates	Binary	0 or 1
Age group		
Age-group categories	Continuous	Age group category (1–12)

Table 3
Model performance.

Probit (*Y* is '0' or '1')	
Sample size	6476
McFadden R^2	0.43
Log likelihood	−2533.2192
Restricted log likelihood	−4483.0229
Dispersal trips correctly predicted	83%
Non-dispersal trips correctly predicted	82%
Dispersal: non-dispersal ratio	0.52:0.48
OLS with probit results ($Y > 0$)	
Sample size	3375
R^2	0.25

in Table 4 are *averages of the partial effects*, and that based on *discrete change* (see Long & Freese, 2001), which was appropriate for binary independent variables. With this in mind, the results show the following:

- A traveller who used private or rental vehicles to travel from a stopover to another is associated with an increase in the dispersal probability (DP) of 0.21. Likewise, air travel is associated with an increase in DP of 1.54 and long distance train/coach, 1.30. However, air travel has a negative (and statistically significant) effect on Y_2.
- For continuous variables such as number of activities, the marginal probability of '0.01' shows that a participation in an additional activity during a trip is associated with 0.01 increase in DP. Thus, if an individual or travel party participates in five additional activities, then the associated DP increases by 0.05.
- If VFR was a main purpose of travel, then DP increases by 0.10. VFR's effect on Y_2 is negative and statistically significant.
- If the trip was packaged then DP increased by 0.08, if the trip involved a guided tour then DP increased by 0.09. However, their effects on Y_2 are statistically significant and negative.
- DP increased by 0.06 if log-transformed length of stay increased by 1.
- Compared to a solo traveller (the base), travelling in couples, with family, friends and relatives, and business associates, increased DP by 0.08, 0.05, 0.04 and 0.06, respectively.
- First-time visitors in Australia were more likely to disperse, having a marginal DP of 0.04.
- Although statistically significant, number of information sources used to gain knowledge about Australia and Australian destinations had no (very little) effect on DP, nor did the age of the survey respondent.

Table 4
Model results (Y_1 and Y_2).

Sample size (6476)	Probit sample selection model (Y_1)			Log(dispersed nights) OLS Outcome model (Y_2)	
	Beta coefficients	Marginal Probability	*P*-value	Beta coefficients	*P*-value
Transport					
Private or rental vehicles	0.93	0.21	0.00	−0.07	0.21
Air travel	1.54	0.43	0.00	−0.34	0.00
Long distance train/ coach	1.3	0.29	0.00	0.14	0.03
Variety-seeking behaviour					
Number of activities	0.04	0.01	0.00	0.02	0.00
Visiting friends and relatives					
VFR was a main purpose for travel	0.45	0.1	0.00	−0.31	0.00
Group tour and package tourism					
Package	0.37	0.08	0.00	−0.12	0.02
Guided	0.39	0.09	0.00	−0.71	0.00
Length of stay					
Log(length of stay)	0.26	0.06	0.00	n/a	n/a
Travel group composition					
Couples	0.36	0.08	0.00	−0.12	−2.56
Family	0.23	0.05	0.00	−0.25	−4.00
Friends and relatives	0.2	0.04	0.00	−0.06	−1.07
Business associates	0.29	0.06	0.03	−0.66	−4.90
Destination familiarity					
First time visit	0.16	0.04	0.00	0.01	0.79
No. information sources	0	0	0.87	0.02	0.17
Age group					
Age-group categories (1–12)	−0.06	−0.01	62.00	−0.06	0.02
Age-group squared	0.01	0	0.00	0.00	0.07
Constant	−2.63		0.00	2.68	0.00
Lambda	n/a	n/a	n/a	−0.95	0.00

As indicated earlier (in Table 3), probit results have good predictive power, whereas the OLS results perform rather poorly. Thus, we focus our discussion on the implications of the probit results herein.

6. Discussion

6.1. Transport

Clearly, dispersal requires good air transport access. While self-drive (or equivalent) mode is an important mode for travel mobility, its relationship with dispersal was not as large as other modes examined such as air transport and long-distance train and coach. This reflects the fact that Australia is a large country with uneven tourism development and tourism appeal across regions. Regional destinations of international visitors' main focus (for example, Cairns or other Great Barrier Reef regions are located relatively far from key gateways in relation to Sydney) so ground modes are less suitable for dispersal. Results in Table 4 indicate the significance of domestic air transport network for international visitors (the use of air transport from one stopover to another is associated with an increase in DP by 0.43). Further, the analysis suggests that dispersal in Australia is related to the use of a variety of travel modes (private car increases DP by 0.21 while long-distance train/coach by 0.29), not only a particular mode of travel. Importantly, while air transport has strong positive association with the dispersal beyond gateways, the extent of this dispersal (Y_2) – measured in nights in dispersed regions – is negatively affected by air transport. Thus, while air transport is an important channel through which dispersal occurs, its contribution to the extent of dispersal is rather limited.

Additional comments are needed on the relationship between travel mode combinations and dispersal. To be precise, a given marginal probability calculated from probit depends on the values of all *X* variables. During our analysis, we found that the associated probability between Train-Coach (excludes intra-city journeys) variable and dispersal depended significantly on whether or not the trip made use of air transport. Scenario analysis suggested that when we varied from a scenario where air transport was not used by anyone (Air transport variable = 0) to where everyone used air transport (Air transport variable = 1), the DP of Train-Coach decreased from 0.39 to 0.23. However, the probability associated with Private and Rental Vehicle remained unchanged when the same scenarios where applied, suggesting that air transport and other long-distance forms of public transport (coach and trains) were significant substitutes, whereas private/rental cars were complements from the viewpoint of dispersal.

6.2. Number of different activities and visiting friends and relatives

International visitors who engaged in greater number of activities in Australia are strongly associated with dispersal, supporting the hypothesis of a positive relationship between dispersal and variety seeking behaviour (e.g. twenty activities during the trip in Australia are associated with an increase of $0.01 \times 20 = 0.2$ DP). VFR is also strongly associated with dispersal, associated with a DP of 0.1. Thus, similar to the case of multidestination travel propensity, DP also increases when travellers mix travel purpose with VFR.

6.3. Tours and guided behaviour

Package tourism is defined as a trip that includes any packaged products or services such as airfares and accommodation. 'Guided tour' variable indicates whether or not a travel party participated in a guided-holiday-group-tour during its travel. It was found that both variables are positively related to dispersal. If the trip was packaged then DP increased by 0.08, and if the trip involved a guided tour then DP increased by 0.09.

The analysis shows that such tourism can be an important way in which dispersal of international tourists are organised. While guided holiday travel was found negatively related to certain multidestination trip itineraries (Tideswell, 2004), guided holiday tour is also a means by which dispersal is achieved for some visitors.

6.4. Length of stay

As expected, length of stay is closely associated with dispersal. The logarithm of length of stay was used because it provided a better fit. DP increased by 0.06 if log-transformed length of stay increased by 1.The result on length of stay indicates that the relationship between dispersal and length of stay is non-linear; the level of association between length of stay and dispersal is greater for short trip durations than long duration.

6.5. Travel party composition

Although the number of travellers in a travel group was found to be of little significance in multidestination travel (e.g., Tideswell & Faulkner, 1999), the type of travelling group is a statistically significant factor for dispersal. Compared to a solo traveller (the base), travelling in 'couples', 'with family', 'friends and relatives', and 'business associates', increased DP by '0.08', '0.05', '0.04' and '0.06', respectively. Based on evidence presented here, it appears that larger travel groups are associated with greater dispersal compared to solo travellers, suggesting that dispersal is related to heterogeneity of preferences. With the current analysis, it was not possible to determine the extent of large-travel group-imposed constraints on dispersal.

6.6. Destination familiarity

The 'level of information sources used' variables were found to be statistically insignificant. Although there was a statistically significant positive relationship between those who visited Australia for the first time and dispersal, the magnitude of the effect was small (0.04 in probability). In theory, destination familiarity should have a tendency to be more special interest oriented, and a tendency to spend time within a narrower range of activities (Li et al., 2008). As indicated earlier, whether or not the focus on special interest means greater dispersal depends on the type of special interest itself. It is not possible within the current analysis to draw conclusion on the effect of destination familiarity. This will require more careful study of the varying destination attributes of regional destinations. As discussed later, this is a limitation of the current study.

6.7. Age group

Including an age variable and the quadratic function of age improved the fit of the model. The likelihood ratio test revealed that these variables were jointly significant statistically (LR stats = 22.76 (P-value = 0.000)). However, the magnitudes of the effects of age variables were negligible, compared to other variables considered in the model.

6.8. Country of origin

To obtain greater insight about the variability in dispersal propensity within and across origins, we applied the probit model for the Tier-1 inbound countries. Results (Table 5) mostly conform to the 'all sample' model shown in Table 4, although there are some variations.

We focus on transport, guided tour and package tourism variables on the assumption that they are perhaps more readily influenced by Australian tourism industry and policy makers than factors such as time constraints and travel purpose. Strong relationships exist between transport modes and dispersal across the origins examined. Interestingly, while air transport was the primary mode associated with dispersal in all markets, there were variations in how each travel mode was related to dispersal. To illustrate, when we examined the ratio of the marginal probabilities of 'air transport' over 'private and rental vehicles' (e.g., for the US the ratio is 0.45/0.20 = 2.3), we obtain 2.3 (US), 1.9 (UK), 1.4 (NZ), 1.1 (Germany), 2.8 (Korea), 6.7 (Japan) and 7.1 (China), showing that Japanese and Chinese dispersals, compared to other countries, are much more strongly associated with air transport relative to other travel modes. Not to be neglected are the significance of long-distance train and coach services for dispersal, although these are generally less important in Australia. These modes, compared to private and rental vehicles (e.g., for the US the ratio is 0.28/0.20 = 1.4), are also relatively more important for visitors from Korea (3.4), Japan (2.5) and China (5.8) than Germany (1.8), UK (1.2), US (1.4) and NZ (1.1). Since trade-offs exist between the financial contribution of greater dispersal and the environmental costs of dispersal, where the latter is measured by carbon dioxide emissions of transport modes (Becken & Simmons, 2008), information of the kind presented above could be relevant in the context of inter-regional transport policy appraisal.

With the exception of Korea and UK, package tourism is a statistically significant factor for the dispersal of tourists in Australia. Guided holiday tour variable was also found positive (and statistically significant) for Germany, Japan, China and the US. However, the current analysis is insufficient to indicate whether or not the type of dispersal associated with these forms of tourism necessarily increases the distribution of dispersal to wider range of destinations. Package tourism and guided holiday tours can be important for dispersal and this research suggests that such tourism is one channel the tourism industry can use to influence dispersal beyond the gateways.

7. Dispersal propensity

The results highlight the factors related to the variation in individual dispersal propensity (IDP). These can be grouped: transport

Table 5
Results by key origins.

	Korea (sample size = 475)	Japan (841)	China (369)	Germany (235)	UK (266)	US (784)	NZ (565)
Transport							
Private or rental vehicles	0.12***	0.11***	0.03**	0.16***	0.19***	0.20***	0.28***
Air travel	0.33***	0.73***	0.25***	0.17***	0.34***	0.45***	0.39***
Long distance train/coach	0.40***	0.27***	0.20***	0.29***	0.23**	0.28***	0.31***
Variety-seeking behaviour							
Number of activities	0.00	0.00	0.01**	0.00	0.03	0.04	0.04
Visiting friends and relatives							
VFR was a main purpose for travel	0.17*	0.04	0.13**	0.18***	0.10*	0.01	0.14***
Group tour and package tourism							
Package	0.06	0.06**	0.14**	0.14***	−0.01	0.13***	0.10**
Guided	0.00	0.11***	0.11*	0.21**	##	0.11*	−0.07
Length of stay							
Log(length of stay)	0.05***	0.00	0.13***	0.07***	0.11***	0.07***	0.04**
Travel group composition							
Couples	0.04	0.01	0.14***	0.02	0.03	0.04	0.04
Family	−0.06*	−0.02	0.21***	0.05	0.10	0.02	−0.04
Friends and relatives	−0.02	−0.03	0.13**	−0.04	−0.12	0.05	−0.02
Business associates	0.05	0.01	0.18***	#***	##	0.20**	##
Destination familiarity							
First time visit	−0.01	0.04**	0.00	0.09**	0.04	0.03	−0.02
No. information sources	−0.01	−0.02	−0.13*	−0.06	−0.18**	−0.03	−0.01
Age group							
Age-group categories (1–12)	0.02	−0.02	0.01	0.05*	0.00	0.03*	0.02
Age-group squared	0.00	0.00*	0.00	0.00	0.00	0.00	0.00

modes, package and guided tours, variety seeking behaviour, visiting friends and relatives (travel purpose), and to lesser extents, group travel and destination familiarity. From the estimated marginal probabilities shown in Table 5, the dispersal probability of each trip can be calculated. In other words, as discussed in Section 3, each trip (6476 in the sample) can be ascribed a value that shows the propensity of the trip to disperse.

The results in Figure 1 confirm the significant variability in the dispersal propensities across individuals, as well as within and across country of origin. The variability can be seen by the vertical length of 25th, 50th and 75th percentile box for the top seven inbound origin (Tier-1) in 2007. For instance, the boxplot shows that German visitors have a high sample dispersal ratio (for the purpose of this paper, dispersal propensity above 0.5 is considered to 'disperse') but also has a high level of variability in dispersal propensity across individuals. In contrast, visitors from New Zealand have low sample dispersal ratio, but with lower variability. Visitors from New Zealand in particular, have low dispersal

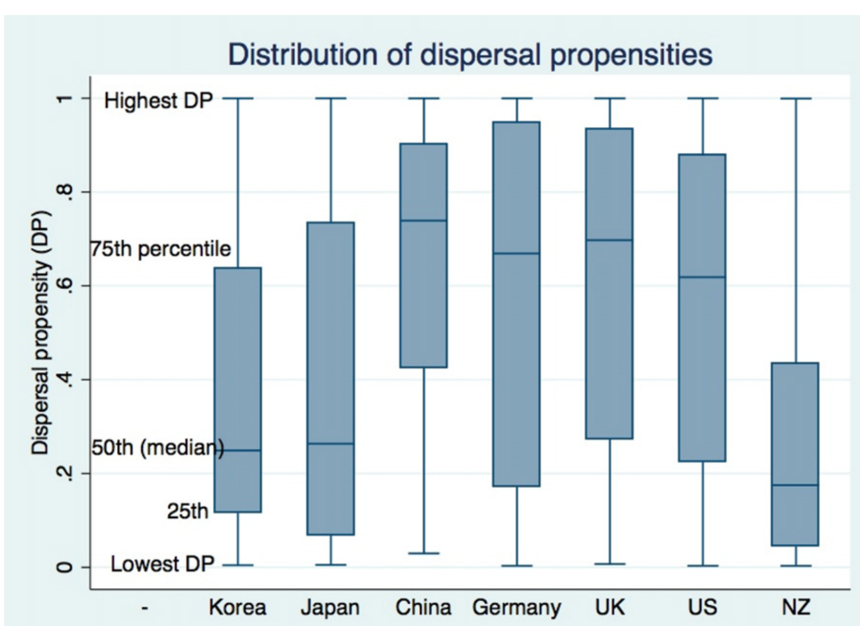

Fig. 1. Distribution of dispersal propensities of Tier-1 inbound origins.

propensity (50% (75%) of NZ visitors have dispersal propensity lower than 0.18 (0.42)), suggesting that it will be difficult to entice the majority of these visitors to disperse beyond Sydney upon arrival. In fact, this is not surprising given the fact that New Zealand–Australia, being a short-haul travel origin-destination, maintains very high connectivity and direct services to Australian regions and cities; thus, it is expected that for those arriving in Sydney, Sydney is the main (and often the only) region of stay.

A point highlighted by the analysis of IDPs is that low dispersal ratio does not necessarily mean that dispersal potential is low. If the spread of dispersal propensity is distributed tightly around a high (low) mean then this is an indication that, all else constant, it is easier (more difficult) to generate dispersal. Thus, NZ, Korea and Japanese inbound visitors pivoting their trips in Sydney are less dispersal prone than visitors from Germany, UK, US, and interestingly, China. Chinese inbound entering through Sydney as a first overnight stopover point has high dispersal propensity, partly due to the fact that Gold Coast – a popular destination among Chinese visitors – could only be accessed via a gateway such as Sydney (in 2007). Dispersal propensity can be interpreted as a tool that conveys some information about the extent to which dispersal of visitors can be enticed by policy and marketing. In this respect, results show that there might be unrealised dispersal potential among Koreans and Japanese (as indicated by the fairly 'wide' distribution of IDPs), compared to NZ visitors, whose IDPs are distributed tightly around a low median.

8. Conclusions

Dispersion of visitors in a given nation is important for the economies of the regional tourism destinations that comprise it. As a result, promoting greater dispersal of tourists and their spending is an important item on Australian government's policy agenda. While the concept of dispersal is not a complex one, its measurement presents difficulties. The dispersal ratio approach to dispersal measurement is a simple and effective way to compare dispersal within markets and segments, as well as dispersal over time. The ratio can be easily obtained from International Visitor Survey (IVS) data, which is the most comprehensive source of tourism data at a national level in Australia, and consequently, it has been a popular measurement approach.

This research has shown that, suitably manipulated, much more information can be obtained from sources of inbound tourism data with respect to dispersal, adding to the typical ratio approach. Specifically, we have extended the usage of IVS from descriptive towards causal analysis, building on the Travel Dispersal Index developed by Oppermann (1992) and the multidestination travel research literature. The contribution of this research can be viewed as follows. First, this paper has provided a structural extension to the descriptive approach (dispersal ratio) towards that of a causal approach, contributing towards the development of a framework to explain tourist dispersal – in both discrete and continuous measurements. In particular, dispersal when specified as a binary variable, can be described reasonably well with a set of selected factors. With the absence of psychographic data, the IVS based proxies for these factors serve as useful alternatives for analysing and understanding the dispersal behaviour of visitors. Second, applying a probit model, this research has estimated individual dispersal propensities to show that different level of dispersal potential exists among individual trips, and that there is significant variability in dispersal propensity across individual trips. It was also shown that the model produces outcomes that could be used for scenario analysis in certain contexts. In so doing, this paper has contributed towards empirically validating the relationships between dispersal and the key factors associated with it. Given the wide availability of IVS, the approaches presented in this paper should be of relevance to both the private and public tourism sector interested in adding to the current inventory of tools used to monitor and analyse dispersal of inbound visitors. This research should be of relevance to tourism offices and destination managers in geographically large destinations and countries interested in developing dispersal metrics and promoting tourist dispersal. Depending on data availability the approach taken here can be used to determine the extent of tourism dispersal in other destinations as input to policy formulation to enhance tourism's regional economic impacts.

This research can be extended in a number of ways. First, the measures and models can be examined across time to estimate time-varying parameters and tourists' travel taste changes along time. Second, ways to jointly incorporate temporal as well as spatial dimensions should be explored. Third, the dispersal factors should be examined in a specific origin-destination setting to account for the variation in geographic contexts. Fourth, ways to specify a stronger causal connection between dispersal and dispersal factors are needed. The current approach was not strictly causal because some of the relationships estimated in this paper, such as between transport and dispersal, show correlative evidence rather than causality. Application of stated choice experiments, for instance, as that undertaken in the context of transport and dispersal by Koo, Wu, and Dwyer (2010b) or Kelly, Haider, and Williams (2007), is an alternative analytical approach that will partially overcome this problem, albeit with the need to collect primary data in specific contexts. Finally (and related to the previous point), tourism supply characteristics (such as destination characteristics and transport availability and infrastructure) should be incorporated in the model to improve the explanatory power of the models. This is a key limitation of the current analysis and echoes Tideswell and Faulkner (1999: p. 373), who in the context of explaining multidestination travel behaviour, stated that "a particular country or state that an overseas tourist chooses to visit during his or her itinerary is ultimately determined by the nature/quantum of the tourism product on offer at each destination, and the degree to which it matches the combination of experiences the tourist is seeking." One of the aims of this paper was to explore ways to measure and explain dispersal based on existing data sources. Thus, the factors that could be empirically examined were subject to this data constraint. Ways of supplementing the existing data sources with tourism supply information should be explored.

Acknowledgements

The project is funded by the Sustainable Tourism Cooperative Research Centre (STCRC) established by the Australian Commonwealth Government.

References

Allcock, A. 1996. Sydney and the bush: an examination of regional activity among inbound tourists using a Trip Index. BTR Conference Paper 96.5 Bureau of Tourism Research.

Australian Bureau of Statistics. (2009a). Regional population growth Australia 2007–2008. http://www.abs.gov.au/ausstats Last viewed 1 February 2010.

Australian Bureau of Statistics. (2009b). Tourism regions maps and correspondence file. http://www.abs.gov.au/ausstats/abs@.nsf/mf/9503.0.55.001 Last viewed 7 September 2010.

Becken, S., & Simmons, D. (2008). Using the concept of yield to assess the sustainability of different tourist types. *Ecological Economics, 67*(3), 420–429.

Becken, S., Wilson, J., Forer, P., Simmons, D. G. 2008. Tourist itineraries and yield: technical background report. Land Environment and People Research Report No. 3, Lincoln University.

Cameron, A., & Trivedi, P. (2005). *Microeconometrics: Methods and applications*. Cambridge.

Collins, D. 2006. Multi-destination itineraries: popular travel itineraries of international visitors 2004. Occasional Paper Number 36, Tourism Research Australia, Canberra.

Cooper, C. P. (1981). Spatial and temporal patterns of tourist behaviour. *Regional Studies, 155*, 359–371.

Debbage, K. (1991). Spatial behavior in a Bahamian resort. *Annals of Tourism Research, 18*, 251–268.

Fennell, D. A. (1996). A tourist space-time budget in the Shetland islands. *Annals of Tourism Research, 234*, 811–829.

Gitelson, R., & Crompton, J. (1984). Insights into the Repeat Vacation Phenomena. *Annals of Tourism Research, 11*, 199–218.

Hofstede, G. Cultural dimensions. Available. http://www.geerthofstede.com/hofstede_dimensions.php Accessed 01.04.11.

Hwang, Y., & Fesenmaier, D. R. (2003). Multidestination pleasure travel patterns: empirical evidence from the American Travel Survey. *Journal of Travel Research, 422*, 166.

Kelly, J., Haider, W., Williams, P. W., & Journal of Travel Research. (2007). *A behavioural assessment of tourism transportation options for reducing energy consumption and greenhouse gases, 453*, 297–309.

Koo, T., Wu, R., & Dwyer, L. M. (2010a). Ground travel mode choices of air arrivals at regional destinations: the significance of tourism attributes and destination contexts. *Research in Transport Economics, 24*, 44–53.

Koo, T., Wu, R., & Dwyer, L. M. (2010b). Transport and regional dispersal of tourists: is modal substitution a source of conflict between low-fare air services and regional dispersal? *Journal of Travel Research, 49*(1), 106–120.

Landau, U., Prashker, J. N., & Hirsh, M. (1981). The Effect of Temporal Constraints on Household Travel Behavior. *Environment and Planning, A13*, 435–449.

Lee, T. H., & Crompton, J. (1992). Measuring novelty seeking in tourism. *Annals of Tourism Research, 19*, 732–751.

Leiper, N. (1989). Main destination ratios analyses of tourist flows. *Annals of Tourism Research, 16*, 530–541.

Lepp, A., & Gibson, H. (2008). Sensation seeking and tourism: tourist role, perception of risk and destination choice. *Tourism Management, 29*, 740–750.

Li, X., Cheng, C., Kim, H., & Petrick, J. (2008). A systematic comparison of first-time and repeat visitors via a two-phase online survey. *Tourism Management, 293*, 429–438.

Limtanakool, N., Dijst, M., & Schwanen, T. (2006). The influence of socio-economic characteristics, land use and travel time considerations on mode choice for medium – and longer-distance trips. *Journal of Transport Geography, 145*, 327–341.

Long, J. S., & Freese, J. (2001). *Regression models for categorical dependent variables using Stata*. Stata Press.

Lue, C. C., Crompton, J. L., & Fesenmaier, D. R. (1993). Conceptualization of multi-destination pleasure trips. *Annals of Tourism Research, 20*, 289–301.

Mansfeld, Y. (1990). Spatial patterns of international tourist flows: towards a theoretical framework. *Progress in Human Geography, 14*(3), 372–390.

McKercher, B., & Lew, A. (2004). Distance decay and the impact of effective tourism exclusion zones on international travel flows. *Journal of Travel Research*.

McKercher, B., Chan, A., & Lam, C. (2008). The impact of Distance on International Tourist Movements. *Journal of Travel Research, 47*, 208–224.

Oppermann, M. (1992). Travel dispersal index. *Journal of Tourism Studies, 31*, 44–49.

Oppermann, M. (1997). First-time and repeat visitors to New Zealand. *Tourism Management, 183*, 177–181.

Pearce, D. G., & Elliot, J. M. C. (1983). The Trip Index. *Journal of Travel Research, 221*, 6–9.

Pizam, A., & Sussman, S. (1995). Does nationality affect tourist behavior? *Annals of Tourism Research, 22*(4), 901–917.

Plog, S. C. (2002). The power of psychographics and the concept of venturesomeness. *Journal of Travel Research, 40*, 244.

Prideaux, B., & Carson, D. (2003). Researching drive tourism – new directions. *Journal of Vacation Marketing, 94*, 307–313.

Tideswell, C. 2004. A road more traveled: multidestination travel itineraries of international visitors. Bureau of Tourism Research, Australian government.

Tideswell, C., & Faulkner, B. (1999). Multidestination travel patterns of international visitors to Queensland. *Journal of Travel Research, 37*, 364–374.

Tourism Australia's Corporate Plan (2009–2012). Available online. http://www.tourism.australia.com/en-au/documents/Corporate%20-%20About%20Us/TA_CorporatePlan_2009.pdf Last viewed 5 May 2010.

Tourism Research Australia. (2009). International visitor profiles. Available online. http://www.ret.gov.au/tourism/tra/international/profiles/Pages/default.aspx Last viewed 5 May 2010.

Weaver, D. (2006). *Sustainable tourism: Theory and practice*. Butterworth-Heinemann.

Wooldridge, J. (2006). *Introductory econometrics: A modern approach*. Thomson South-Western.

Wu, C. L., & Carson, D. (2008). Spatial and temporal tourist dispersal analysis in multi destination travel. *Journal of Travel Research, 463*, 311–317.