Research Article

How Long Does an Economic Impact Last? Tracking the Impact of a New Giant Panda Attraction at an Australian Zoo

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Abstract

A concerning issue with Economic Impact Analysis (EIA) is that many EIAs give results for one year, without being explicit about how long impacts are expected to last. New tourism attractions should not be assumed to provide continuing positive impacts into the future. For instance, the Giant Pandas at Adelaide Zoo generated a positive economic impact in their first year of residence (22% of a sample of tourists visited Adelaide "due to pandas," additional tourism expenditure in the region was $27.7 million, with $2.3 to $4.6 million captured by the zoo); however, increased numbers visiting to see the pandas lasted only two years. Investment decision makers expected larger, longer-term economic benefits than eventuated, and the zoo experienced financial difficulties. This study provides advice for predictive EIA of new tourism attractions and prompts a call for tourism EIA studies to be explicit about the time period for which results are relevant.

Keywords

economic impact analysis, duration of impacts, new tourism attraction, Giant Pandas, zoo revenue, zoo attractions

Introduction

This is a cautionary tale about the need to make conservative and evidence-based estimates of the potential size, distribution, and importantly, duration, of economic impacts of a significant new feature added to an existing tourism attraction. It is difficult to make ex ante estimates of the potential demand by visitors for a new attraction feature. The conduct and publication of ex post economic impact assessments for attractions, such as this one, should increase our ability to predict the duration of economic impacts.

Further, this article adds to critique of tourism economic impact analysis (EIA) to identify a concerning factor not often discussed. EIA results are often reported for a single year. Without an explicit and well-argued basis for projecting these estimates forward, it is possible that incorrect assumptions will be made about the future stream of impacts and that positive impacts projected forward in time will be exaggerated, with serious financial consequences for investors.

This article reports on the economic impact of a new tourism attraction, the hosting of Giant Pandas at Adelaide Zoo (in South Australia, Australia), to illustrate the importance of carefully considering forward estimates of economic impacts. The pandas, Wang Wang and Fu Ni, arrived at the zoo in 2010, on a 10-year loan from China and feature prominently in the zoo's promotional material designed to attract visitors.

The decision to host the pandas involved the Australian Government, the government of South Australia, and Zoos South Australia (Zoos SA). Adelaide Zoo is one of two zoos managed by Zoos SA, which is a nonprofit conservation charity with the mission to "save species from extinction and to connect people with nature" (Zoos SA 2012, 4). This multiple involvement reflects that the hosting of pandas is not a purely commercial decision but has complex tourism, conservation, education, and potentially even trade benefits (Vidal 2014), many of which are intangible.

The two governments and Zoos SA initially funded and continue to fund the Adelaide Zoo panda display. Specifically, the South Australian government provided $18.9 million to refurbish parts of the zoo (Zoos SA 2009) and provides the zoo with between $3 and $5 million per year for general zoo operations and conservation activities (Zoos SA Annual Reports); the Australian Government provides the $1 million per annum payment to China for panda "rental" (Caica 2011); and Zoos SA borrowed $6.7 million to construct the state-of-the-art panda display area (Peddie 2010) and provides for ongoing management costs. Clearly, it is difficult to separate out "panda" costs from other zoo capital and operational costs. As will be shown in this article, the revenue benefits to the zoo, and

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broader tourism benefits to South Australia, appear to have been overestimated. Zoos SA ended up with a considerable debt of $24 million in 2011 (Caica 2011; Schultz-Byard 2011), and while this debt was not solely "due to pandas," the cost of providing for the pandas contributed to it and clearly, the revenue due to panda visitation did not "rescue" the zoo from debt.

There was no ex ante EIA or other form of economic assessment published before the decision was taken to host the pandas, but no doubt internal assessments were made by the parties involved. Prior to the arrival of the pandas, the Zoos SA organization had high hopes that the new attraction would lead to a "doubling of visitor numbers" to the zoo (Zoos SA 2009, 1). At the time the panda exhibit opened, the South Australian Treasurer said the pandas "were expected to generate $632 million for the state for the next decade" in tourism spending (Kevin Foley quoted in Owen 2009).

The Treasurer's prediction probably included expectation of the birth of panda cubs over the 10-year loan period. There have been cubs born to pandas on loan from China to other zoos around the world, and visitor numbers to those zoos have increased as a result (Lynne 2006). However, based on experience in zoos elsewhere, expectations should have been modest in this regard. Giant Pandas have a low birth rate in the wild (Smithsonian National Zoological Park 2016) and low success rates in captive breeding (Pandas International 2016). While efforts have been under way for five years to assist Wang Wang and Fu Ni to breed, unfortunately no cubs were born by 2016 (Tucker 2016). Under the conditions of panda loans, cubs must be returned to China after two years (Vidal 2014), so that this condition will obviously limit the economic impact of visitors attracted to see panda cubs.

The research reported here was initiated in 2010, when the pandas first went on display. Collection of survey data from visitors to the zoo covered the whole year, and the results show the actual economic impact of an increase in visitor numbers, including tourists to South Australia, in terms of the size of the impact and its distribution between the Adelaide Zoo and the state of South Australia. This illustrates where the greatest financial benefits lie. Data collected in that initial year also give an indication of the duration of the boost to visitor numbers after the panda attraction opened. Significant to this study, observations made since that time give a longer-term picture of the duration of the economic impact. This longer-term view makes a contribution to an understanding of the duration of economic benefits of new visitor and tourism attraction features. This article proceeds with a discussion of relevant literature, methodology, data analysis and results, and finishes with discussion and conclusions.

Literature Review

Economic Impact Analysis

Economic impact analysis (EIA) is a commonly used economic approach for project evaluation. However, it is worth stating at the outset that EIA is less comprehensive than cost–benefit analysis (CBA) as a project assessment tool (Song et al. 2012). CBA looks at investment and operating costs of a project, including opportunity costs of private or public involvement, and compares these with benefits of that investment and activity (Campbell and Brown 2003). Significantly, CBA explicitly compares the costs and benefits over a specified time period, discounting future values to a net present value (NPV) (Dwyer, Forsyth, and Dwyer 2010). CBA can also be undertaken from a public interest perspective, including consideration of social and environmental externalities (Tribe 2011).

EIA has its focus on predicting or reporting on the benefits side of the equation. It has value when it estimates as accurately as possible what will occur, or has occurred, as a result of a "shock" such as a new investment, policy change, or event (Dwyer, Forsyth, and Spurr 2004). Applied in a tourism and event context, EIA can be used to estimate changes in direct expenditure by visitors to a defined region. Further economic modeling can be employed to estimate associated direct and total (direct + indirect + induced) changes in key indicators, including household income, gross domestic (or state or regional) product (GDP), and employment. Economic models used in EIA include tourism satellite accounts (TSAs), which usually model direct effects only (Dwyer, Forsyth, and Dwyer 2010); and input–output (IO) analysis, social accounting matrices (SAM), or computable general equilibrium modeling (CGE), which can be used to estimate total effects (Crompton, Jeong, and Dudensing 2015).

There is an argument for undertaking EIA of tourism attractions, new additions to tourism attractions, and tourism associated with events, to both understand existing investments and provide the basis for planning future ones. In their wide-ranging review of tourism economics, Song et al. (2012) note that recent tourism EIA studies have focused on the impact of events (positive events such as a sporting event and negative events such as a terrorist attack) and policy changes, but these authors do not include any examples of EIA of new tourism attractions.

Critique of EIA in tourism applications includes Crompton's identification of 10 "mischievous procedures" that result in EIA producing "large numbers that study sponsors seek to support a predetermined position," namely, to support favored investments in facilities and events (Crompton 2006, 67). These 10 procedures fall into the areas of (1) the overall scope of the analysis—ignoring costs, ignoring opportunity costs, inclusion of consumer surplus, and expanding the project's scope; (2) generating exaggerated visitor expenditure—including local residents, inappropriate aggregation of visitor groups, inclusion of time switchers and casuals, ignoring displacement costs and exaggerating visitor numbers; and (3) "abuse" of multipliers (Crompton 2006). The problems with scope of analysis largely arise from interpretation of results, as EIA is not as comprehensive as CBA (as

outlined above), but EIA results may be passed off as being comprehensive. The expenditure and multiplier issues relate to producing exaggerated results and arise from how the studies are conducted. Crompton and others have followed up with articles examining sources of overestimation in expenditure analysis (Jeong, Crompton, and Dudensing 2016) and use of economic impact multipliers in EIA (Crompton, Jeong, and Dudensing 2015). Dwyer, Jago, and Forsyth (2015) have also discussed limitations of EIA as applied to tourism associated with special events, especially when compared to the more broadly based CBA approach.

This current article identifies an additional source of potential "mischievous" use of EIA, namely, *exaggerating positive impacts projected forward in time*. The size and duration of impacts into the future will be very important to ex ante decisions on a potential tourism investment, or ex post evaluation of such an investment. EIA studies usually estimate economic impacts over a one-year time period. There is no requirement for an explicit projection and discounting of impacts for a future time period as is practiced in CBA. Many EIAs are silent about potential future impacts. EIAs are therefore very open to interpretation (by people who wish to use the results) regarding the duration of the impact, viz., whether positive impacts will occur for just the one year studied or into the future.

In relation to EIA of tourism associated with events, this will not be a problem for EIA of one-off sporting or cultural events, such as the Pope's tour to a region (Barajas, Lago-Penas, and Sanchez 2014) where the impacts are contained within the one-year time period and not repeated. It is also unlikely to be a problem for mega events that have a preevent preparation and construction period, the event itself, and a postevent legacy period that together last several years (Li, Blake, and Thomas 2013), as the EIA needs to be explicit in differentiating expected impacts in the different time periods. This has been recognized, for example, in EIAs of the Sydney and Beijing Olympic Games (Madden 2006; Li and Blake 2009). However, many events are annual (Warnick, Bojanic, and Xu 2015) and if results of EIA for the event in one year (provided by analysts) are projected forward (by other users of the results), without consideration of particular conditions in the year studied and potential demand conditions in future years, there may be an under- or overestimation of future impacts. EIAs of tourism facilities and attractions often do not explicitly address future impacts. Examples include the six EIAs of tourism attractions discussed in the next section of this literature review (Carlsen and Wood 2004; Hjerpe and Kim 2007; Saayman and Saayman 2010; Stoeckl et al. 2010; Driml et al. 2011; Ha and Grunwell 2011), or three of four EIA studies discussed by Crompton (2006), all of which provided results for one year and were silent on what may be expected in the future. As will be illustrated in this article, if the results of EIA for Giant Pandas at Adelaide Zoo as measured in 2010 for the first year of their residence were to be projected forward for the 10 years of the project, the results would be highly exaggerated.

Conditions for conducting a tourism EIA include that the economy of interest (the region) must be able to be defined and it is necessary to know the existing economic contribution of tourism to an economy via a model such as a TSA (ABS 2013). It is also necessary to be able to separate the impact of the new event, facility or attraction from the "baseline" of what would have happened anyway (Dwyer, Forsyth, and Dwyer 2010). The relevant measures of impact are based on any additional expenditure in the defined region by visitors generated by the event, facility, or attraction (Dwyer, Forsyth, and Dwyer 2010). It is critical that additional expenditure does not include expenditure by locals living within the defined region as this is simply redistributed expenditure (Crompton 2006). Also, expenditure by "time switchers" and "casuals" should not be included. For events of short duration, it is important to exclude "time switchers" who were going to visit the region at some time but switched to visit during the event; however, this is not considered of concern for more permanent attractions (Jeong, Crompton, and Dudensing 2016).

"Casuals" are people who would have been visiting the region anyway. The traditional approach to discriminating between true additional visitors and casual visitors has been to ask a dichotomous yes/no question—for example, "Would you have visited the region if the attraction was not there?" Those who answer "No" are the true additional visitors and their expenditure, plus any additional expenditure by casuals who specifically stayed longer due to the event, facility, or attraction, makes up the additional expenditure. Jeong, Crompton, and Dudensing (2016) propose a more sensitive approach of asking visitors to nominate on a scale of 1 to 10 the importance of the event, facility, or attraction to their visit and then apportioning their expenditure on that basis.

Direct economic impacts are driven by an increase (or decrease) in tourists' spending and can be measured in terms of changes in key economic indicators. In Australia, where this study is situated, published indicators in the TSA are consumption (in "purchaser's prices"—what tourists pay in Australia), output (in "basic prices"—consumption minus net taxes and imports), gross value added (GVA), GDP, and employment (Pham and Kookana 2014). Australia is advanced in the development of TSA; a national TSA is published annually by the Australian Bureau of Statistics (ABS 2013). Tourism Research Australia (TRA) has adapted the national TSA using IO tables and has published estimates of the direct, indirect, and total economic contribution of tourism for Australia (Kookana, Pham, and Quinn 2014) and also at the subnational level for eight states and territories (Pham and Kookana 2014). These TSAs can be used as a source of published "multipliers," but these multipliers should only be applied if the direct economic impact being studied is not large enough to change the structure of the whole tourism sector.

Economic Impacts of Tourism Attractions and Their Duration

This study focuses on quantifying the size and distribution of the economic impact of a new tourism attraction feature and the duration of that impact. A review of the tourism economic impact literature found very few studies that focus on a new attraction, or a significant new attraction feature, or address the time period for which additional benefits flow. Studies that have assessed the economic impact of existing tourism attractions include Grand Canyon river rafting (Hjerpe and Kim 2007), live aboard dive boats on the Great Barrier Reef (Stoeckl et al. 2010), a heritage railway (Ha and Grunwell 2011), and national parks (Carlsen and Wood 2004; Saayman and Saayman 2010; Driml et al. 2011). None of these studies commented on the likely duration of the impact and most reported economic impacts for one year and did not comment upon changes in economic impacts from the past or speculate on the size of future economic impacts.

Approaches used in these studies to identify true additional expenditure involved surveying visitors and asking them to nominate the primary reason for their visit to the region (Ha and Grunwell 2011) or asking them if they would have come to the region anyway if the attraction did not exist (Stoeckl et al. 2010; Carlsen and Wood 2004; Driml et al. 2011). Any assessment of a new attraction would need to identify if it is the new attraction that brings visitors to a region or if they would have visited anyway—it cannot be just assumed that any increased visitation is due to the new attraction.

Some studies have been identified that assess and predict the economic impact, including the duration, of new attraction features. Cornelis (2010) used an econometric approach to isolate the impact of new attraction features (rides, shows, themed areas) within theme parks on visitor numbers to four European theme parks and found that new attraction features showed positive significant impacts for a period of less than two years. In a separate article, Cornelis (2011) found that in Europe, theme parks that invest every three years in a major new attraction showed the highest effect on increasing visitor numbers. These findings raise the question of the duration of impacts of a new attraction feature. It cannot be assumed that they will continue for a long time into the future.

One published study specifically predicted the potential economic impact of introducing Giant Pandas at Memphis Zoo (USA), including the economic impact on the greater Memphis area (Wallace and Orchik 2004). These authors used visitor data from the zoo and existing visitor surveys to predict increased visitor numbers to the greater Memphis area specifically because of pandas. They used expenditure data from the surveys to estimate additional expenditure in the region and used published multipliers to estimate total economic impact. It was estimated that the impact of the pandas would be highest in the first year (112,000 panda-induced nonresident visitors) and would then reduce but still be relevant for 10 years. The estimated 10-year total impact due to pandas was $270 million in output with 4,962 additional jobs supported. However, in a postscript to the article, the authors reported that the actual panda-induced nonresident visitor numbers in the first year were 34,000—only a third of the number originally predicted. Thus, although the study does illustrate a significant impact on the regional economy, it also shows difficulty in estimating the size and duration of visitor impact.

Zoos as Tourism Attractions and Conservation Organisations

Internationally, the growth of ecotourism, wildlife, and nature-based visitor attractions has been a standout in the tourism industry over the past decade (Ballantyne and Packer 2013). Zoos and aquariums have contributed to such growth as "massive ecotourism operations" (Grajal 2013, 464) which has increasingly seen them function as tourist rather than local recreational attractions (Frost 2011). In Australia, zoos rated second after the cinema as the most visited cultural attraction for residents for the ten years up to 2008 and international visitors to zoos contributed $116 million to the Australian economy in 2008 (Beri, Tranent, and Abelson 2010). Internationally, with visitation of more than 700 million annually (Gusset and Gerald 2011) zoos range from "substantial operations in major cities, with visitation levels comparable to other top attractions, to small, regional, owner-operator ventures" (Frost 2011, 1). Zoos must balance operations between the presentation of animals for visitor education and entertainment and on-site and off-site conservation activities (Turley 1999; Mason 2008).

Methodology

This research was designed to obtain an estimate of impacts that could be attributed directly due to the introduction of a new panda zoo attraction in terms of:

a. increased zoo revenues;
b. additional direct tourism expenditure in South Australia;
c. the duration of the economic impact;
d. additional direct and total contribution to the South Australian economy.

The generation of information on the size of any additional direct tourism expenditure in South Australia (item b) is a key output for this study. The distribution of this additional expenditure between the Adelaide Zoo and other businesses in South Australia can be determined with information on zoo revenue (item a). How long any additional tourism expenditure was enjoyed is also examined (item c). The calculation of additional direct and total contribution to the South Australian economy (item d) was undertaken to estimate the contribution to GSP and also to compare our study results with the statement of expected tourism spending

made by the State Treasurer in 2009. The methodology combined original data collection via visitor surveys at Adelaide Zoo with published information on visitor expenditure, Adelaide Zoo visitors and revenue, and the TSA 2010–2011 for South Australia (Pham and Kookana 2014).

Visitor Surveys

Visitor surveys were conducted at Adelaide Zoo from January to November 2010, covering the full first year of the panda exhibit. Two questionnaires were designed—one for visitors on a day trip from home, and one for visitors staying overnight in the Adelaide region. Survey questionnaires were deliberately kept to only one page, to allow for self-completion by visitors while they were queuing to enter the panda enclosure. Both day trippers and overnight visitors were asked whether they had come specifically to see the pandas; for example, overnight visitors were asked, "If the Adelaide Zoo *did not* have pandas on display, would you have chosen to visit Adelaide anyway? Yes or No." Overnight visitors who would have come anyway were asked if they were staying longer in Adelaide in order to see the pandas and if so, how many extra nights they would stay.

Eight survey periods were implemented, covering three school holiday weeks and five non–school holiday weeks between January and November 2010. Four periods were implemented in the first half of the year (January–April) and four periods in the second half of the year (July–November). Within these broad time period parameters, days to conduct the survey were chosen by convenience, and convenience sampling was undertaken with questionnaires distributed to visitors as they waited to see the pandas. Questionnaires were self-completed and returned on-site. Only one member of each group traveling together completed the questionnaire on behalf of the group. The survey included a question on the number of adults and children (under 15 years) in the group. A quota of 100 completed questionnaires from day trippers and 100 from overnight visitors was employed in each of the eight survey periods. Between 90% and 100% of people approached accepted a questionnaire and almost 100% of those people completed and returned their questionnaire. In total, 864 day-trip surveys and 825 overnight surveys were returned with sufficient information for use in analysis. Convenience sampling has been found by Jeong, Crompton, and Dudensing (2016) to be a reasonable approach in gathering information on visitor expenditure, allowing more responses for a given budget than probability sampling without significantly comprising results. A problem with our approach, however, was that too few international visitors were recruited within the overnight visitor quota (see Analysis and Results Section).

Published Expenditure Data

Collection of expenditure data from visitors is subject to recall error (Faulkner and Raybould 1995) and is time consuming. Therefore, it was decided to keep the questionnaire short, to maximise response rates while drawing upon respected published visitor expenditure estimates, so no expenditure questions were included on the questionnaire. Expenditure was defined as all money spent on the trip including accommodation, meals, transport, and entertainment. This approach is used by the Australian Government's research body TRA (TRA 2015) in the national surveys of domestic and international tourists published regularly (TRA 2016a, 2016b). Expenditure for day trips and per visitor night is provided at a national, state, and regional level. These expenditure measures appear to be relatively consistent over many years of data collection and reporting. The published TRA data were accessed to select the per visitor night expenditure for the relevant region for 2010 (TRA 2011). In this case, a weighted average of the tourism regions of Adelaide and nearby Adelaide Hills was used. This was $102 per day trip, $221 per visitor night for domestic overnight visitors, and $89 per visitor night for international visitors (Adelaide only). The low per-night value for international visitors is attributed to their spending more nights in the region—their total expenditure in the region is higher than domestic visitors.

Analysis and Results

Sample Respondents Who Visited Due to Pandas or Stayed Longer

This information was critical to identifying how much visitor expenditure could be attributed to the attraction of the pandas. The results of the questions that sought to identify "visits due to pandas" or those who "stayed longer" were as follows:

- Twenty-four percent of day trip respondents would not have visited the zoo if the pandas were *not* on display, thus their visit can be directly attributed as due to pandas.
- Twenty-two percent of overnight visitor respondents (tourists) would not have visited Adelaide if the pandas were *not* on display, thus their visit can be directly attributed as due to pandas.
- Sixteen percent of overnight visitor respondents (tourists) said they would stay longer in the region to see the pandas (6.4% an additional day [not overnight], 4.5% an extra day and night, and 4.4% two or more extra nights).

Increased Revenue to the Zoo

To estimate any increased zoo revenue due to pandas, it was necessary to see if visitor numbers and revenue, as reported in Zoos SA Annual Reports, actually increased in 2010 when the panda exhibit opened and then use the survey information to estimate how much of the increase could be attributed

Table 1. Increase in Adelaide Zoo Admissions and Visitor Revenue in 2010.

	2008/2009	'Average' 2010	Increase in 2010	% Increase of All 2010
Admissions[a]	369,549	487,987	118,438	24%
Visitor Revenue[b]	$4,734,324	$9,366,250	$4,631,926	49%
Average revenue per admission	$13	$19		

a. Paid, members, free and functions admissions.
b. Revenue from admissions, education, retail sales, catering sales, tours income and events (excludes revenue from sponsorship, donations bequests and membership).
Source: Zoos SA Annual Reports.

to the attraction of the pandas. This analysis used both the day trip survey and the overnight visitor survey. Pandas are not the only attraction of the zoo, so care needed be taken in attributing any increase just to the pandas.

The first year of the panda attraction was calendar year 2010. An estimate of calendar year 2010 admissions and revenue was derived as an average of Zoos SA's reported figures for 2009–2010 and 2010–2011 (notably the figures in both years were nearly the same). The 2010 average was compared with 2008–2009, before the pandas arrived (see Table 1). There were approximately 118,500 more admissions in 2010, and this was 24% of all 2010 admissions. The revenue result was an extra $4.6 million. So, we can definitely say that there was an increase in visitor numbers and revenue after the panda exhibit opened, but was this all due to pandas?

Because the number of extra visitors was 24% of all 2010 visitors and because our survey found that around 22% to 24% of respondents' visits could be attributed due to pandas, we can fairly safely attribute all the extra visitors to the attraction of the pandas in that year. However, while extra revenue was generated by special events to see pandas (Zoos SA 2010) and perhaps additional souvenir sales, it is not necessarily the case that all the extra revenue was due to pandas. On average, revenue per admission increased. At $19 per admission, the revenue from the 118,500 extra visitors would be $2.3 million. Therefore, at least $2.3 million, and possibly up to $4.6 million, can be attributed as due to pandas in calendar year 2010.

Additional Tourism Expenditure in South Australia Due to Pandas

Investigation of responses to the day trip survey showed no day trips were made from outside of South Australia. Therefore, the research items (b) and (d) on economic benefits to South Australia used only the survey responses of the overnight visitors. The first step in analysis was to check for outliers (Stynes and White 2006). Some outliers at the high side of "number of visitors in a group" and "number of visitor nights" were identified using Tukey's Hinges, as values more than 1.5 times higher than the third quartile (Macfie and Nufrio 2006). These values were recoded into the highest "reasonable" score as identified by Tukey's Hinges analysis (Grace and Sawilowsky 2009).

Table 2. Overnight Visitors: Visit Due to Pandas by Origin.

Origin	Yes, Would Have Visited Anyway	No, Therefore Visit Is Due to Pandas	Total
South Australia	75	12	87
Other Australia	426	153	579
International	138	11	149
Total	639	176	815

Note: Responses included = 815; responses excluded (missing, nonresponse) = 10.

The distribution of overnight visitors by their origin and the "visit" question was generated using crosstabs in IBM SPSS Statistics (see Table 2).

As the research focused on *additional tourism expenditure* to South Australia, day trip (as above) and overnight visitors who were residents of this state were excluded from the further analysis. While some international visitors did visit and stay longer due to pandas, unfortunately, the sample size for international visitors was below 30 respondents (both for visit and stay longer) and so too low for further analysis (Wheater and Cook 2000). It was not thought valid to combine interstate and international visitors, as published average expenditures per night and per stay in South Australia for these groups were quite different. Therefore, further analysis was only undertaken for the overnight respondents from Other Australia, that is, "interstate tourists." The estimate from the research will therefore be conservative. The proportion of annual zoo visitors by origin, calculated from visitor numbers supplied by Adelaide Zoo, was as follows: South Australia, 67% (day trippers and overnight visitors to Adelaide); interstate tourists, 28%; and international tourists, 5%. While international tourists make up only 5% of zoo visitors, they do spend more per stay than other visitors.

A further reason that the estimate of expenditure will be conservative is that the questionnaire only asked for visitor nights spent in Adelaide, not all of South Australia. Therefore, any visitor nights spent outside Adelaide by interstate tourists in the sample are not included in the analysis. Adelaide is the main tourism destination in South Australia and in 2010 accounted for 43% of domestic (Australian tourist) visitor nights in the state. In 2010, the average stay of domestic visitors in the Adelaide region was 3.7 nights and for all of South Australia was 3.8 nights (TRA 2016c). This indicates that visitors who go to Adelaide on average do not spend many nights in the rest of South Australia. The mean number of visitor nights for a group in our sample of interstate tourists was 5.2 nights. Therefore, this underestimate is unlikely to be significant.

Total expenditure of the whole sample of interstate tourists was estimated by multiplying the number of adult visitors in the group by the number of nights spent in Adelaide for each of the 579 respondents in the sample, then summing these to total adult visitor nights. The total number of adult visitor nights was then multiplied by the published $221 per visitor night to estimate total expenditure.

$$e_{\text{interstate}} = \left(\sum_{i=1}^{579} \left(a_i \text{ x } n_i \right) \right) \text{x } P \quad (1)$$

where $e_{\text{interstate}}$ = expenditure of the whole sample of interstate visitors, a = number of adults in a group; n = number of nights spent in South Australia by group; i = relevant group (respondent); and P = published expenditure per visitor night ($221).

The sample mean expenditure per adult visitor was also calculated (total expenditure divided by total number of adults in the sample). In the whole sample, the mean number of adult visitors in a group was 2.3 adults and the mean number of nights in Adelaide per group was 5.2.

The sample additional tourism expenditure due to pandas was then estimated. This involved the expenditure by those people who visited due to pandas and those who stayed longer. As for the whole sample, total adult visitor nights were derived for those who visited due to pandas (153 responses) and then multiplied by $221 per visitor night. In this subsample, the mean number of adult visitors in a group was 2.4 adults and the mean number of nights in Adelaide per group was 4.4. Because of the smaller number of respondents who stayed longer (80 responses), the number of extra nights stayed was collapsed and recoded. An extra day (not overnight) was recoded as 0.25% of a night (31 responses), and all responses of one night or more were collapsed into one night in order to make the number in that cell sufficient for analysis (49 responses). Thus, the expenditure estimate for these stayed-longer visitors is also conservative. The expenditure for these visitor nights was calculated and added to the visited-due-to-pandas expenditure, to get the sample additional tourism expenditure attributed due to pandas. The sample percentage of additional tourism expenditure by interstate tourists was calculated as a percentage of the total expenditure for the whole sample. All results for the sample are shown in Table 3.

The sample of visitors is just a small proportion of all visitors to the Adelaide Zoo in a year. However, the sample size for interstate tourists was considered large enough to justify extrapolation from the sample to the population of interstate tourists who visit the zoo. Based on information supplied by the Adelaide Zoo, the number of adult interstate visitors to the zoo in 2010 was estimated at 93,600. Total expenditure in South Australia by this population of 93,600 interstate tourist visitors was estimated using the sample mean expenditure per adult visitor. The additional tourism expenditure in South Australia by the population of adult interstate tourist visitors to the zoo due to pandas was calculated using the sample percentage of additional tourism expenditure due to pandas, applied to the estimated total expenditure by the population of interstate tourist visitors to the zoo (see Table 4).

Table 3. Sample Estimated Total Expenditure and Additional Tourism Expenditure Due to Pandas in South Australia by Interstate Tourists.

	Interstate Tourists
Whole sample total expenditure	$1,540,370
Whole sample mean expenditure per adult zoo visitor	$1,153
Sample expenditure visit due to pandas	$366,197
Sample expenditure 'stay longer'	$29,763
Sample additional tourism expenditure due to pandas	$395,960
Sample additional tourism expenditure % of sample total expenditure	25.7%

Table 4. Population Estimated Total Expenditure and Additional Tourism Expenditure Due to Pandas in South Australia by Interstate Tourists.

	Interstate Tourists
Population of adult visitors to Adelaide Zoo in 2010	93,600
Sample mean expenditure per adult zoo visitor[a]	$1,153
Population estimated total expenditure interstate tourist zoo visitors	$107,918,138
Sample additional tourism expenditure % of sample total expenditure[a]	25.7%
Population estimated additional tourism expenditure	$27,740,910

a. From Table 3.

The estimated additional tourism expenditure in South Australia by interstate tourists to Adelaide Zoo in 2010 that can be attributed to the attraction of the pandas was $27.7 million. While this amount is notable, it was less than 1% of all visitor (day trip and overnight) expenditure in South Australia in that year (TRA 2011).

It is also notable that the estimated additional revenue to the Adelaide Zoo due to pandas of at least $2.3 million, and possibly up to $4.6 million, was the equivalent of only 8% to 17% of the total $27.7 million additional tourism expenditure in South Australia. So, the majority of additional tourism expenditure due to pandas actually went to other businesses (including accommodation, food and beverage, and transport) in South Australia, rather than to Adelaide Zoo.

Duration of the Impact

Based on the survey data for 2010, the pattern of responses to the visit due to pandas question is shown in Figure 1. This

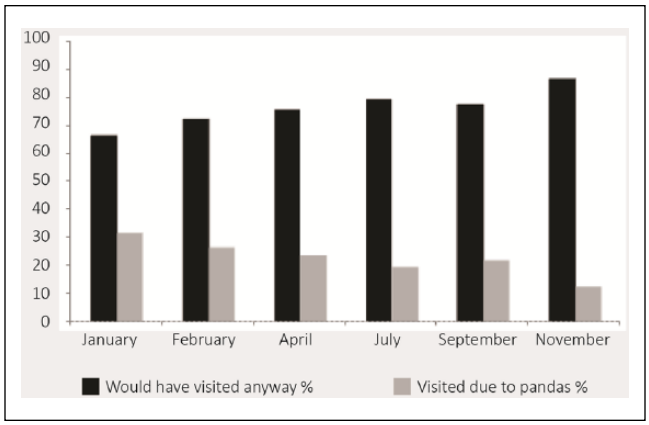

Figure 1. Percentage of visits, all survey respondents, by month of survey.

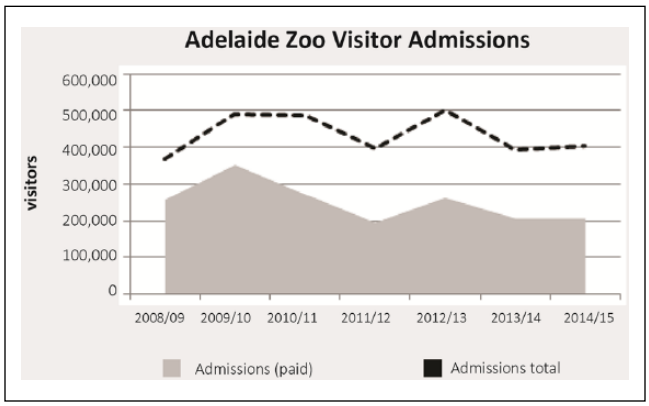

Figure 2. Adelaide Zoo visitor admissions.
Source: Zoos SA Annual Reports.
Note: Total includes paid, members, free, and functions admissions.

figure visually indicates a decline from January 2010 to November 2010 in the percentage of all survey respondents (day trip plus overnight visitors) whose visit was due to pandas. Chi-squared tests showed a significant difference in percentages in the first half of the year against the second half of the year for all survey respondents combined ($\chi^2[1, N = 1655] = 14.67$, $p < .05$) and for day trip visitors ($\chi^2[1, N = 840] = 19.85$, $p < .05$), with the percentage of visits due to pandas being lower in the second half of the year. For overnight visitors, the pattern was not as distinct, with the percentage of visits due to pandas ranging between 10% and 27% over the months and no significant difference between the first and second half of the year ($\chi^2[1, N = 815] = 0.74$, $p > .05$). However, the lowest percentage (10%) did occur in November.

For the longer term beyond 2010, Annual Reports of Zoos SA throw further light on the duration of impacts of the new attraction (Figures 2 and 3). Zoo visitor numbers did increase in the first year of the panda exhibit (2010), but visitor numbers and revenue plateaued and then dropped. In 2009–2010, paid admissions were 37% above 2008–2009, and total

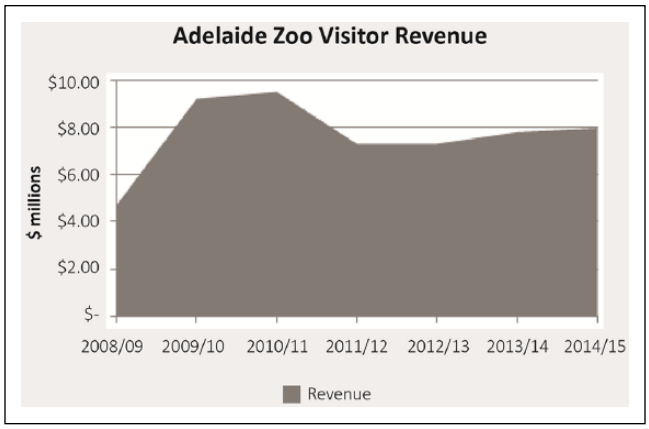

Figure 3. Adelaide Zoo visitor revenue.
Source: Zoos SA Annual Reports.
Note: Revenue from admissions, education, retail sales, catering sales, tours income, and events (excludes revenue from sponsorship, donations bequests, and membership).

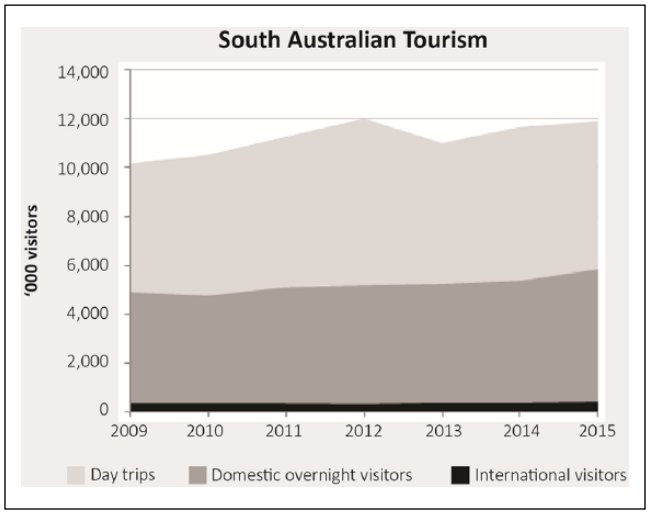

Figure 4. South Australian Tourism 2009 to 2015.
Source: TRA 2016d, 2016e, 2016f.

admissions were 33% above 2008–2009, but there was no growth in 2010–2011 (Zoos SA 2010, 2011) and visitor numbers decreased to "pre-panda" levels in 2011–2012. Zoos SA attributes the increase in visitor numbers in 2012–2013 to events and activities for the Zoo's 130th birthday celebrations (Zoos SA 2013). Visitor admissions then fell in 2013–2014 (Zoos SA 2014) and increased marginally in 2014–2015 (Zoos SA 2015). These admissions and revenue data indicate that the "panda effect" may have only lasted up to two years.

Of course, it is possible that the pattern of visitation to the zoo was more related to the general trends in tourism in South Australia than to the presence of the pandas. Trends in tourism in South Australia by day trippers and domestic and international visitors over the period 2009 to 2015 are shown in Figure 4. The largest numbers of tourists were

Table 5. Quotes from Zoos SA Annual Reports.

Year	Quote
2009	Prediction that the pending arrival of the Giant Pandas would lead to an "expected doubling of visitor numbers" (Zoos SA 2009, 1)
2010	"Visitation has tracked at about 70% higher than normal with 25% of visitors from interstate or overseas" (Zoos SA 2010, 4).
2011	"As expected after the initial 12 month period of hype and excitement associated with the Pandas, visitation has plateaued somewhat. However visitation continues at well above pre-Panda levels—on average some 40% above—and we continue to benefit from the profile they deliver." (Zoos SA 2011, 1)
2012	"At Adelaide Zoo, paid admissions decreased by 28.4% and total admissions decreased by 18.5%." (Zoos SA 2012, 25)

day trippers, and there were annual increases in the number of day trips, except for 2013 when they fell by about 1 million trips (zoo visitor numbers rose in 2012–2013 and fell in 2013–2014). Domestic overnight visitor numbers increased each year except for 2010 when they fell by 139,000 (a year when zoo visitor numbers increased). The pattern of visitor numbers to Adelaide Zoo (as shown in Figure 2) does not mirror either of these trends, and specifically the drop in zoo visitors in 2011–2012 was counter to general tourism trends. International visitor numbers did fluctuate over this period; however, international visitors make up only around 7% of all overnight visitors to South Australia and 5% of Adelaide Zoo visitors. Overall, it appears that visitor numbers to Adelaide Zoo did not simply follow South Australian tourism trends.

Quotes from Zoos SA Annual Reports highlight expectations and observations (Table 5). Before the pandas arrived, hopes were high that their arrival would lead to a "doubling of visitor numbers" to the Adelaide Zoo (Zoos SA 2009, 1). The visitor admissions for the full year 2010–2011 published in the Annual Reports do not support the "70% increase" claimed in the quote in Table 5.

Additional direct and total contribution to the South Australian economy

Earlier in this article, it was reported that the State Treasurer of South Australia in 2009 expected the pandas to generate "$632 million for the state for the next decade" due to tourism spending (Kevin Foley quoted in Owen 2009). Unfortunately, it is not clear from the Treasurer's statement if the dollar value he reported was *direct* expenditure, output or contribution to GSP, or if a multiplier had been used to estimate *total* effects, or if the assumption was that the $632 million would be earned evenly at $63 million per year. It was decided to test out this statement against our additional tourism expenditure due to pandas result of $27.7 million for 2010 by taking our estimate for 2010 and using ratios or "multipliers" derived from the published TSA for South Australia (Pham and Kookana 2014) to estimate direct and total output and GSP contributions to the South Australian economy. The $27.7 million was in "purchasers prices" and was converted using ratios derived from the TSA to a direct output estimate of approximately $22 million in "basic prices" (Pham and Kookana 2014), and that provided the basis for the other indicators to be estimated (see Table 6). Because of the use of ratios based on the published TSA, these results should be treated as approximate estimates only.

Table 6. Estimates of Direct and Total Effects, South Australia.

Indicator	Direct	Total
Output	$22.2 m	$42.2 m
Gross state product	$11.0 m	$24.4 m

It appears that even if the State Treasurer was talking about total output effects, his expectations were too high. This was compounded by expectations of increased visitor expenditure over 10 years, which is not supported by our results. Useful information from this exercise is that the $27.7 million additional tourism expenditure due to the pandas is likely to have generated $24.4 million additional total contribution to South Australia's GSP in 2010.

Discussion and Conclusion

Methodology and Limitations

The survey employed a single page questionnaire aimed at maximizing responses and was successful with the response rate higher than 90%. The addition of questions to see if any visitors stayed longer because of pandas proved useful; however, the stay-longer expenditure was only 9.2% of the sample additional tourism expenditure.

Limitations of the approach included that the quota sampling approach used collected insufficient responses from international visitors, so a recommendation for future research is to set a separate quota for interstate and international tourists (or any major separate groups relevant to the analysis). The decision to use reputable published expenditure data was convenient, but it assumes that zoo visitors are similar to "average" visitors to the regions, and is a limitation of this study. As average revenue per zoo admission was $19 in 2010, it was not considered that zoo visitors would have noteably higher costs than average visitors. A further limitation is that expenditure estimates due to pandas are conservative because of a number of decisions made; a dichotomous approach to excluding casuals, using only nights spent in Adelaide, excluding international visitors, and collapsing the stay-longer responses. However, it

can be argued that a conservative approach is preferable when considering investment decisions.

The Size, Distribution, and Duration of Economic Impacts of Giant Pandas at Adelaide Zoo

The hosting of Giant Pandas by zoos such as the Adelaide Zoo is more complex than being just a visitor or tourism attraction. There are hopes that the pandas' presence will contribute to awareness of panda (and other species) conservation and that careful management will lead to reproduction, which is critical to survival of this species. However, the cost of hosting pandas is high and thus the tangible tourism economic impact is a relevant question.

Based on our results, it would be reasonable to say that the economic impact of the pandas to the Adelaide Zoo was additional revenue of around $4.6 million to $9.2 million over the two years 2010 and 2011, with negligible additional impact in subsequent years. At this stage in the 10-year panda project (2010 to 2019), this is likely to be the total impact, unless panda cub(s) are born (in the years 2017 to 2019), in which case a similar economic boost could be predicted for a two-year period. It appears that the revenue expectations of Zoos SA were much higher than actually achieved. Significantly, the pre-panda prediction of a "doubling of visitor numbers" (Zoos SA 2009, 1) appears to have been an assumption for the long term and these expectations possibly led Zoos SA to make financial decisions that contributed to a difficult debt situation.

In terms of the broader economic impact of additional tourism to South Australia, the additional tourism expenditure was around $60 million, resulting in a total contribution to GSP of $48 million for the two years 2010 and 2011, also with negligible additional impact since that time.

This economic impact information should be looked at carefully by other zoos and governments considering hosting pandas. Negotiations between zoos and government supporters should acknowledge the magnitude of the costs, likely revenue, and its distribution and duration and the wider tangible and intangible economic benefits. A full CBA (Campbell and Brown 2003) that includes nonmarket valuation of education and conservation benefits is recommended if governments want a clear economic assessment of the optimal level of government contribution.

It certainly would be good for other zoos to avoid the frustrations voiced by the then Zoos SA chief executive Dr. Chris West in 2010,

> We are a charity, bringing very significant tourism revenue into South Australia but we are not loaded ourselves. We are stretched—against a balanced business plan—and will be repaying the bank for a while. The time-frame for paying off the panda debt depends on several factors including visitation, other revenue and panda babies, but at the current rate it looks like it will be closer to 10 years than to five. (West quoted in Peddie 2010)

Implications for Predicting the Economic Impacts of New Attraction Features

In a broader sense, this study adds information about the duration of increased demand for a new tourism attraction feature and may contribute to more evidence-based ex ante estimates in the future. Realistic expectations about how many years an increase in visitor numbers and revenue is likely to last are important in making decisions that require capital investment and incur ongoing costs. The results of this study support the findings of Cornelis (2010, 2011), that the duration of additional visitation to a new tourism attraction feature is two to three years. This period of two to three years could be a starting point for ex ante assessments with recommendations that a strong case needs to be made for predicting longer term (or shorter term) increases in visitor numbers.

Implications for Economic Impact Analysis

Referring back to the "mischievous procedures" identified by Crompton (2006) and our additional identified issue of exaggerating positive impacts projected forward—our analysis of the duration of the economic impact of the Giant Pandas at Adelaide Zoo provides the basis for a call for tourism EIA studies to be explicit about the time period for which analysts expect the results to be relevant. One alternative is for analysts to clearly state that results are for the one year studied and to express caution about extrapolating them into the future. More usefully, analysts may choose to project results forward, but this should be based on explicit assumptions and analysis, including sensitivity analysis to account for possible variations in future visitor demand.

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References

ABS (Australian Bureau of Statistics). 2013. *Tourism Satellite Account: Australian National Accounts 2011-12 5249.0*. Canberra: ABS.

Ballantyne, R., and J. Packer. 2013. "Ecotourism: Themes and Issues." In *International Handbook of Ecotourism*, edited by R. Ballantyne and J. Packer. Cheltenham, UK: Edward Elgar.

Barajas, Angel, Santiago Lago-Penas, and Patricio Sanchez. 2014. "On the Regional Economic Effects of the Pope's Journeys:

Evidence from the Visit to Santiago de Compostela in 2010." *Tourism Economics* 20 (2): 279–99.

Beri, V., A. Tranent, and P. Abelson. 2010. "The Economic and Social Contribution of the Zoological Industry in Australia." *International Zoo Yearbook* 44:192–200.

Caica, P. 2011. "Ministerial Statement." *Hansard, House of Assembly, South Australia 21 June 2011*. Adelaide: Government of South Australia.

Campbell, H. F., and R. P. C. Brown. 2003. *Benefit Cost Analysis: Financial and Economic Appraisal Using Spreadsheets*. Melbourne: Cambridge University Press.

Carlsen, J., and D. Wood. 2004. *Assessment of the Economic Value of Recreation and Tourism in Western Australia's National Parks, Marine Parks and Forests*. Gold Coast: Sustainable Tourism Cooperative Research Centre.

Cornelis, P. C. M. 2010. "Impact of New Attractions on Theme Park Attendance." *Worldwide Hospitality and Tourism Themes* 2 (3): 262–80.

Cornelis, P. C. M. 2011. "A Management Perspective on the Impact of New Attractions." *Journal of Vacation Marketing* 17 (2): 151–62.

Crompton, John. 2006. "Economic Impact Studies: Instruments for Political Shenanigans?" *Journal of Travel Research* 45 (1): 47–82.

Crompton, John L., Ji Youn Jeong, and Rebekka M. Dudensing. 2015. "Sources of Variation in Economic Impact Multipliers." *Journal of Travel Research* 1–14. doi: 10.1177/0047287515617298.

Driml, Sally, Richard P. C. Brown, Roy Ballantyne, Shane Pegg, and Noel Scott. 2011. "Estimating the State-Wide Economic Significance of National Park Tourism: The Case of Queensland, Australia." *Tourism Analysis* 16:243–57.

Dwyer, L., P. Forsyth, and W. Dwyer. 2010. *Tourism Economics and Policy*. Bristol: Channel View.

Dwyer, Larry, Peter Forsyth, and Ray Spurr. 2004. "Evaluating Tourism's Economic Effects: New and Old Approaches." *Tourism Management* 25 (3): 307–17.

Dwyer, Larry, Leo Jago, and Peter Forsyth. 2015. "Economic Evaluation of Special Events: Reconciling Economic Impact and Cost–Benefit Analysis." *Scandinavian Journal of Hospitality and Tourism* 16 (2): 115–29.

Faulkner, Bill, and Michael Raybould. 1995. "Monitoring Visitor Expenditure Associated with Attendance at Sporting Events: An Experimental Assessment of the Diary and Recall Methods." *Festival Management and Event Tourism* 3 (2): 73–81.

Frost, W. 2011. *Zoos and Tourism—Conservation, Education, Entertainment?* Bristol: Channel View.

Grace, T. A., and S. S. Sawilowsky. 2009. "Data Error Prevention and Cleansing: A Comprehensive Guide for Instructors of Statistics and Their Students." *Model Assisted Statistics and Applications* 4 (4): 303–12.

Grajal, A. 2013. "Zoos as Ecotourism Experiences." In *International Handbook on Ecotourism*, edited by R. Ballantyne and J. Packer, 504. Cheltenham, UK: Edward Elgar.

Gusset, M., and D. Gerald. 2011. "The Global Reach of Zoos and Aquariums in Visitor Numbers and Conservation Expenditures." *Zoo Biology* 30 (5): 1098–2361.

Ha, I., and S. S. Grunwell. 2011. "The Economic Impact of a Heritage Tourism Attraction on a Rural Economy: The Great Smoky Mountains Railroad." *Tourism Analysis* 16:629–36.

Hjerpe, E. E., and Y.-S. Kim. 2007. "Regional Economic Impacts of Grand Canyon River Runners." *Journal of Environmental Management* 85 (1): 137–49.

Jeong, J. Y., J. L. Crompton, and R. M. Dudensing. 2016. "The Potential Influence of Researchers' 'Hidden' Procedure Decisions on Estimates of Visitor Spending and Economic Impact." *Journal of Travel Research* 55 (7): 874–888. doi:10.1177/ 0047287515605932.

Kookana, Jai, Tien Duc Pham, and Tim Quinn. 2014. *Tourism's Contribution to the Australian Economy 1997-98 to 2012-13*. Canberra: Australian Government, Austrade.

Li, ShiNa, and Adam Blake. 2009. "Estimating Olympic Related Investment and Expenditure." *International Journal of Tourism Research* 11:337–56.

Li, ShiNa, Adam Blake, and Rhodri Thomas. 2013. "Modelling the Economic Impact of Sports Events: The Case of the Beijing Olympics." *Economic Modelling* 30:235–44.

Lynne, Warren. 2006. "Panda, Inc." *National Geographic* 210 (1): 42–59.

Macfie, B. P., and P. M. Nufrio. 2006. *Applied Statistics for Public Policy*. New York: M.E. Sharpe.

Madden, A. R. 2006. "Economic and Fiscal Impacts of Mega Sports Events: A General Equilibrium Assessment." *Public Finance and Management* 6:346–94.

Mason, Peter. 2008. "Roles of the Modern Zoo: Conflicting or Complementary?" *Tourism Review International* 11: 251–63.

Smithsonian National Zoological Park. 2016. "Giant Pandas." http://nationalzoo.si.edu/Animals/GiantPandas/PandaFacts/.

Owen, Michael. 2009. "Pandas Worth $630 Million to the State." *The Australian*, December 14, 2009.

Pandas International. 2016. "Captive Breeding Program." https://www.pandasinternational.org/program-areas-2/captive-breeding-program/.

Peddie, Clare. 2010. "Pandas Will Leave Adelaide Zoo in Debt for a Decade." news.com.au, December 27. http://www.news.com.au/national/wang-wang-leaves-giant-panda-debt-for-adelaide-zoo/story-e6frfkvr-1225976525886.

Pham, Tien Duc, and Jai Kookana. 2014. *State Tourism Satellite Accounts 2012-13*. Canberra: Australian Government, Austrade.

Saayman, M., and N. Saayman. 2010. "Regional Development and National Parks in South Africa: Lessons Learned." *Tourism Economics* 16 (4): 1037–64.

Schultz-Byard, N. 2011. "Adelaide Zoo $24m in Debt." Australian Broadcasting Corporation. http://www.abc.net.au/local/stories/2011/06/21/3249843.html.

Song, Haiyan, Larry Dwyer, Gang Li, and Zeng Cao. 2012. "Tourism Economics Research: A Review and Assessment." *Annals of Tourism Research* 39 (3): 1653–82.

Stoeckl, N., A. Birtles, M. Farr, A. Mangott, M. Curnock, and P. Valentine. 2010. "Live-Aboard Dive Boats in the Great Barrier Reef: Regional Economic Impact and the Relative Values of Their Target Marine Species." *Tourism Economics* 16 (4): 995–1018.

Stynes, D. J., and E. M. White. 2006. "Reflections on Measuring Recreation and Travel Spending." *Journal of Travel Research* 45 (1): 8–16.

TRA (Tourism Research Australia). 2011. *Regional Tourism Profiles 2010-11*. Canberra: Tourism Research Australia.

TRA (Tourism Research Australia). 2015. *Regional Expenditure Methodology*. Canberra: Australian Government, Austrade. http://tra.gov.au/aboutus/regional-expenditure.html.

TRA (Tourism Research Australia). 2016a. *Travel by Australians: Year Ended December 2015*. Canberra: Australian Government, Austrade. http://tra.gov.au/research/latest-nvs-report.html.

TRA (Tourism Research Australia). 2016b. *International Visitors in Australia: Year Ended December 2015*. Canberra: Australian Government, Austrade. http://www.tra.gov.au/research/latest-ivs-report.html.

TRA (Tourism Research Australia). 2016c. *Overnight Trips in Australia by Residents*. Canberra: Australian Government, Austrade. http://www.tra.gov.au/research/domestic-travel-by-australians.html.

TRA (Tourism Research Australia). 2016d. *NVS_3_Daytrips_YE_Dec_2015*. Canberra: Australian Government, Austrade. http://www.tra.gov.au/documents/nvs/NVS_3_Daytrips_YE_Dec_2015.xlsx.

TRA (Tourism Research Australia). 2016e. *NVS_2_Nights_YE_Dec_2015*. Canberra: Australian Government, Austrade. http://www.tra.gov.au/research/domestic-travel-by-australians.html.

TRA (Tourism Research Australia). 2016f. *IVS_2_YE_Dec_2015*. Canberra: Australian Government, Austrade. http://tra.gov.au/research/International-tourism-statistics.html.

Tribe, John. 2011. *The Economics of Recreation, Leisure and Tourism*. Oxford: Butterworth-Heinemann.

Tucker, Alyssa-Jane. 2016. "Giant Panda Breeding Update." http://www.adelaidezoo.com.au/giant-panda-breeding-update/.

Turley, Sophie K. 1999. "Conservation and Tourism in the Traditional UK Zoo." *Journal of Tourism Studies* 10 (2): 2–13.

Vidal, John. 2014. "Zoos Weigh Up the Cost of China's 'Pandanomics.'" *The Guardian*, September 13. http://www.theguardian.com/world/2014/sep/13/edinburgh-zoo-pandas-tian-tian-china-pandanomics-birth-cub.

Wallace, Jeff, and Andrea Orchik. 2004. "The Economic impact of Pandas at the Memphis Zoo." *Business Perspectives* 16 (3): 30–37.

Warnick, Rodney B., David C. Bojanic, and Feng Xu. 2015. "Using a Trade Market Analysis Technique to Refine Measurements for Economic Impact Analysis of Special Events." *Journal of Travel Research* 54:52–65.

Wheater, C. P., and P. A. Cook. 2000. *Using Statistics to Understand the Environment*. London: Routledge.

Zoos SA. 2009. *08/09 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2010. *09/10 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2011. *10/11 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2012. *11/12 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2013. *12/13 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2014. *13/14 Zoos SA Annual Report*. Adelaide: Zoos SA.

Zoos SA. 2015. *14/15 Zoos SA Annual Report*. Adelaide: Zoos SA.

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