MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

SCIENCE, SKILLS AND INNOVATION

# Regional Estimates of Tourism Expenditure

## Method, concepts and results

newzealand.govt.nz

**MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

# Ministry of Business, Innovation and Employment (MBIE)

## Hīkina Whakatutuki  Lifting to make successful

MBIE develops and delivers policy, services, advice and regulation to support economic growth and the prosperity and wellbeing of New Zealanders.

MBIE combines the former Ministries of Economic Development, Science + Innovation, and the Departments of Labour and Building and Housing.

ISBN 978-0-478-41385-4 (online)

August, 2013

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

# 1 INTRODUCTION

There is a growing demand for detailed information on tourism expenditure at a local level for decision making by the tourism industry, individuals and local government. Currently, up-to-date data is available on tourism expenditure at a national level but not at a regional or territorial authority (TA) level.

Tourism data is available from surveys such the International Visitor Survey (IVS) and the Domestic Travel Survey (DTS). However, these surveys are designed to estimate tourism expenditure at the national level (with a relative margin of error of around three to six per cent), not at detailed level.

The IVS collects information on the travel patterns and expenditure of international visitors to New Zealand at a national level. It is a sample survey of approximately 5,200 international visitors to New Zealand aged 15 years or older per year. Hence, the sample size for the survey makes estimates of expenditure at a detailed level less reliable.

The DTS is also a sample survey which measures expenditure and behaviours of domestic travelers within New Zealand surveying approximately 15,000 people aged 15 years and older per year. The DTS does not capture all types of household tourism expenditure. In addition, its sample size means that estimates at a detailed level are less reliable.

For reporting at a regional, industry or TA level, the Regional Tourism Indicators (RTI) are far superior to survey methods such as the IVS and the DTS. They use electronic card transactions (ECT) data as the source and are designed to provide timely data on domestic and international tourism spending in the various regions of New Zealand. However, the RTIs by themselves cannot provide actual spend figures, as they only represent a proportion of total tourism spend (as they monitor a sample of electronic transactions). For this reason, the Ministry of Business, Innovation and Employment (the Ministry) publishes the RTIs as an index which measures the change in expenditure rather than the actual dollars.

The Regional Tourism Estimates (RTEs) take the RTIs one step further by building on its advantages. They use the same electronic card transaction data used for the RTIs to produce estimated absolute dollar values (not indexes) of tourism expenditure which can be disaggregated at a detailed level e.g. by industry, visitors' country of origin, destination regions, Regional Tourism Organisation (RTOs) level and TA. To achieve this, the RTEs are based on the RTIs and are calibrated to the Tourism Satellite Account (TSA) by industry[1] and the IVS by visitor's country of origin.

This paper outlines the concepts and methodology behind the technique used to derive the RTEs along with selected regional results. It also looks at how robust the results are for publication to potential users of this data.

[1] Industry in the Tourism Satellite Account (TSA) is classified using the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC 06)

## 2 BACKGROUND

Prior to 2012, the Ministry published annual estimates of tourism expenditure (absolute values) at a regional level on its website. These were published as "New Zealand Regional Tourism Estimates 2006-2011" on the Ministry's website[2]. They were based on a wide range of tourism data including the IVS, DTS, and electronic transactions data. The methodology to derive the old regional tourism estimates used a complex smoothing and adjustment process to compensate for sample design, sample size characteristics, and shocks such as the February 2011 Christchurch earthquake.

There were many deficiencies with the old regional tourism estimates. These included large (but unestimated) sample errors and there was a need to revise historical data every year. This caused particular problems for stakeholders seeking a stable series to use for key performance indicators. The Ministry ceased the release of the "New Zealand Regional Tourism Estimates 2006-2011" in 2011.

Subsequently, the Sector Performance team at the Ministry started preliminary testing of a new and improved RTEs methodology in early 2013. This new approach built on the rapidly growing understanding of the electronic transaction data that form the basis of the Regional Tourism Indicators (RTIs), good practice statistical methodology, and estimates of total tourism size and industry makeup from the TSA that had not previously been utilised.

The RTEs are, therefore, based on the RTIs which have coverage of 70% for international tourism data and 20% for domestic tourism data. However, they will be updated each year leading to a revision of historical estimates. This is because the TSA is updated each year in October and only provisional figures are released in the first instance for a given year.

The Ministry tested the preliminary RTE results with stakeholders such as Regional Tourism Organisations (RTOs) and Tourism New Zealand (TNZ) in early 2013. Feedback from stakeholders indicates that there is a high demand for this information as there is no such tourism expenditure data presently available to users at the regional level. The preliminary RTEs have been shared with selected stakeholders under the proviso that they be used as "MBIE experimental analysis with further testing required".

In general, feedback from stakeholders has been very positive indicating that there is a very high demand for tourism expenditure at an RTO level. For example, some stakeholders have indicated that this information will assist them in applying for funding from local councils. Other stakeholders expressed concerns in relation to the robustness of the RTEs, which will be the subject of discussion in Section 6: "Results and validation".

[2] More details can be found at http://www.med.govt.nz/sectors-industries/tourism/tourism-research-data/other-research-and-reports/regional-data

# 3 DATA SOURCES

The three data sources used to derive the RTEs are: the Regional Tourism Indicators (which are sourced from electronic card transactions data), Statistics New Zealand's Tourism Satellite Account and the International Visitor Survey.

## 3.1 Regional Tourism Indicators (RTIs)

The Regional Tourism Indicators[3] (RTIs) were launched by the Ministry in December 2012. They use unit record electronic card transactions (ECT) data as the source. International RTI data is sourced from Paymark via Marketview. Approximately 70% of New Zealand retailers use the Paymark network. On the other hand, domestic RTI data is sourced from BNZ via Marketview. BNZ has around 20% share of the domestic electronic card market.

The RTI data includes:

- All debit, credit and charge card transactions with New Zealand based merchants.
- All card-present transactions at the point of sale, whether authorised by PIN or signature.
- 15% Goods and Services Tax (GST).

The RTI data excludes:

- Card-not-present transactions (payments of invoices, mail order, telephone and internet sales via credit card, direct debit from credit cards etc), where the card is not present directly at a point of sale terminal; credit card transactions with non-New Zealand-based merchants for example, via the internet or telephone mail order.
- Transactions by New Zealand card holders whilst overseas.
- Cash, cheques or hire purchase transactions.
- Automatic payments or direct debits from bank accounts.
- Internet bank account payments
- Withdrawals from ATMs.

## 3.2 Tourism Satellite Account (TSA)

Statistics NZ releases the TSA in October each year. The TSA provides a picture of the role tourism plays in New Zealand, with information on tourism's contribution to the New Zealand economy in terms of expenditure and employment. The source table for the purposes of this project is Table 7 of the 2012 TSA report[4] which is an aggregated table rather than unit record data. It shows tourism expenditure by industry and type of tourist for each year ending March which is used as margin totals for deriving the RTEs by industry[5].

## 3.3 International Visitor Survey (IVS)

The Ministry is responsible for releasing the IVS, although the data collection component is outsourced. The IVS provides accurate, quarterly national information on the characteristics, behaviour and expenditure of international visitors. It is a sample survey of approximately 5,200 international visitors to New Zealand aged 15 years or older per year[6].

---

[3] See http://www.med.govt.nz/sectors-industries/tourism/tourism-research-data/regional-tourism-indicators

[4] See http://www.stats.govt.nz/browse_for_stats/industry_sectors/Tourism/tourism-satellite-account-2012/tourism-expenditure.aspx

[5] Once the TSA is updated and available in October 2013, the software programs used to derive the RTEs will be updated to include the 2013 tourism expenditure figures.

[6] See http://www.med.govt.nz/sectors-industries/tourism/tourism-research-data/international-visitor-survey for more details on the IVS.

The margins that are used from the IVS to derive the RTEs are the visitors' country of origin totals for tourism expenditure. These country totals are aggregated from the unit record data. Details about the country groupings used are discussed further under Section 5: "Conceptual Issues".

# 4 ESTIMATION METHODOLOGY

The methodology to derive the RTEs uses the Iterative Proportional Fitting (IPF)[7] technique. New Zealand appears to be one of the leaders in using this methodology along with the use of electronic card transactions data to produce regional tourism indicators. Other countries, such as Australia, publish tourism expenditure data by tourism regions but use a different methodology than the IPF (Tourism Research Australia, 2011). To date, we have not been able to locate any literature from other countries in the use of the IPF to produce regional tourism estimates.

## 4.1 Iterative Proportional Fitting (IPF)

The IPF is more commonly known as the 'raking' technique. IPF is a procedure for adjusting a table of data cells so that they add up to selected totals for both the columns and rows (in the two-dimensional case) of the table. The method scales the cells in a contingency table formed from the RTI electronic card transactions unit record data so that their marginal totals equal totals estimated from the IVS and the TSA).

The unadjusted data cells may be referred to as the 'seed' cells, and the selected totals may be referred to as the 'marginal' totals. The key point to note here is that the IPF method adjusts the data so that groups which are underrepresented in the seed can be accurately represented in the final dataset.

The following example shows how the IPF works using a simple 2x2 table. The following is the "seed" data.

| | | |
|---|---|---|
| 7 | 5 | 12 |
| 3 | 11 | 14 |
| 10 | 16 | 26 |

The new margins are also known. This is the sample survey data. We do not know the individual cell counts from the survey data. Only totals are known.

| | | |
|---|---|---|
| | | 15 |
| | | 8 |
| 10 | 13 | 23 |

Our aim is to find out the values for the body of the table with the new margins which are consistent with the original table in terms of the cross product ratio. This can be achieved using the IPF algorithm.

**Step 1**

We multiply the row or column by the ratio of the margins. Hence, we multiply the top row by $\frac{15}{12}$ and the second row by $\frac{8}{14}$. This will adjust the cells in the table so that they sum to the column margin on the RHS. But this will not result in the correct row margin at the bottom.

[7] IPF was first proposed by Deming, W. and Stephan, F. (1940).

| | | |
|---|---|---|
| 8.75 | 6.25 | 15 |
| 1.714286 | 6.285714 | 8 |
| 10.46429 | 12.53571 | 23 |

**Step 2**

We will now multiply the columns by the equivalent ratios using the new table and the required new margin. Thus, we will multiply the left column by $\frac{10}{10.46429}$ and the right column by $\frac{13}{12.53571}$. The new result will have the correct row margin but the new column margin will now be incorrect.

| | | |
|---|---|---|
| 8.361775 | 6.481481 | 14.84326 |
| 1.638225 | 6.518519 | 8.156744 |
| 10 | 13 | 23 |

**Step 3**

We can continue this process until some convergence criterion is achieved. After 10 iterations, the following result is obtained. Detailed calculations are shown in Appendix B.

| | | |
|---|---|---|
| 8.407869 | 6.592097 | 14.99997 |
| 1.592131 | 6.407903 | 8.000033 |
| 10 | 13 | 23 |

### 4.2 The IPF applied to RTI domestic data

To apply the IPF to RTI domestic data, we first calculate RTI-TSA domestic tourism expenditure ratios or weights by industry using the RTI data and TSA margins. These ratios are then adjusted or 'raked' to ensure that the RTI domestic expenditure by industry sum up to match the TSA totals.

Tables 1-5 show how this two-stage process works for domestic tourism expenditure for the year ending March 2012[8].

To start with, Table 1 shows the original or raw RTI (electronic card transactions) domestic expenditure incurred by New Zealanders by industry for the year ending March 2012.

[8] The latest TSA report available at the time of writing is for the year ending March 2012. The 2013 TSA report will include provisional data for the year ending March 2013. However, this will not be available until October 2013.

**Table 1: RTI unadjusted domestic tourism expenditure for the year ending March 2012 by RTI industry, $ (million)**

| RTI INDUSTRY | Expenditure |
|---|---|
| Accommodation services | 170 |
| Cultural and recreational services | 45 |
| Food and beverage services | 171 |
| Food retailing | 289 |
| Fuel retailing | 158 |
| Non tourism-related | 281 |
| Other retailing | 547 |
| Transport (incl. Travel agency and tours) | 105 |
| **Total industry** | **1,767** |

Source: MBIE, Regional Tourism Indicators

Our goal is to produce adjustment factors for weighting up domestic expenditure data from the RTIs so that ultimately the data can be disaggregated at a detailed level but sum up to match the TSA domestic totals. We first reproduce Table 1 by presenting the RTI domestic expenditure data according to the industry groupings (product) in the TSA. This is shown in Table 2.

**Table 2: RTI unadjusted domestic expenditure for the year ending March 2012 by TSA product, $ (million)**

| PRODUCT | Expenditure |
|---|---|
| Accommodation services | 170 |
| Other tourism products | 327 |
| Food and beverage serving services | 171 |
| Retail sales - other | 836 |
| Retail sales - fuel and other automotive | 158 |
| Other passenger transport | 105 |
| **Total Industry** | **1,767** |

Source: MBIE, Regional Tourism Indicators

Table 3 shows the TSA-RTI industry ratios. These will be 'raked' or scaled up to match the TSA domestic demand totals.

**Table 3: TSA-RTI domestic expenditure ratios by industry for the year ending March 2012**

| PRODUCT | TSA Domestic Expenditure $ (million) | RTI Domestic Unweighted Expenditure $ (million) | TSA-RTI domestic expenditure ratio[a] |
|---|---|---|---|
| Accommodation services | 957 | 170 | 5.6 |
| Other tourism products | 1,310 | 327 | 4.0 |
| Food and beverage serving services | 1,232 | 171 | 7.2 |
| Retail sales - other | 3,659 | 836 | 4.4 |
| Retail sales - fuel and other automotive | 2,355 | 158 | 14.9 |
| Other passenger transport | 1,537 | 105 | 14.6 |
| **Total Industry** | **11,050** | **1,767** | **6.3** |

Note: Air Passenger Transport and Education Services are excluded. See Section 5: "Conceptual issues".

a The TSA-RTI ratios are correct to one decimal place. Hence, multiplying the ratios with the RTI domestic expenditure will not total to the exact TSA domestic expenditure by industry.

Source: Statistics New Zealand, 2012 Tourism Satellite Account

MBIE, Regional Tourism Indicators

The adjustment factors to weigh up RTI domestic expenditure to the TSA industry margins are the TSA-RTI ratios in Table 3. Table 4 shows the final weighted domestic expenditure for the year ending March 2012. This matches exactly with the TSA figures by industry (product).

**Table 4: Weighted domestic tourism expenditure for the year ending March 2012, $ (million)**

| PRODUCT | Expenditure |
|---|---|
| Accommodation services | 957 |
| Other tourism products | 1,310 |
| Food and beverage serving services | 1,232 |
| Retail sales - other | 3,659 |
| Retail sales - fuel and other automotive | 2,355 |
| Other passenger transport | 1,537 |
| **Total industry** | **11,050** |

Source: MBIE, Regional Tourism Estimates 2012

### 4.3 The IPF applied to RTI international data

To apply the IPF to RTI international tourism expenditure data, we first calculate RTI-TSA and RTI-IVS expenditure ratios by industry and by visitors' country of origin using the RTI data, TSA and IVS margins. These ratios are then adjusted or 'raked' to ensure that the RTI expenditure by industry sum up to match the TSA totals, and that the RTI expenditure by country sum up to match the IVS country totals.

Tables 5-10 show how this process works for international tourism expenditure data for the year ending 2012.

**Table 5: RTI unadjusted international expenditure for the year ending March 2012 by RTI industry and by visitors' country of origin, $ (million)**

| Industry | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accommodation services | 106 | 8 | 17 | 12 | 5 | 2 | 38 | 43 | 14 | 0 | 5 | 38 | 3 | **292** |
| Cultural and recreational services | 25 | 3 | 2 | 4 | 1 | 1 | 13 | 10 | 3 | 0 | 1 | 13 | 2 | **78** |
| Food and beverage services | 69 | 5 | 6 | 5 | 3 | 2 | 27 | 25 | 6 | 0 | 3 | 22 | 3 | **178** |
| Food retailing | 42 | 4 | 9 | 6 | 3 | 3 | 21 | 16 | 5 | 0 | 3 | 18 | 2 | **131** |
| Fuel retailing | 26 | 3 | 1 | 6 | 1 | 1 | 13 | 8 | 2 | 0 | 1 | 13 | 1 | **75** |
| Non tourism-related | 17 | 1 | 2 | 2 | 1 | 3 | 9 | 6 | 2 | 1 | 2 | 7 | 1 | **53** |
| Other retailing | 165 | 11 | 39 | 10 | 12 | 10 | 55 | 40 | 21 | 3 | 9 | 54 | 11 | **442** |
| Transport (incl. Travel agency and tours) | 82 | 8 | 8 | 12 | 3 | 3 | 39 | 26 | 12 | 0 | 5 | 42 | 3 | **245** |
| **Total Industry** | **532** | **43** | **85** | **56** | **29** | **23** | **217** | **175** | **66** | **5** | **29** | **206** | **27** | **1,494** |

Source: MBIE, Regional Tourism Indicators

We reconstruct Table 5 using the TSA ANZSIC industry grouping (product). This is shown in Table 6.

**Table 6: RTI unadjusted international expenditure for the year ending March 2012 by TSA product and by visitors' country of origin, $ (million)**

| TSA product | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accommodation services | 106 | 8 | 17 | 12 | 5 | 2 | 38 | 43 | 14 | 0 | 3 | 5 | 38 | **292** |
| Other tourism products | 42 | 4 | 4 | 6 | 2 | 3 | 22 | 16 | 5 | 1 | 3 | 3 | 20 | **130** |
| Food and beverage serving services | 69 | 5 | 6 | 5 | 3 | 2 | 27 | 25 | 6 | 0 | 3 | 3 | 22 | **178** |
| Retail sales - other | 207 | 15 | 49 | 16 | 14 | 13 | 77 | 57 | 26 | 3 | 13 | 12 | 72 | **573** |
| Retail sales - fuel and other automotive | 26 | 3 | 1 | 6 | 1 | 1 | 13 | 8 | 2 | 0 | 1 | 1 | 13 | **75** |
| Other passenger transport | 82 | 8 | 8 | 12 | 3 | 3 | 39 | 26 | 12 | 0 | 3 | 5 | 42 | **245** |
| **Total industry** | **532** | **43** | **85** | **56** | **29** | **23** | **217** | **175** | **66** | **5** | **27** | **29** | **206** | **1,494** |

Source: MBIE, Regional Tourism Indicators

Table 7 shows the TSA-RTI industry ratios for international tourism expenditure for the year ending March 2012.

**Table 7: TSA-RTI international expenditure ratios by TSA product for the year ending March 2012**

| TSA PRODUCT | TSA International Expenditure $ (million) | RTI International Unweighted Expenditure $ (million) | TSA-RTI industry ratio[a] |
|---|---|---|---|
| Accommodation services | 1,107 | 292 | 3.8 |
| Other tourism products | 729 | 130 | 5.6 |
| Food and beverage serving services | 1,668 | 178 | 9.4 |
| Retail sales - other | 1,459 | 573 | 2.5 |
| Retail sales - fuel and other automotive | 388 | 75 | 5.2 |
| Other passenger transport | 862 | 245 | 3.5 |
| **Total Industry** | **6,213** | **1,494** | **4.2** |

Note: Air Passenger Transport and Education Services are excluded. See Section 5: "Conceptual issues".

a The TSA-RTI ratios are correct to one decimal place. Hence, multiplying the ratios with the RTI international expenditure will not total to the exact TSA domestic expenditure by industry

Sources: Statistics New Zealand, 2012 Tourism Satellite Account

MBIE, Regional Tourism Indicators

Table 8 shows the IVS-RTI country ratios for international tourism expenditure for the year ending March 2012.

**Table 8: TSA-RTI international expenditure ratios by IVS country for the year ending March 2012**

| Country | IVS tourism expenditure $ (million) | RTI International Unweighted Expenditure $ (million) | IVS-RTI country ratio[a] |
|---|---|---|---|
| Australia | 1,649 | 532 | 3.1 |
| United Kingdom | 567 | 217 | 2.6 |
| USA | 454 | 175 | 2.6 |
| Japan | 224 | 29 | 7.7 |
| Republic of Korea | 130 | 23 | 5.7 |
| People's Republic of China | 473 | 85 | 5.6 |
| Germany | 213 | 56 | 3.8 |
| Canada | 122 | 43 | 2.8 |
| Rest of Asia | 565 | 66 | 8.6 |
| Rest of Americas | 102 | 29 | 3.5 |
| Rest of Europe | 612 | 27 | 22.7 |
| Rest of Oceania | 229 | 5 | 45.8 |
| Africa and Middle East | 294 | 206 | 1.4 |
| **Total** | **5,635** | **1,494** | **3.8** |

a The IVS-RTI ratios are correct to one decimal place. Hence, multiplying the ratios with the RTI international expenditure will not total to the exact IVS expenditure by country

Sources: MBIE, International Visitor Survey, year ended March 2012

MBIE, Regional Tourism Indicators, year ended March 2012

The original weights in Tables 7 and 8 reflect the different propensity for credit card use in different industries and by tourists of different origins. For example, Chinese and Japanese visitors

spend less via electronic card transactions, hence have a high IVS/RTI ratio and a high adjustment factor compared to other countries of origin. Similarly, food and beverage services have a relatively low degree of electronic card spend and receive a high adjustment factor compared to other industries.

The raking procedure then combines the weights in Tables 7 and 8 to produce an optimal adjustment factor for each combination of industry and country of origin. The final raked adjustment factors by industry and visitors' country of origin are shown in Table 9.

**Table 9: Adjustment factors for international tourism expenditure for the year ending March 2012**

| TSA PRODUCT | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accommodation services | 3.1 | 2.8 | 6.7 | 3.8 | 8.6 | 6.4 | 2.6 | 9.6 | 9.6 | 56.1 | 4.0 | 9.6 | 3.0 |
| Other tourism products | 4.5 | 4.0 | 9.7 | 5.5 | 12.4 | 9.2 | 3.7 | 13.9 | 13.9 | 81.0 | 5.8 | 13.9 | 4.4 |
| Food and beverage serving services | 8.0 | 7.1 | 17.1 | 9.7 | 21.9 | 16.3 | 6.6 | 24.5 | 24.5 | 142.6 | 10.2 | 24.5 | 7.7 |
| Retail sales - other | 1.9 | 1.7 | 4.0 | 2.3 | 5.2 | 3.8 | 1.6 | 5.8 | 5.8 | 33.7 | 2.4 | 5.8 | 1.8 |
| Retail sales - fuel and other automotive | 4.5 | 4.1 | 9.8 | 5.5 | 12.5 | 9.3 | 3.8 | 14.0 | 14.0 | 81.4 | 5.8 | 14.0 | 4.4 |
| Other passenger transport | 2.9 | 2.6 | 6.3 | 3.6 | 8.0 | 6.0 | 2.4 | 9.0 | 9.0 | 52.2 | 3.7 | 9.0 | 2.8 |

Source: MBIE and Statistics New Zealand

Table 10 shows the final weighted international tourism expenditure for the year ended March 2012.

**Table 10: Weighted international tourism expenditure by TSA product and by IVS country of origin for the year ending March 2012, $ (million)**

| TSA PRODUCT | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Accommodation services | 333 | 23 | 116 | 47 | 45 | 10 | 99 | 108 | 124 | 21 | 14 | 52 | 114 | **1,107** |
| Other tourism products | 190 | 17 | 38 | 32 | 24 | 29 | 84 | 58 | 72 | 45 | 16 | 39 | 86 | **729** |
| Food and beverage serving services | 548 | 38 | 109 | 45 | 69 | 30 | 180 | 159 | 146 | 43 | 34 | 94 | 171 | **1,668** |
| Retail sales - other | 390 | 25 | 196 | 36 | 74 | 49 | 119 | 85 | 147 | 102 | 31 | 74 | 130 | **1,459** |
| Retail sales - fuel and other automotive | 119 | 11 | 14 | 31 | 10 | 7 | 48 | 29 | 26 | 16 | 5 | 17 | 57 | **388** |
| Other passenger transport | 238 | 20 | 48 | 43 | 25 | 19 | 95 | 62 | 108 | 26 | 13 | 48 | 117 | **862** |
| **Total country** | **1,818** | **135** | **521** | **235** | **247** | **144** | **626** | **501** | **623** | **252** | **112** | **324** | **675** | **6,213** |

Source: MBIE, Statistics New Zealand

From Table 10, we see that total international tourism expenditure for the year ending March 2012 was $6,213 million, which is much higher than the total from the IVS shown in Table 8 of $5,635 million. The difference of $578 million is international tourism expenditure that is accounted for in the TSA but not in the IVS[9]. The TSA's total was chosen over the IVS as it draws on more sources of data and is the definitive analysis of the importance of tourism for the economy.

Once the weights have been created, the results in Table 10 can be further disaggregated to detailed regional levels such as by TA, regional council, RTO level etc. This is made possible by the fact that the RTI data can be broken down to granular regional breakdowns. Chapter 6 contains the results and a discussion on how robust they are for practical use.

[9] The IVS does not capture education services or air passenger transport and both these expenditures have been excluded from the analysis. Despite this, there is a difference of $578 million between the two data sources, which are due to other expenditure accounted for in the TSA and not in the IVS.

# 5 CONCEPTUAL ISSUES

The key strength of the RTEs is that they are available in absolute dollars at a detailed regional level. Hence, stakeholders such as Regional Tourism Organisations (RTOs) will be able to make more informed decisions with such granular level information at hand. Having said that, RTEs are limited to some degree by a few conceptual issues, which users should be aware of. Users should also note the assumptions of the IPF methodology. In this section, we discuss the conceptual issues and assumptions. We also explain how we have dealt with them, wherever possible.

## 5.1 Airfares

Air passenger transport for both domestic and international markets is excluded in the derivation of the RTEs. This means even the airfares component of education services is excluded. The rationale for doing that is that airfares are excluded in the IVS and (mostly) in the RTI data, and attribution to regions would be problematic or impossible.

## 5.2 Education services

The TSA provides margin totals for education services for each year ending March. Education services refer to tourism expenditure by international students in New Zealand for less than 12 months and is the sum of expenditure on course fees, living costs, and airfares.

For the derivation of the RTEs, we exclude the airfares component from education services and include only course fees, living costs and accommodation expenditure. We use the proportions supplied by Statistics New Zealand as shown in Table 11, i.e., the sum of proportions for course fees, living costs and accommodation.

As an example, for the year ending March 2012, the margin total we use for education services for international expenditure is $572 million [(0.34+0.54) 88% of $650 million[10]]. The rationale for doing this is that the airfares component in education services is excluded in the RTI data.

**Table 11: Breakdown of education services expenditure by international students, year ending March 2009-2012**

| Year | Course Fees | Living costs/Accommodation | Airfares |
|---|---|---|---|
| 2009 | 0.33 | 0.53 | 0.15 |
| 2010 | 0.33 | 0.53 | 0.14 |
| 2011 | 0.34 | 0.54 | 0.12 |
| 2012 | 0.34 | 0.54 | 0.12 |

Source: Statistics New Zealand

The RTI source data recorded as education includes very little of what the TSA includes as the living costs/accommodation component. This is why it has such a high adjustment factor in Tables 7 and 9.

After deriving the education services expenditure at a regional level, we decided that the spend results were too small and unreliable for publication at a detailed level. As a result, we decided to exclude education services completely from our analysis.

[10] $650 million is obtained from Table 7 of 2012 TSA report.

### 5.3 Goods and Services Tax (GST)

In the TSA, expenditure incurred from GST is shown separately. This is because all monetary aggregates presented in the TSA are in producers' prices, unless otherwise stated. Producers' prices are the amounts producers receive for selling their products. For this reason, they are exclusive of GST. For consistency, in calculating the weights and adjustment factors for the RTEs, we use the GST exclusive TSA margin totals.

The RTI data, on the other hand, includes GST. Since the distribution of GST across regions or TAs is not considered to be a substantial issue for the purposes of this project, and is likely to very closely follow total spend in any event, we have made the decision to exclude GST entirely in the derivation of the RTEs. This ensures that final aggregates of the RTEs will match with TSA non-GST totals.

### 5.4 Visitors' country of origin

For consistency with the IVS, we use the following country groupings to disaggregate the RTEs: Australia, People's Republic of China, Germany, United States of America, Japan, Republic of Korea, Canada, UK, Rest of Europe, Rest of Asia, Rest of Oceania, Africa and Middle East and Rest of Americas. These are the 13 individual countries of origin included in the post-stratification weighting regime of the upcoming new International Visitor Survey, and hence the markets for which the estimates of total spend in New Zealand are most reliable.

### 5.5 Domestic and government demand, and household demand

Domestic tourism expenditure in the TSA is disaggregated as "business and government demand" and "household demand"[11]. The RTIs cannot separate business or government transactions from those by households. Hence, for the purposes of this project, we assume that the distribution of domestic expenditure under "business and government demand" and "household demand" is similar across regions.

### 5.6 Other IPF assumptions

The IPF methodology forces a number of additional assumptions. We assume that:

- The weights and adjustment factors by the visitors' country of origin can be applied across destination regions. In other words, we assume that the propensity to use electronic card transactions by industry and by visitors' country of origin is similar across destination regions in New Zealand.
- There is no interaction between visitors' country of origin and industry propensity to use electronic transactions. For example, the weighting method takes into account that Japanese are, in general, less likely to use electronic means of making transactions than the Australians. We have to assume that this difference is the same in each industry.

[11] [11] See http://www.stats.govt.nz/browse_for_stats/industry_sectors/Tourism/tourism-satellite-account-2012/tourism-expenditure.aspx

# 6 RESULTS AND VALIDATION

In this section, we discuss the RTE results and test their validity by comparing them to other tourism expenditure indicators. We show only selected results at a regional level. Further disaggregated results are available in Appendix C, although full data tables will be available on the Ministry's website in September 2013.

## 6.1 Comparing domestic RTE spend with TSA

Table 12 shows the domestic RTEs by regional council and by TSA ANZSIC group for the year ending March 2012. Region here is classified as Statistics New Zealand's regional council. From an RTI perspective, the regional council are destination regions as they reflect the region where users of electronic card transactions have spent their money. The industry totals for domestic expenditure match the TSA industry totals as discussed earlier in Chapter 4 (shown in Table 12 in shaded colour).

In 2012, domestic tourism expenditure varied by region reflecting the nature and significance of the domestic tourism industry in that region. Auckland, Waikato, Wellington and Canterbury had the largest contribution to domestic tourism expenditure in 2012. Domestic tourism expenditure in Auckland was mainly in other retail sales, other passenger transport and other tourism products.

**Table 12: Domestic RTEs spend by regional council and by TSA ANZSIC group for the year ending March 2012, $ (million)**

| Region | Accommodation | Food and beverage serving services | Other passenger transport | Other tourism products | Retail sales - fuel and other automotive | Retail sales - other | Total |
|---|---|---|---|---|---|---|---|
| Auckland | 138.1 | 211.8 | 540.1 | 349.1 | 241.4 | 828.0 | **2,308.6** |
| Bay of Plenty | 82.8 | 90.6 | 51.3 | 74.0 | 204.8 | 261.7 | **765.2** |
| Canterbury | 125.6 | 152.6 | 185.1 | 123.0 | 316.3 | 407.9 | **1,310.6** |
| Gisborne | 9.9 | 7.3 | 4.2 | 2.1 | 15.6 | 19.9 | **59.0** |
| Hawke's Bay | 38.1 | 44.2 | 32.1 | 140.4 | 89.4 | 126.0 | **470.1** |
| Manawatu-Wanganui | 47.4 | 68.8 | 45.0 | 67.8 | 214.6 | 217.7 | **661.2** |
| Marlborough | 24.7 | 18.0 | 25.8 | 5.7 | 45.8 | 52.5 | **172.6** |
| Nelson | 13.6 | 13.2 | 12.6 | 4.8 | 29.1 | 35.8 | **109.2** |
| Northland | 44.7 | 45.6 | 29.8 | 30.4 | 130.1 | 151.8 | **432.4** |
| Otago | 122.2 | 140.1 | 93.1 | 94.0 | 182.5 | 337.0 | **968.8** |
| Southland | 29.0 | 32.7 | 21.6 | 21.3 | 79.7 | 106.5 | **290.9** |
| Taranaki | 25.0 | 17.8 | 20.6 | 17.4 | 48.8 | 59.4 | **189.0** |
| Tasman | 20.2 | 33.2 | 31.3 | 22.4 | 37.0 | 129.6 | **273.7** |
| Waikato | 109.1 | 163.6 | 89.3 | 112.2 | 475.9 | 474.3 | **1,424.4** |
| Wellington | 100.1 | 179.0 | 339.0 | 239.7 | 198.0 | 412.5 | **1,468.3** |
| West Coast | 26.5 | 13.3 | 16.1 | 5.6 | 46.0 | 38.4 | **145.9** |
| **Total RTEs** | **957.0** | **1,232.0** | **1,537.0** | **1,310.0** | **2,355.0** | **659.0** | **11,050.0** |
| **Total TSA** | **957.0** | **1,232.0** | **1,537.0** | **1,310.0** | **2,355.0** | **659.0** | **11,050.0** |

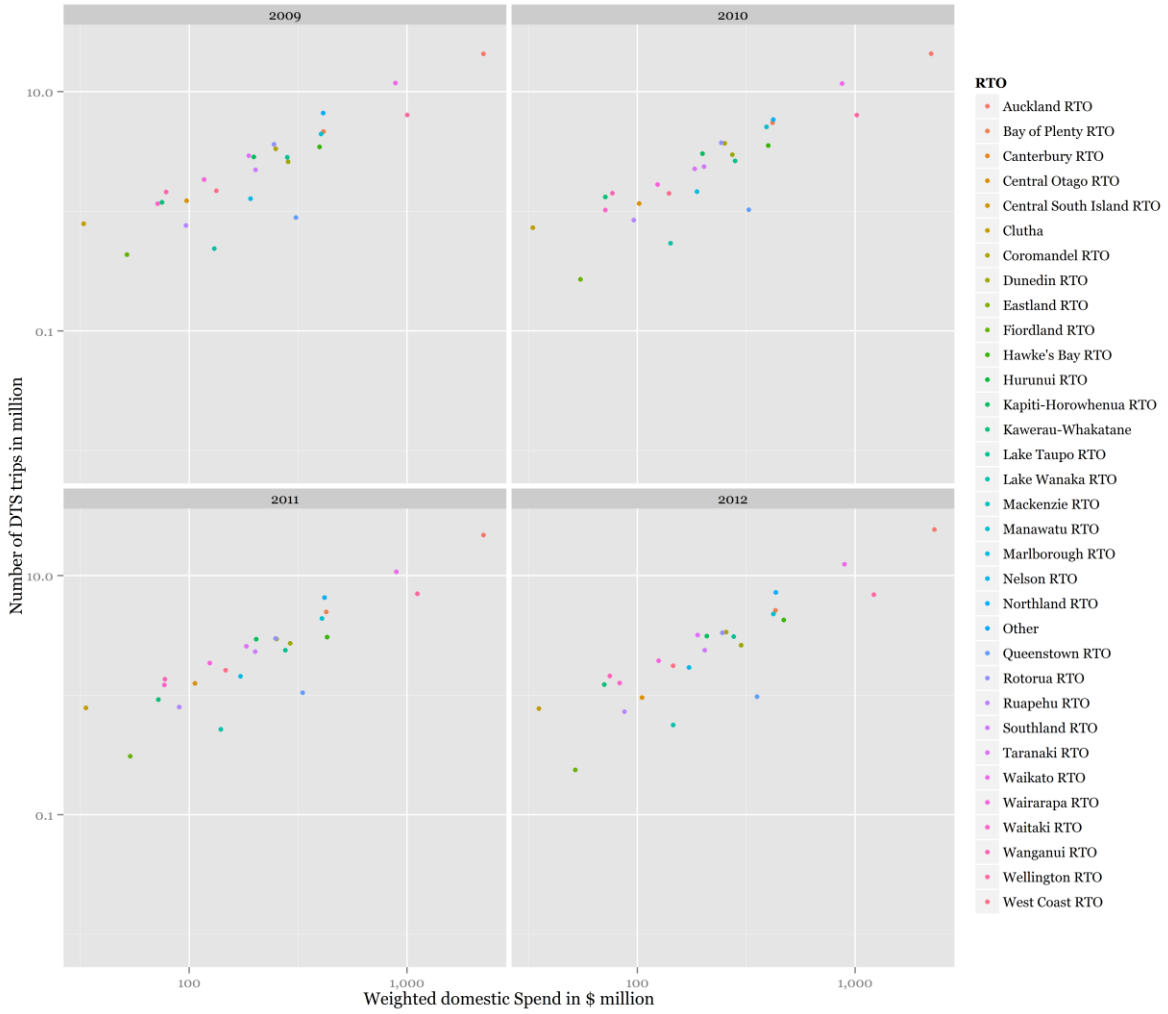
Source: MBIE, Regional Tourism Estimates, 2012

Statistics New Zealand, TSA report 2012

## 6.2 Comparing domestic RTE spend with DTS trips

We compare the RTEs domestic tourism expenditure with the number of trips from the Domestic Travel Survey (DTS). Figure 1 shows the results for the years ending March 2009-2012 for each RTO. The four scatterplots clearly depict a linear relationship between the DTS trips and domestic RTE expenditure, as one would expect.

**Figure 1: DTS trips and RTE domestic spend by RTO, years ending March 2009-2012**




Source: MBIE, Regional Tourism Estimates and Domestic Travel Survey

## 6.3 Comparing international RTE spend with IVS

Auckland, Otago and Canterbury had the highest international tourism expenditure in 2012. In Auckland, international expenditure was mostly contributed by visitors from Australia and "Other" countries. "Other" includes visitors from Taiwan, Singapore and other countries not included elsewhere. As shown in Table 13 in the shaded row, the international RTEs by country are not equal to the IVS tourism expenditure by country. This is expected as the TSA captures other expenditure that the IVS does not. Understandably, the totals from the two measures will not match. We recommend readers to use caution so that they do not get confused between the totals for the RTEs and the IVS.

**Table 13: International RTE Spend by visitors' country of origin and regional council for the year ending March 2012, ($ million)**

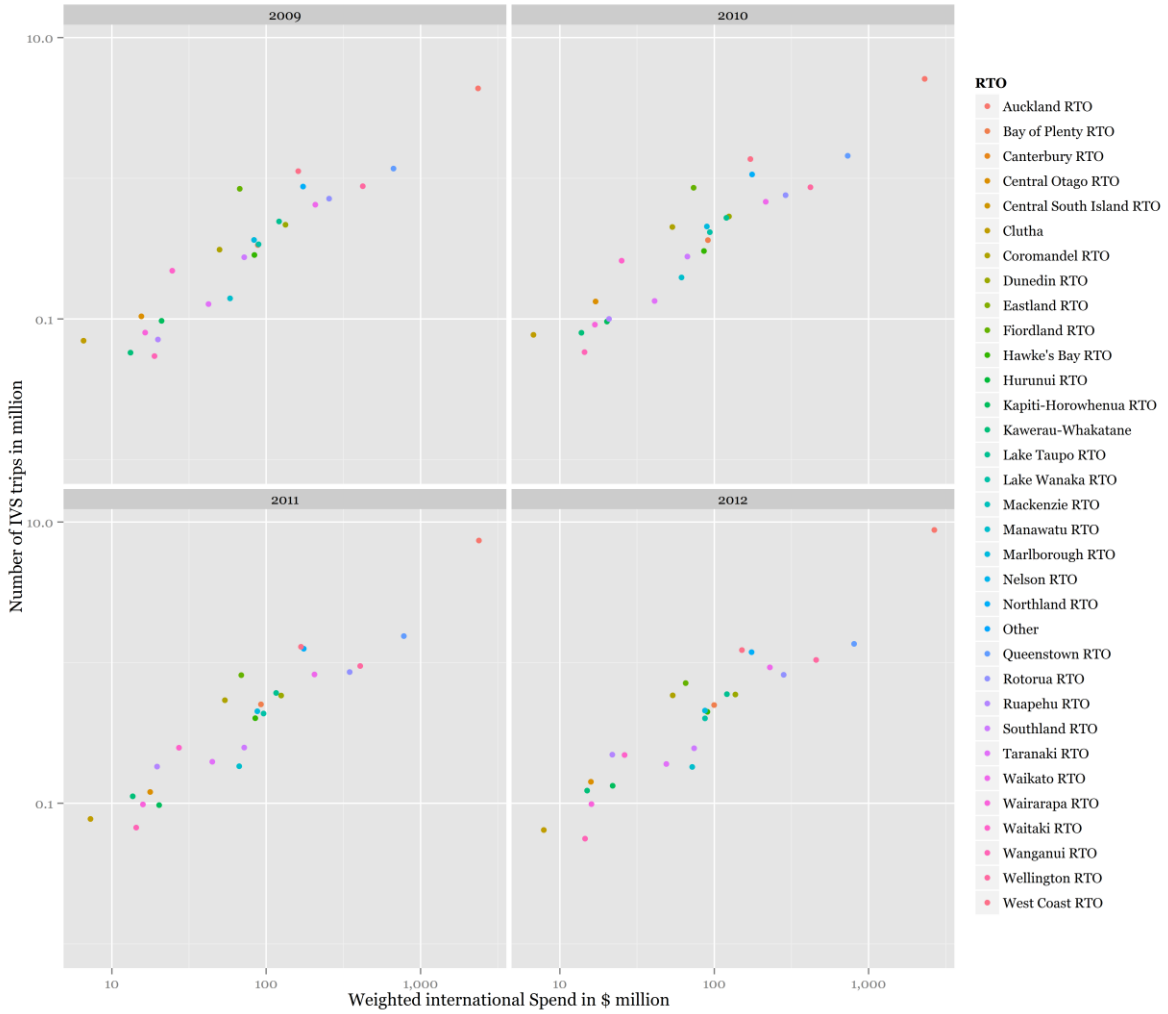
| Region | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Auckland | 624 | 41 | 301 | 55 | 117 | 72 | 198 | 161 | 262 | 191 | 53 | 150 | 241 | **2,467** |
| Bay of Plenty | 84 | 10 | 64 | 13 | 10 | 30 | 36 | 24 | 32 | 9 | 7 | 17 | 41 | **376** |
| Canterbury | 216 | 13 | 31 | 31 | 35 | 12 | 70 | 60 | 88 | 8 | 7 | 26 | 72 | **669** |
| Gisborne | 5 | 1 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 2 | **14** |
| Hawke's Bay | 29 | 3 | 3 | 4 | 4 | 0 | 14 | 8 | 5 | 2 | 1 | 5 | 10 | **87** |
| Manawatu-Wanganui | 26 | 2 | 3 | 5 | 3 | 1 | 9 | 6 | 6 | 4 | 2 | 4 | 10 | **79** |
| Marlborough | 26 | 3 | 2 | 6 | 1 | 0 | 12 | 9 | 4 | 1 | 1 | 4 | 12 | **81** |
| Nelson | 13 | 3 | 1 | 8 | 1 | 0 | 11 | 8 | 3 | 4 | 1 | 2 | 13 | **68** |
| Northland | 47 | 7 | 3 | 14 | 3 | 1 | 27 | 15 | 7 | 2 | 2 | 7 | 25 | **159** |
| Otago | 364 | 20 | 68 | 34 | 41 | 21 | 97 | 94 | 116 | 4 | 21 | 35 | 99 | **1,012** |
| Southland | 37 | 3 | 5 | 11 | 4 | 1 | 15 | 13 | 12 | 1 | 2 | 5 | 23 | **131** |
| Taranaki | 19 | 2 | 1 | 2 | 1 | 0 | 6 | 4 | 5 | 1 | 1 | 3 | 4 | **48** |
| Tasman | 17 | 3 | 2 | 6 | 3 | 0 | 11 | 8 | 4 | 1 | 1 | 4 | 11 | **69** |
| Waikato | 98 | 10 | 13 | 19 | 11 | 3 | 46 | 28 | 24 | 11 | 6 | 19 | 43 | **331** |
| Wellington | 176 | 12 | 18 | 16 | 12 | 3 | 54 | 49 | 42 | 14 | 7 | 36 | 46 | **482** |
| West Coast | 37 | 4 | 7 | 12 | 1 | 1 | 19 | 15 | 15 | 1 | 2 | 5 | 24 | **141** |
| **Total RTEs** | **1,818** | **135** | **521** | **235** | **247** | **144** | **626** | **501** | **623** | **252** | **112** | **324** | **675** | **6,213** |
| **Total IVS** | **1,649** | **122** | **473** | **213** | **224** | **130** | **567** | **454** | **565** | **229** | **102** | **294** | **612** | **5,635** |

Source: Regional Tourism Estimates 2012

International Visitor Survey for the year ending March 2012

Figure 2 shows that for each year, there is a strong relationship between the number of trips made by overseas visitors by RTO sourced from the IVS and the RTE expenditure by RTO. This provides reasonable confidence that the RTE estimates are what one would expect at the RTO level.

**Figure 2: RTE international spend and IVS visits, 2009-2012**




Source: MBIE, Regional Tourism Estimates

MBIE, International Visitor Survey

## 6.4 Comparing total RTE spend with regional GDP

We compare total (i.e. both domestic and international) RTE with Statistics New Zealand's regional GDP for the year ending March 2009 and 2010[12]. Table 14 shows the ratio of the two expenditures by region. Note that regional GDP and RTEs cannot be directly compared because regional GDP is a flow measure while the RTEs are a stock measure[13]. Regional GDP[14] is a measure of value added expenditure – i.e. it shows the value added in both tourism and non-tourism expenditure while the RTEs show total tourism expenditure at the end of a given year. Even though the two measures are not directly comparable, we are interested in observing the trend of the two series. The ratios of the two measures are consistent for the two years, which provides validity that the RTEs are stable at least for those two years.

[12] Regional GDP data is available only for years ending March 2007-2010 at the time of writing. Since the RTEs are also available only for 2009-2012 at this stage, comparisons between the two expenditures can only be made for years ending March 2009 and 2010.

[13] See http://www.stats.govt.nz/browse_for_stats/industry_sectors/Tourism/tourism-satellite-account-2012.aspx. Figure 1 of the 2012 Tourism Satellite Account Report shows that direct tourism value added was 26.5% of total tourism expenditure in the year ended March 2012.

[14] See http://www.stats.govt.nz/browse_for_stats/economic_indicators/NationalAccounts/RegionalGDP_MRYeMar0710.aspx

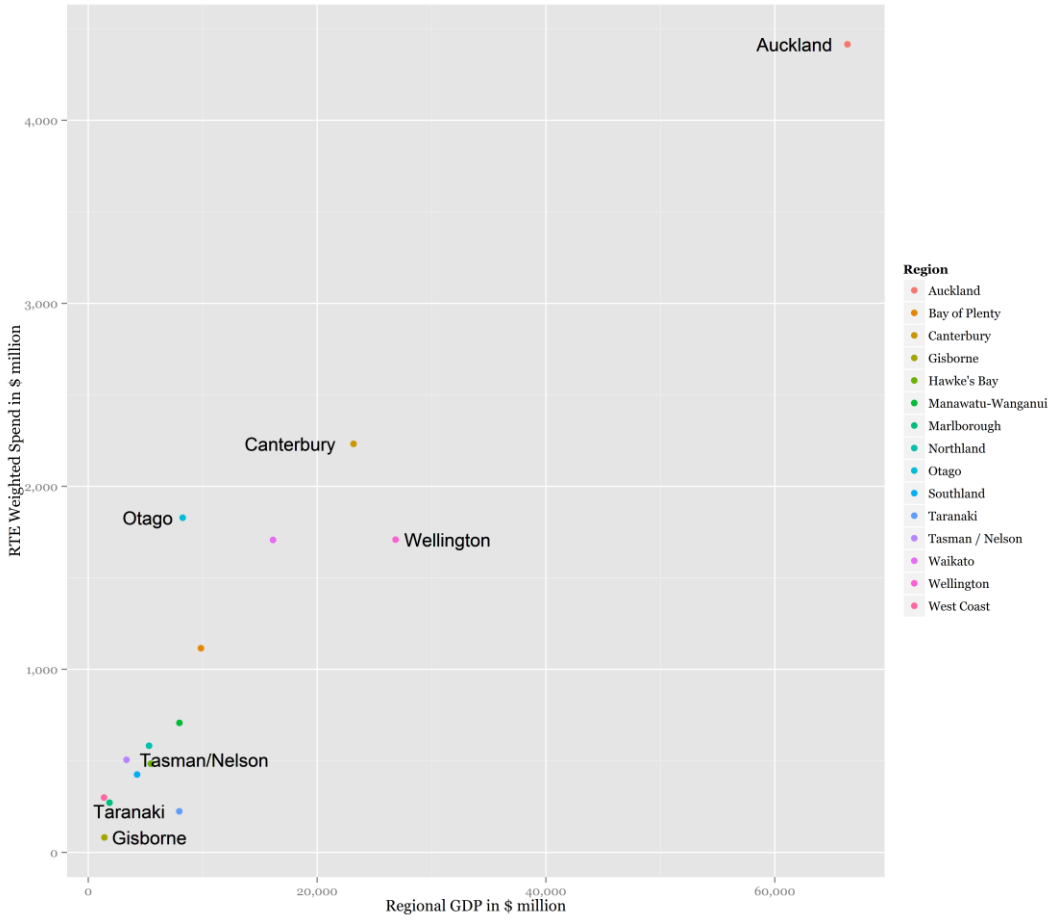
**Table 14: Comparing regional GDP with RTE spend, March 2009 and 2010**

| Region | Regional GDP ($ million) | | RTEs ($ million) | | Ratio of GDP to RTE | |
|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2009 | 2010 | 2009 | 2010 |
| Northland | 5,415 | 5,323 | 574 | 582 | 9.4 | 9.1 |
| Auckland | 65,016 | 66,347 | 4,427 | 4,415 | 14.7 | 15.0 |
| Waikato | 16,321 | 16,150 | 1,721 | 1,707 | 9.5 | 9.5 |
| Bay of Plenty | 9,523 | 9,859 | 1,092 | 1,115 | 8.7 | 8.8 |
| Gisborne | 1,381 | 1,413 | 80 | 81 | 17.3 | 17.4 |
| Hawke's Bay | 5,375 | 5,478 | 479 | 484 | 11.2 | 11.3 |
| Taranaki | 8,354 | 7,959 | 230 | 224 | 36.4 | 35.6 |
| Manawatu-Wanganui | 7,523 | 7,978 | 723 | 707 | 10.4 | 11.3 |
| Wellington | 25,700 | 26,858 | 1,686 | 1,708 | 15.2 | 15.7 |
| Tasman / Nelson | 3,198 | 3,356 | 494 | 505 | 6.5 | 6.7 |
| Marlborough | 1,908 | 1,864 | 270 | 271 | 7.1 | 6.9 |
| West Coast | 1,453 | 1,395 | 284 | 299 | 5.1 | 4.7 |
| Canterbury | 22,419 | 23,188 | 2,232 | 2,232 | 10.0 | 10.4 |
| Otago | 7,863 | 8,270 | 1,748 | 1,828 | 4.5 | 4.5 |
| Southland | 4,106 | 4,279 | 423 | 425 | 9.7 | 10.1 |
| **Total** | **185,555** | **189,718** | **16,462** | **16,581** | **11.3** | **11.4** |

Source: MBIE and Statistics New Zealand

Figure 3 shows the 2010 comparison between regional GDP and RTEs in a graph. In general, there is the expected linear relationship between the two, showing higher estimated tourism spend in regions with higher GDP.

**Figure 3: Regional GDP and RTE spend for the year ending March 2010.**

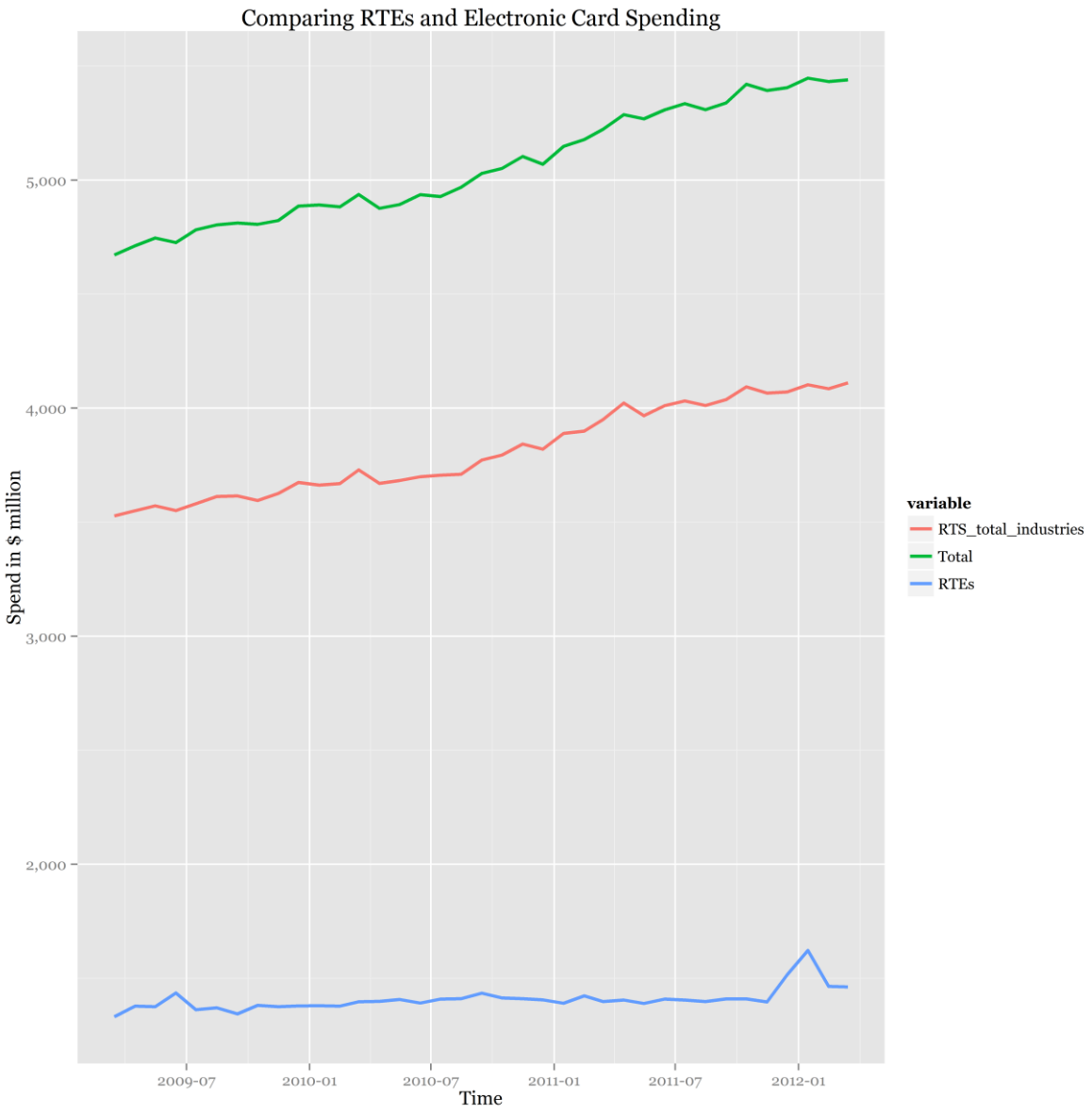



Source: Statistics New Zealand and MBIE

## 6.5 Comparing RTE spend with Electronic Card Transactions (ECT)

Figure 4 shows seasonally adjusted monthly RTEs in comparison with Statistics New Zealand's seasonally adjusted monthly series of total retail spending (RTS total industries) and total ECT expenditure[15] (total). The RTEs appear to be tracking as expected given that they have a lower coverage than the ECT and the RTS.

**Figure 4: Comparison of RTEs with Statistics New Zealand's ECT data, seasonally adjusted monthly series, Mar 2009 - Mar 2012**




Source: MBIE, Regional Tourism Estimates

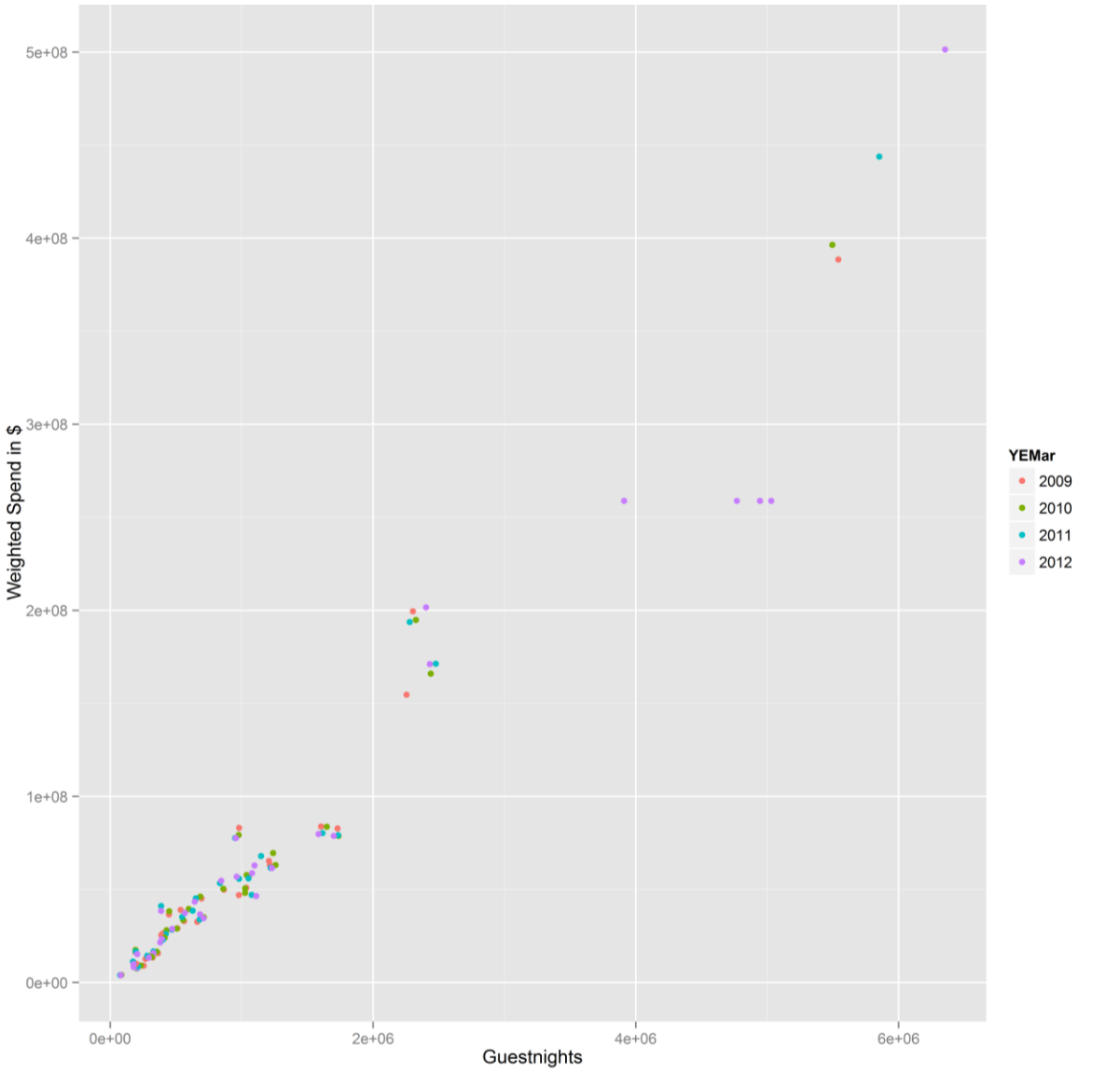
## 6.6 Comparing with Commercial Accommodation Monitor (CAM)

Figure 5 compares the domestic and international RTEs on accommodation with Statistics New Zealand's Commercial Accommodation Monitor (CAM) for the years ending 2009-2012. The CAM is a census (i.e. not a sample) of all short-term commercial accommodation units. The survey provides monthly data on capacity, occupancy rates, guest nights and origin of guests (domestic or

[15] Data on ECT can be extracted from Statistics New Zealand's Infoshare. See http://www.stats.govt.nz/browse_for_stats/businesses/business_characteristics/electronic-card-transactions-info-releases.aspx

international) at a national and regional level. Clearly, there is a strong correlation between the two datasets for all RTOs, which gives confidence that the RTEs are robust.

**Figure 5: RTE accommodation spend and Commercial Accommodation Monitor (CAM) guest nights, for years ending March 2009-2012 for all RTOs**



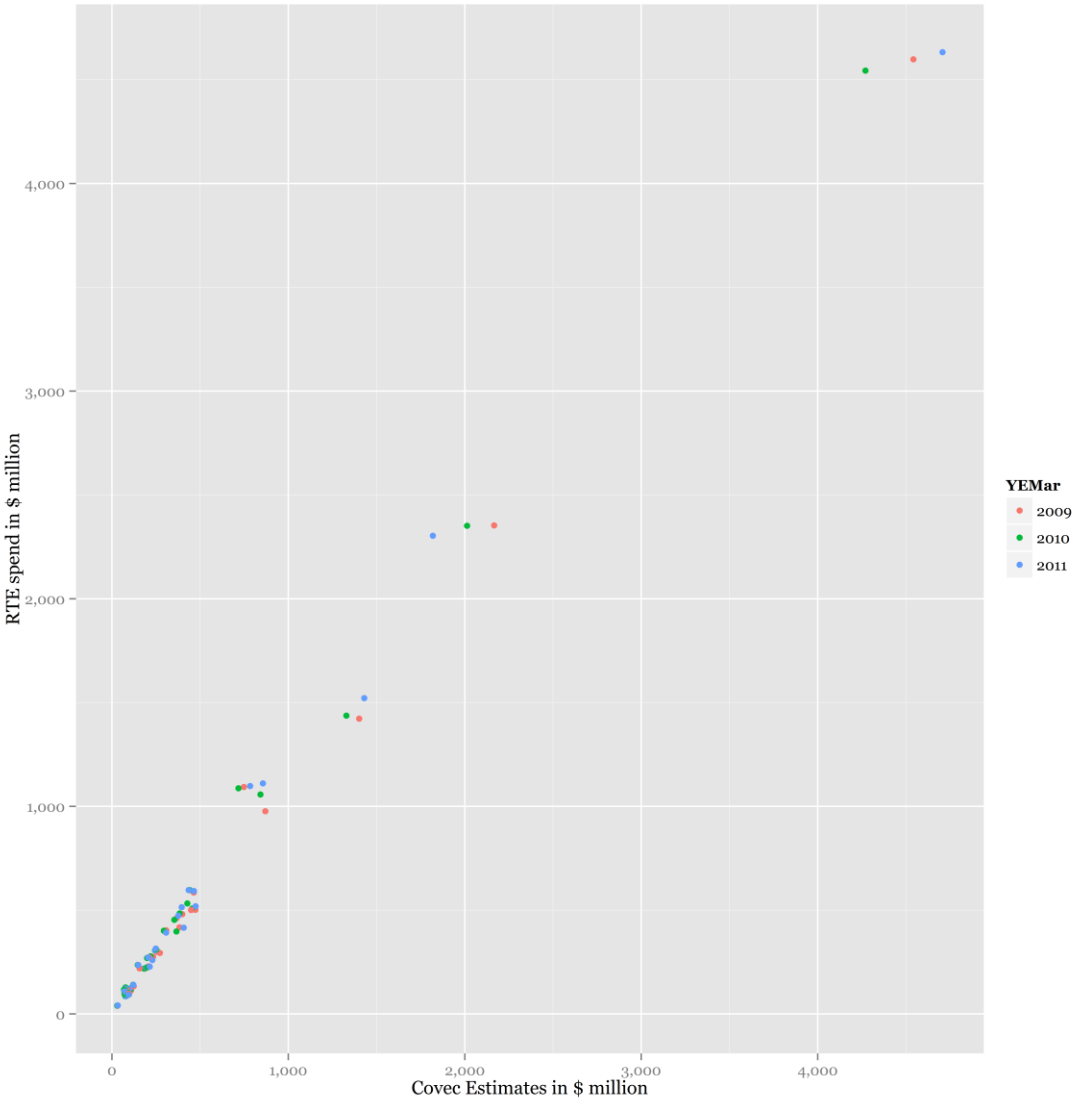

Source: Statistics New Zealand, Commercial Accommodation Monitor (CAM)

MBIE, Regional Tourism Estimates

### 6.7 Comparing with Covec Regional Tourism Estimates 2006-2011

As discussed earlier in "Section 2: Background", the Ministry produced regional estimates of tourism expenditure prior to 2012. The Ministry commissioned Covec to produce these forecasts. They can be downloaded from the Ministry's website for the 2006-2011 March years. We compare the Covec estimates for 2009-2011 with the RTEs. Figure 6 shows a graph for all the RTOs, with Auckland standing out in the far top right corner. The two estimates clearly align closely with each other.

**Figure 6: Covec spend and RTE spend for all RTOs, for the years ending March 2009-2011**

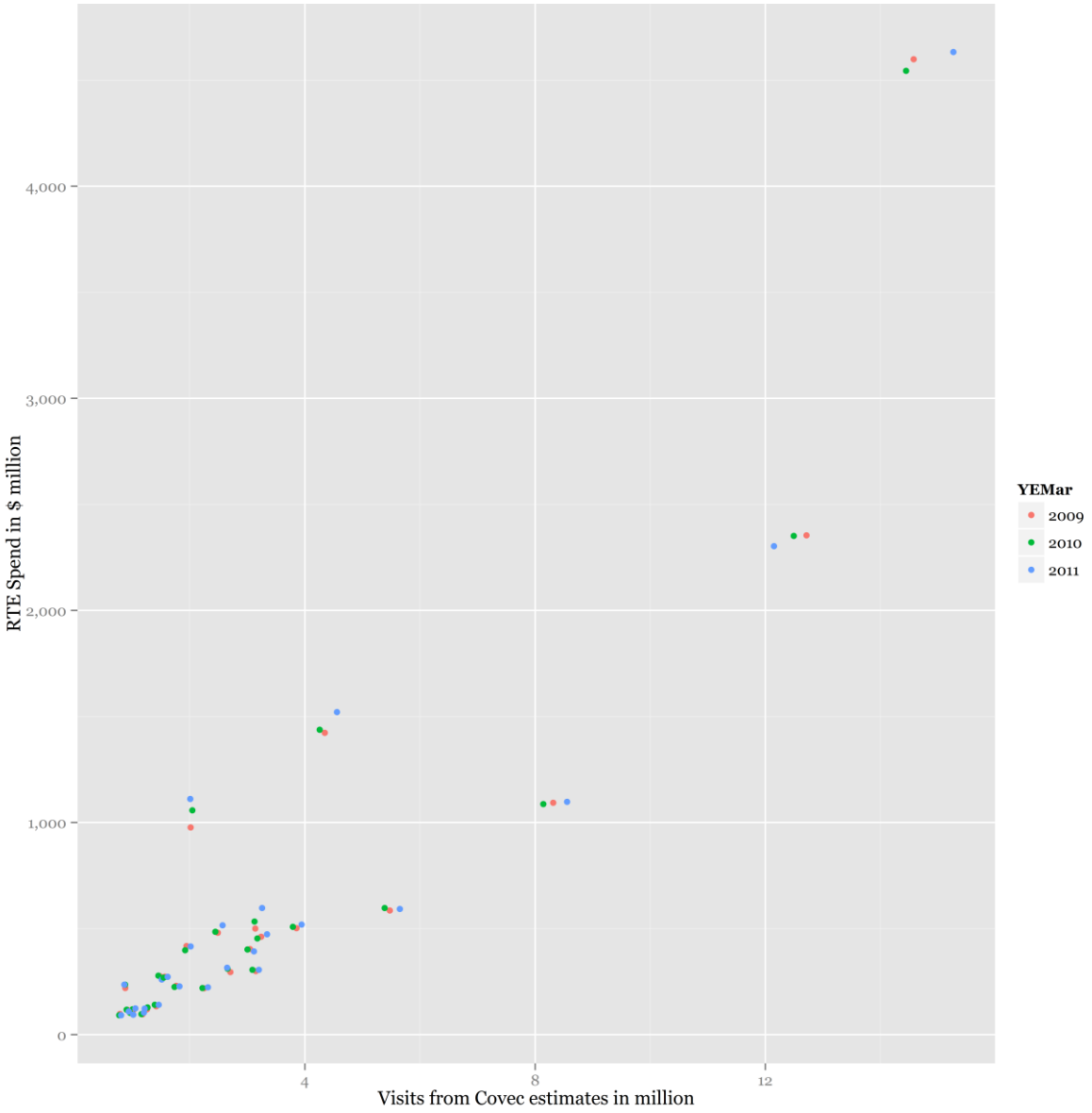



Source: MBIE

Figure 7 shows a similar correlation between the number of visits from the Covec estimates and the RTE spend[16]. This means that we can be reasonably confident that the RTEs spend are stable over time.

[16] Note that in the RTE project, estimating the number of visits or the number of transactions is out of scope.

**Figure 7: Covec visits and RTEs spend for all RTOs, for the years ending March 2009-2011**



# 7 CONCLUSION AND NEXT STEPS

The objectives of this paper were to explain the methodology to produce estimates of tourism expenditure at a detailed regional level and to assess the validity of the results. We successfully produced the small area estimates of tourism expenditure and compared them to a number of other available tourism expenditure data at a regional level. In conclusion, the Ministry is confident that the estimates will provide a robust source of information to its users for their planning and decision making at a regional level.

The Ministry acknowledges that a number of assumptions were made to produce these regional estimates of tourism expenditure. The Ministry, therefore, recommends that users take note of these assumptions and use the results with caution. The Ministry also acknowledges that the quality of the RTEs is likely to improve if the use of electronic cards and their coverage in the RTIs improved.

We welcome feedback from users as this will enable us to continuously improve the quality and robustness of the information we produce. Users can email their feedback to TR_SharedMailbox@mbie.govt.nz

# 8 APPENDIX A: COMPUTER PROGRAMS

There are three R programs used to produce the RTEs:

- **Program I** derives weights for domestic and international tourism expenditure to match TSA margins by industry, and to match IVS totals by visitors' country of origin.
- **Program II** creates a function which performs the weighting in Program I automatically.
- **Program III** extracts the RTIs domestic and international electronic transaction card data and applies the weights in program II to any regional breakdown we choose.

The RTI electronic card transaction data is accessible to only MBIE staff who have access to the TRED database. To run these three programs, some basic knowledge of R and SQL is required. Each program is provided here for the benefit of users.

**Program I**

**Purpose: To create lookup table of adjustment factors for weighting the RTIs up to the TSA and IVS level for year ending March**

**Output: Two objects TSA.weights.table.int and TSA.weights.table.dom with necessary information for merging and lookup, to be called later by the function weight.to.TSA()**

```
####
library(RODBC)
library(english)
library(survey)

ch<-odbcConnect("TRED64")
##############################################################################################################
############# International

load("P:/R/tourism workspaces/IVStrips.RData")

# We used a concordance file which links individual countries to the 13 groups of countries COPR13

ref<-read.csv("P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/COPRLookup_vij.csv")
head(ref)
dim(ref)

IVStrips2 <- merge(ref[, c("COPRDetail", "COPR13")], IVStrips, by="COPRDetail", all.y=TRUE)
dim(IVStrips)

# This SQL query only needs to be run once so is performed before the loop 2009:2012 starts.
INTANZ <- sqlQuery(ch,
        "select g.GROUP_NAME, c.CY_NAME, YEAR_NUMBER, trunc((MONTH_NUMBER-1)/3)+1 as QUARTER,
        sum(SPEND_AMOUNT)
        from RTI_MAIN.INTNL_SPEND s
        join RTI_MAIN.PERIOD p on p.PERIOD_ID = s.PERIOD_ID
        join RTI_MAIN.INTNL_DIMENSION d on d.DIMENSION_ID = s.DIMENSION_ID
        join RTI_MAIN.COUNTRY c on c.CY_N4_CODE=d.ORIGIN_ID
        join RTI_MAIN.ANZSIC a on d.ANZSIC_ID=a.ANZSIC_CODE
        join RTI_MAIN.ANZSIC_GROUP g on a.GROUP_CODE=g.GROUP_CODE
        where a.ANZSIC_NAME <> 'Air and Space Transport' and g.GROUP_NAME<>'Education'
        group by g.GROUP_NAME, c.CY_NAME, YEAR_NUMBER, trunc((MONTH_NUMBER-1)/3)+1
```

```
        order by c.CY_NAME")


names(INTANZ) <- c("ANZSIC", "COPRDetail", "Year", "Quarter", "Spend")

INTANZ2 <- merge(ref, INTANZ, by="COPRDetail")

INTANZ3 <- subset(INTANZ2,select=c(COPR13,ANZSIC,Year,Quarter,Spend))

#We need to label COPR13 as Country2 as it is needed later
names(INTANZ3)[1]<-"Country2"
head(INTANZ3)

# Create a new ANZSIC variable with names that match those in the TSA
INTANZ3$ANZSIC2 <- rename.levels(INTANZ3$ANZSIC,
        orig=c("Food and beverage services",
                "Transport (incl. Travel agency and tours)",
                "Fuel retailing",
                "Other retailing",
                "Food retailing",
                "Non tourism-related",
                "Non tourism-related ",
                "Cultural and recreational services"),
        new=c("Food and beverage serving services",
                "Other passenger transport",
                "Retail sales - fuel and other automotive",
                "Retail sales - other",
                "Retail sales - other",
                "Other tourism products",
                "Other tourism products",
                "Other tourism products"))

# Check worked ok
# table(INTANZ3$ANZSIC2, INTANZ3$ANZSIC)

# Create a YE March variable
INTANZ3$YEMar <- with(INTANZ3, ifelse(Quarter==1, Year, Year+1))

head(INTANZ3)

TSA.weights <- list()

# Use of this TSAYear variable is to facilitate later turning this into a loop
# that calculates weights for each YE Mar from 2009 to 2012

# Next list of data frames is created from Table 7 of the TSA.
# Note that it excludes air transport, and only includes
# the education fees and living expenses of "education" (ratios
# were given by email by Statistics New Zealand)
#MBIE made a decision to exclude education services.
```

```
ok.ANZSICs <- c("Accommodation",
        "Other passenger transport",
        "Retail sales - fuel and other automotive",
        "Retail sales - other",
        "Food and beverage serving services",
        "Other tourism products")

TSA.list <- list(
        Mar2009=data.frame(ANZSIC=ok.ANZSICs,
                int.demand=c(1081,883,364,1418,1556,702)),
        Mar2010=data.frame(ANZSIC=ok.ANZSICs,
                int.demand=c(1109,886,349,1431,1597,713)),
        Mar2011=data.frame(ANZSIC=ok.ANZSICs,
                int.demand=c(1112,877,363,1448,1621,717)),
        Mar2012=data.frame(ANZSIC=ok.ANZSICs,
                int.demand=c(1107,862,388,1459,1668,729))
)

# Note this loop goes through 4 years; will need to increase to 5 when we have 2013 data, etc

for (i in 1:4){

        # i <- 1 # for debugging
        TSAYear <- i + 2008

        TSA <- TSA.list[[i]]

        # In 2012 The total below should be 9071 within rounding -
        # total int'l tourist demand in 2012 from Table 7 in TSA,
        # excl GST, air transport, education services and the air transport component of education
        # sum(TSA$int.demand)+2207 + 0.12*650 # commented out as not essential


        # Now to create a new variable that adds in GST. We
        # do this by multiplying by the ratio of GST-inclusive
        # demand (9558 in 2012) compared to GST-exclusive (9071
        # in 2012).  Note that we now also convert to millions of dollars
        # by multiplying by 10^6.
        #

        # GST.correct <- c(9344/8857, 9243/8765, 9409/8926, 9558/9071)

        # TSA$int.demand2 <- TSA$int.demand * GST.correct[i] * 10^6

        TSA$int.demand2 <- TSA$int.demand * 10^6

        # english(round(sum(TSA$int.demand2))) # in English please, what is total tourism spend including GST
        total.ivs <- with(subset(IVStrips2, YEDec==TSAYear), sum(SpendxWeight))
        head(total.ivs)

        names(TSA) <- c("ANZSIC", "TSAvalue", "Freq")
```

```
    TSA <- with(TSA, data.frame(ANZSIC, Freq))
    summary(TSA)

    # Calculate the YE March values by country.  The Square brackets
    # at the end of the dcast() are used to put the rows in the same order
    # as the come from TRED
    totals.ivs <- dcast(subset(IVStrips2, YEMar==TSAYear), COPR13~.,
      sum, value.var="SpendxWeight")[c(1,2,3,4,5,6,7,8,9,10,11,12,13),]
    totals.ivs

    names(totals.ivs) <- c("Country", "Freq")
    #str(totals.ivs)


    # scale up the IVS country totals so they add up to the TSA total, by
    # multiplying them by the appropriate ratio:
    totals.ivs$Freq <- totals.ivs$Freq * sum(TSA$Freq)/sum(totals.ivs[,"Freq"])

    # PE - before you do this you need to use a concordance table to set up a cy13 country variable
    # so you can cast it to that level, not the 160 levels of the current "Country"

    INTANZ4 <- melt(dcast(subset(INTANZ3, YEMar==TSAYear), ANZSIC2 ~ Country2, sum, value.var="Spend"))
    names(INTANZ4) <- c("ANZSIC", "Country", "RTISpend")

    INT.svy <- svydesign(id=~1, weights=~RTISpend, data=INTANZ4)
    INT.svy <- rake(INT.svy,
      sample=list(~ANZSIC, ~Country),
      population=list(TSA, totals.ivs))

    # Next three should all add to the same value - the total we are scaling up to:
    sum(TSA$Freq)
    sum(totals.ivs$Freq)
    sum(weights(INT.svy))

    # The "Adj" column will be the actual adjustment multiplier for each combination
    # of ANZSIC and country:
    INTANZ4$Adj <- weights(INT.svy)/INTANZ4$RTISpend
    INTANZ4$YEMar <- TSAYear
    INTANZ4$MergeBy <- with(INTANZ4, paste(ANZSIC, Country, YEMar))
    # summary(INTANZ4)


    TSA.weights[[i]] <- INTANZ4

    # end of loop
  }

# Note that as we get more than four years we will need to modify the line below
TSA.weights.table.int <- rbind(TSA.weights[[1]], TSA.weights[[2]],TSA.weights[[3]],TSA.weights[[4]])
```

```
write.csv(TSA.weights.table.int,file="P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup
tables/TSA.weights.table.int.csv")

##########################################
#
# Domestic
#
################################
DOMANZ <- sqlQuery(ch,
        "select g.GROUP_NAME, YEAR_NUMBER, trunc((MONTH_NUMBER-1)/3)+1 as QUARTER, sum(SPEND_AMOUNT)
        from RTI_MAIN.DMSTC_SPEND s
        join RTI_MAIN.PERIOD p on p.PERIOD_ID = s.PERIOD_ID
        join RTI_MAIN.DMSTC_DIMENSION d on d.DIMENSION_ID = s.DIMENSION_ID
        join RTI_MAIN.ANZSIC a on d.ANZSIC_ID=a.ANZSIC_CODE
        join RTI_MAIN.ANZSIC_GROUP g on a.GROUP_CODE=g.GROUP_CODE
        where a.ANZSIC_NAME <> 'Air and Space Transport' and g.GROUP_NAME<>'Education'
        group by g.GROUP_NAME, YEAR_NUMBER, trunc((MONTH_NUMBER-1)/3)+1")

names(DOMANZ) <- c("ANZSIC", "Year", "Quarter", "Spend")

# Create a new ANZSIC variable with names that match those in the TSA
DOMANZ$ANZSIC2 <- rename.levels(DOMANZ$ANZSIC,
        orig=c("Food and beverage services",
                "Transport (incl. Travel agency and tours)",
                "Fuel retailing",
                "Other retailing",
                "Food retailing",
                "Non tourism-related",
                "Non tourism-related ",
                "Cultural and recreational services"),
        new=c("Food and beverage serving services",
                "Other passenger transport",
                "Retail sales - fuel and other automotive",
                "Retail sales - other",
                "Retail sales - other",
                "Other tourism products",
                "Other tourism products",
                "Other tourism products"))


# Create a YE March variable
# Use of this TSAYear variable is to facilitate later turning this into a loop
# that calculates weights for each YE Mar from 2009 to 2012

DOMANZ$YEMar <- with(DOMANZ, ifelse(Quarter==1, Year, Year+1))



TSA.weights <- list()

# Next list of data frames is created from Table 7 of the TSA.
```

```
# Note that it excludes air transport, and only includes
# the education fees and living expenses of "education" (ratios
# were given by email by Bernie)
#

ok.ANZSICs <- c("Accommodation",
            "Other passenger transport",
            "Retail sales - fuel and other automotive",
            "Retail sales - other",
            "Food and beverage serving services",
            "Other tourism products")

TSA.list <- list(
            Mar2009=data.frame(ANZSIC=ok.ANZSICs,
                        dom.demand=c(314+599, 1021+519, 492+1710, 3384, 135+1021, 81+1182)),
            Mar2010=data.frame(ANZSIC=ok.ANZSICs,
                        dom.demand=c(313+608, 1012+511, 472+1642, 3496, 136+1036, 83+1187)),
            Mar2011=data.frame(ANZSIC=ok.ANZSICs,
                        dom.demand=c(320+621, 1027+518, 497+1711, 3572, 140+1052, 86+1198)),
            Mar2012=data.frame(ANZSIC=ok.ANZSICs,
                        dom.demand=c(330+627, 1028+509, 531+1824, 3659, 144+1088, 88+1222))
)

## Checks
# sum(TSA.list[[4]]$dom.demand) # 3347+9674-1225-732 = 11064
# sum(TSA.list[[3]]$dom.demand) # = 3259+9373-1189-688 = 10755
# sum(TSA.list[[2]]$dom.demand)
# sum(TSA.list[[1]]$dom.demand)

# Note this loop goes through 4 years; will need to increase to 5 when we have 2013 data, etc

for (i in 1:4){

            TSAYear <- i + 2008
            TSA <- TSA.list[[i]]

            TSA$dom.demand2 <- TSA$dom.demand * 10^6

            # english(round(sum(TSA$dom.demand2))) # in English please, what is total tourism spend including GST

            names(TSA) <- c("ANZSIC", "TSAvalue", "Freq")
            TSA <- with(TSA, data.frame(ANZSIC, Freq))

            DOMANZ2 <- dcast(subset(DOMANZ, YEMar==TSAYear), ANZSIC2 ~ ., sum, value.var="Spend")
            names(DOMANZ2) <- c("ANZSIC", "RTISpend")
            english(sum(DOMANZ2$RTISpend))

            DOM.svy <- svydesign(id=~1, weights=~RTISpend, data=DOMANZ2)
            DOM.svy <- rake(DOM.svy,
              sample=list(~ANZSIC),
              population=list(TSA))
```

```
        # Next TWO should all add to the same value - the total we are scaling up to:
        # english(sum(TSA$Freq))
        # english(sum(weights(DOM.svy)))

        # The "Adj" column will be the actual adjustment multiplier for each combination
        # of ANZSIC and country:
        DOMANZ2$Adj <- weights(DOM.svy)/DOMANZ2$RTISpend
        DOMANZ2$YEMar <- TSAYear
        DOMANZ2$MergeBy <- with(DOMANZ2, paste(ANZSIC, YEMar))
        # summary(DOMANZ2)


        TSA.weights[[i]] <- DOMANZ2

        # end of loop
        }

# Note that as we get more than four years we will need to modify the line below

TSA.weights.table.dom <- rbind(TSA.weights[[1]], TSA.weights[[2]],TSA.weights[[3]],TSA.weights[[4]])
head(TSA.weights.table.dom)

write.csv(TSA.weights.table.dom,file="  P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables
TSA.weights.table.dom.csv")

save(TSA.weights.table.int, TSA.weights.table.dom,
file="P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/TSA.weights.tables3")
```

**Program II:**

**Purpose: To create a function for weighting a data frame extracted from TRED up to TSA totals, in IVS proportions (for international tourism data)**

**Output: weight.to.TSA() function**

```
#########################################################################

weight.to.TSA <- function(ECT, type){

# Function that takes an object in long format from an SQL query,
# containing electronic cart transaction (ECT) data from TRED,
# and creates a WeightedSpend variable based on ANZSIC and country,
# using weights in the appropriate version of TSA.weights.table.int (to
# IVS and TSA) or TSA.weights.table.dom (just to TSA)
#
# The object returned should have the same number of rows and one more
# column ("WeightedSpend") than the ECT given as the first argument
#
# ECT needs the following columns with these names:
#   Country - the 8 known countries plus other (only if type=="INT")
#   ANZSIC - just those with weights
#   YEMar - one of 2009, 2010, 2011, or 2012 (or more in subsequent years)
#
# ECT can have multiple rows for any combination of ANZSIC, Country etc.
#
# Requires the existence of TSA.weights.table.int or TSA.weights.table.dom
#
####



# Programme starts here

load("P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/TSA.weights.tables")



if( !(type%in%c("INT", "DOM"))){stop("type must be 'INT' or 'DOM'")}

if(type=="INT"){
        # Create the "MergeBy" variable for matching to the set of weights
        ECT$MergeBy <- with(ECT, paste(ANZSIC, Country, YEMar))

        # Merge with the frame with weights
        ECT.w <- join(ECT, TSA.weights.table.int[, c("MergeBy", "Adj")], by="MergeBy")
}

if(type=="DOM"){
        # Create the "MergeBy" variable for matching to the set of weights
        ECT$MergeBy <- with(ECT, paste(ANZSIC, YEMar))

        # Merge with the frame with weights
```

```
        ECT.w <- join(ECT, TSA.weights.table.dom[, c("MergeBy", "Adj")], by="MergeBy")

}
        # Create the actual weighted spend figures
        ECT.w$WeightedSpend <- with(ECT.w, Spend * Adj)

        # Clean up  - columns not needed
        ECT.w$MergeBy <- NULL

        ECT.w$Adj <- NULL

return(ECT.w)
}
```

**Program III:**

**Purpose: To apply the weights created in programs I and II to both international and domestic tourism data.**

**Output: 1 long form dataset with both domestic and international data by TA, industry, visitors' country of origin for the year ending March 2009-2013. Note for 2013, we use the 2012 weights until 2013 TSA report is released**

```
setwd("P:/OTSP/Regional Estimation/Regional Estimates/Project Management/Methodology")

############################
#
library(english)
library(RODBC)
###
###
# Step 1 - Create the weight.to.TSA() function and reference tables
source("P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/Source for function weighting to TSA and IVS.R")

# and open connection to database
ch<-odbcConnect("TRED64")

###Domestic
######
# Step 2 - Domestic SQL query, and aggregate to the right level of ANZSIC

DOM <- sqlQuery(ch,
        "select p.YEAR_NUMBER, p.MONTH_NUMBER, g.GROUP_NAME, o.REGION_NAME, m.TA_NAME,
sum(SPEND_AMOUNT)
        from RTI_MAIN.DMSTC_SPEND s
        join RTI_MAIN.PERIOD p on p.PERIOD_ID = s.PERIOD_ID
        join RTI_MAIN.DMSTC_DIMENSION d on d.DIMENSION_ID = s.DIMENSION_ID
        join RTI_MAIN.TA_LOCATION o on d.ORIGIN_ID = o.TA_CODE
        join RTI_MAIN.TA_LOCATION m on d.MERCHANT_ID = m.TA_CODE
        join RTI_MAIN.ANZSIC a on d.ANZSIC_ID=a.ANZSIC_CODE
        join RTI_MAIN.ANZSIC_GROUP g on a.GROUP_CODE=g.GROUP_CODE
        where a.ANZSIC_NAME <> 'Air and Space Transport' and g.GROUP_NAME<>'Education'
        group by p.YEAR_NUMBER, P.MONTH_NUMBER, g.GROUP_NAME, o.REGION_NAME, m.TA_NAME")

names(DOM) <- c("Year", "Month", "ANZSIC", "Origin", "TA", "Spend")

# TAs in TRED need to be converted to Stats NZ TAs.
ref <- read.csv("P:/OTSP/Regional Estimation/Regional Tourism Indicators/4.Analysis/Functions and lookup tables/area unit to ta lookup - processed.csv")
TAs_lookup <- dcast(ref, RTI_TA+SNZ_TA~.)
TAs_lookup$RTI_TA <- gsub("Hawkes", "Hawke's", TAs_lookup$RTI_TA)

#We need the same matching variable "RTI_TA" in DOM
names(DOM)[5] <- "RTI_TA"
DOM2 <- merge(DOM,TAs_lookup, by="RTI_TA", all.x=TRUE)
```

```
# Simplify the ANZSICs down to those for which we have weights
DOM2$ANZSIC <- rename.levels(DOM2$ANZSIC,
        orig=c("Food and beverage services",
                "Transport (incl. Travel agency and tours)",
                "Fuel retailing",
                "Other retailing",
                "Food retailing",
                "Non tourism-related",
                "Non tourism-related ",
                "Cultural and recreational services"),
        new=c("Food and beverage serving services",
                "Other passenger transport",
                "Retail sales - fuel and other automotive",
                "Retail sales - other",
                "Retail sales - other",
                "Other tourism products",
                "Other tourism products",
                "Other tourism products"))


DOM2$YEMar <- with(DOM2, ifelse(Month%in%c(1:3), Year, Year+1))
DOM3 <- subset(DOM2, YEMar%in%(2009:2012))

# Step 3. Now we are ready for weighting.
# Use the weight.to.TSA function to create a new data frame, the same as INT but with
# an added "WeightedSpend" column.  Note we need to include one of the previously calculated
# lookup tables in TSA.weights.table as the second argument to the function (hence the "load()" command
# earlier in this example script).  TSA.weights.table is a list, with each element a data frame of
# adjustment factors.

DOM.w <- weight.to.TSA(DOM3, "DOM")
DOM.w$Spend <- NULL


# Without margins
DOM2.w<-dcast(DOM.w, YEMar+ANZSIC+Origin+SNZ_TA~., sum,value.var="WeightedSpend")

names(DOM2.w)[5]<-"WeightedSpend"
DOM2.w$Type <- "Domestic"

write.csv(DOM2.w,file="P:/P:/OTSP/Regional Estimation/Regional Estimates/Project Management/Final/Domestic.csv")

DOM2.w$YEMar <- factor(DOM2.w$YEMar, labels=c('2009','2010','2011','2012','2013'))
tapply(DOM2.w$WeightedSpend, list(ANZSIC=DOM2.w$ANZSIC, YEMar=DOM2.w$YEMar),sum, na.rm=TRUE)

#########################################################################
## International
###
# Step 4 - SQL query, and aggregate to the right level of Country and ANZSIC
```

```
# Simplify the countries down to 13 ONLY

ref1<-read.csv("P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/COPRLookup_vij.csv")

INT <- sqlQuery(ch,
      "select p.YEAR_NUMBER, trunc((MONTH_NUMBER-1)/3)+1 as QUARTER, g.GROUP_NAME, c.CY_NAME,
TA_NAME, RTO_NAME, REGION_NAME, sum(SPEND_AMOUNT)
      from RTI_MAIN.INTNL_SPEND s
      join RTI_MAIN.PERIOD p on p.PERIOD_ID = s.PERIOD_ID
      join RTI_MAIN.INTNL_DIMENSION d on d.DIMENSION_ID = s.DIMENSION_ID
      join RTI_MAIN.COUNTRY c on c.CY_N4_CODE=d.ORIGIN_ID
      join RTI_MAIN.ANZSIC a on d.ANZSIC_ID=a.ANZSIC_CODE
      join RTI_MAIN.ANZSIC_GROUP g on a.GROUP_CODE=g.GROUP_CODE
      join RTI_MAIN.TA_LOCATION t  on t.TA_CODE = d.MERCHANT_ID
      where a.ANZSIC_NAME <> 'Air and Space Transport' and g.GROUP_NAME<>'Education'
      group by p.YEAR_NUMBER,  trunc((MONTH_NUMBER-1)/3)+1, g.GROUP_NAME, c.CY_NAME, TA_NAME,
RTO_NAME, REGION_NAME
      order by c.CY_NAME")

names(INT) <- c("Year", "Quarter", "ANZSIC", "COPRDetail", "TA","RTO","Region","Spend")

levels(INT$COPRDetail)
levels(INTANZ$COPRDetail)
INT2 <- merge(ref1, INT, by="COPRDetail")

dim(INT2)

INT3 <- subset(INT2,select=c(COPR13,ANZSIC,Year,Quarter, Spend,RTO,TA,Region))

#We need to label COPR13 as Country as it is needed later
names(INT3)[1]<-"Country"
head(INT3)

# TAs in TRED need to be converted to Stats NZ TAs.
ref2 <- read.csv("P:/OTSP/Regional Estimation/Regional Estimates/Functions and lookup tables/area unit to ta lookup -
processed_vij.csv")
View(ref2)
TAs_lookup <- dcast(ref2, RTI_TA+SNZ_TA~.)
TAs_lookup$RTI_TA <- gsub("Hawkes", "Hawke's", TAs_lookup$RTI_TA)
head(TAs_lookup)
summary(TAs_lookup$RTI_TA)

#We need the same matching variable "RTI_TA" in INT
head(INT3)
names(INT3)[7]<-"RTI_TA"
head(INT3)
INT4 <- merge(INT3,TAs_lookup, by="RTI_TA", all.x=TRUE)
head(INT4)
View(INT4)

# Simplify the ANZSICs down to those for which we have weights
```

```
INT4$ANZSIC <- rename.levels(INT4$ANZSIC,
        orig=c("Food and beverage services",
                "Transport (incl. Travel agency and tours)",
                "Fuel retailing",
                "Other retailing",
                "Food retailing",
                "Non tourism-related",
                "Non tourism-related ",
                "Cultural and recreational services"),
        new=c("Food and beverage serving services",
                "Other passenger transport",
                "Retail sales - fuel and other automotive",
                "Retail sales - other",
                "Retail sales - other",
                "Other tourism products",
                "Other tourism products",
                "Other tourism products"))

head(INT4)
INT4$YEMar <- with(INT4, ifelse(Quarter == 1, Year, Year+1))

INT5 <- subset(INT4, YEMar %in% (2009:2012))



# Step 5. Now we are ready for weighting.
# Use the weight.to.TSA function to create a new data frame, the same as INT but with
# an added "WeightedSpend" column.  Note we need to include one of the previously calculated
# lookup tables in TSA.weights.table as the second argument to the function (hence the "load()" command
# earlier in this example script).  TSA.weights.table is a list, with each element a data frame of
# adjustment factors.

summary(INT5)

INT.w <- weight.to.TSA(INT5, "INT")
#INT.w$YEMar=INT.w$YEMar
INT.w$Spend <- NULL

head(INT.w)

# To create margins so that we create a "total" level for both ANZSIC and Origin
#INT2.w<-dcast(INT.w, YEMar+ANZSIC+Country+SNZ_TA~., value.var="WeightedSpend", sum,
margins=c("ANZSIC","Origin","TA"))

# Without margins
INT2.w <- dcast(INT.w, YEMar+ANZSIC+Country+Region~., sum, value.var="WeightedSpend")

head(INT2.w)
names(INT2.w)[5]<-"WeightedSpend"
INT2.w$Type <- "International"
```

```
View(INT2.w)

INT2.w$YEMar <- factor(INT2.w$YEMar, labels=c('2009','2010','2011','2012'))
tapply(INT2.w$WeightedSpend/1000000,
list(Region=INT2.w$Region,Country=INT2.w$Country,YEMar=INT2.w$YEMar),sum,na.rm=TRUE)

#Step 6: to combine both domestic and international RTE datasets
head(DOM2.w)
names(DOM2.w)[6]<-"WeightedSpend"
head(INT2.w)

names(INT2.w)[3] <- "Origin"
combined.w <- rbind(INT2.w, DOM2.w)

combined.w<-dcast(combined.w, YEMar+RTO+ANZSIC+SNZ_TA+Type+Origin~., sum,value.var="WeightedSpend")
head(combined.w)
names(combined.w)[7]<-"WeightedSpend"

setwd("P:/OTSP/Regional Estimation/Regional Estimates/Project Management/Final")

write.csv(combined.w,"Combined RTE_vij.csv")
```

# 9 APPENDIX B: ILLUSTRATING HOW IPF WORKS USING A SIMPLE EXAMPLE

| | | | |
|---|---|---|---|
| Data from census | 7 | 5 | 12 |
| | 3 | 11 | 14 |
| | 10 | 16 | 26 |
| | | | |
| New Margins from survey | | | 15 |
| | | | 8 |
| | 10 | 13 | 23 |
| | | | |
| **Iterations** | | | |
| 1 | 8.75 | 6.25 | 15 |
| | 1.714286 | 6.285714 | 8 |
| | 10.46429 | 12.53571 | 23 |
| | | | |
| 2 | 8.361775 | 6.481481 | 14.84326 |
| | 1.638225 | 6.518519 | 8.156744 |
| | 10 | 13 | 23 |
| | | | |
| 3 | 8.450075 | 6.549925 | 15 |
| | 1.606744 | 6.393256 | 8 |
| | 10.05682 | 12.94318 | 23 |
| | | | |
| 4 | 8.402333 | 6.578679 | 14.98101 |
| | 1.597667 | 6.421321 | 8.018988 |
| | 10 | 13 | 23 |
| | | | |
| 5 | 8.412983 | 6.587017 | 15 |
| | 1.593884 | 6.406116 | 8 |
| | 10.00687 | 12.99313 | 23 |
| | | | |
| 6 | 8.40721 | 6.590498 | 14.99771 |
| | 1.59279 | 6.409502 | 8.002292 |
| | 10 | 13 | 23 |
| | | | |
| 7 | 8.408495 | 6.591505 | 15 |
| | 1.592334 | 6.407666 | 8 |
| | 10.00083 | 12.99917 | 23 |
| | | | |
| 8 | 8.407798 | 6.591925 | 14.99972 |
| | 1.592202 | 6.408075 | 8.000276 |
| | 10 | 13 | 23 |
| | | | |
| 9 | 8.407953 | 6.592047 | 15 |
| | 1.592147 | 6.407853 | 8 |
| | 10.0001 | 12.9999 | 23 |
| | | | |
| 10 | 8.407869 | 6.592097 | 14.99997 |
| | 1.592131 | 6.407903 | 8.000033 |
| | 10 | 13 | 23 |

# 10 APPENDIX C: FURTHER REGIONAL RESULTS

**Table 15: International tourism expenditure by TSA ANZSIC group, visitors' country of origin and regional council for the year ending March 2012, $ (million)**

| ANZSIC/REGION | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Accommodation** | **333** | **23** | **116** | **47** | **45** | **10** | **99** | **108** | **124** | **21** | **14** | **52** | **114** | **1,107** |
| Auckland | 91 | 5 | 86 | 9 | 15 | 4 | 20 | 27 | 41 | 14 | 5 | 16 | 29 | **363** |
| Bay of Plenty | 14 | 2 | 2 | 3 | 2 | 1 | 6 | 5 | 6 | 1 | 1 | 2 | 8 | **53** |
| Canterbury | 46 | 2 | 7 | 6 | 10 | 1 | 13 | 16 | 24 | 1 | 1 | 5 | 14 | **145** |
| Gisborne | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Hawke's Bay | 6 | 1 | 1 | 1 | 1 | 0 | 3 | 2 | 1 | 0 | 0 | 1 | 2 | **18** |
| Manawatu-Wanganui | 5 | 1 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 3 | **17** |
| Marlborough | 5 | 1 | 0 | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 0 | 1 | 3 | **18** |
| Nelson | 3 | 0 | 0 | 2 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 1 | 3 | **14** |
| Northland | 10 | 1 | 1 | 3 | 1 | 0 | 5 | 3 | 2 | 0 | 0 | 2 | 5 | **33** |
| Otago | 58 | 3 | 10 | 6 | 6 | 2 | 16 | 17 | 20 | 1 | 3 | 7 | 15 | **164** |
| Southland | 10 | 1 | 1 | 2 | 1 | 0 | 4 | 4 | 3 | 0 | 0 | 1 | 5 | **34** |
| Taranaki | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | **13** |
| Tasman | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 2 | **12** |
| Waikato | 18 | 2 | 3 | 4 | 2 | 0 | 7 | 7 | 4 | 1 | 1 | 3 | 8 | **61** |
| Wellington | 49 | 3 | 3 | 4 | 3 | 1 | 10 | 15 | 14 | 2 | 2 | 10 | 10 | **126** |
| West Coast | 9 | 1 | 2 | 3 | 1 | 0 | 5 | 4 | 5 | 0 | 0 | 1 | 5 | **35** |
| **Other tourism products** | **190** | **17** | **38** | **32** | **24** | **29** | **84** | **58** | **72** | **45** | **16** | **39** | **86** | **729** |
| Auckland | 44 | 4 | 19 | 4 | 9 | 7 | 20 | 14 | 19 | 36 | 5 | 17 | 21 | **218** |
| Bay of Plenty | 18 | 2 | 4 | 3 | 2 | 10 | 8 | 6 | 6 | 1 | 2 | 4 | 10 | **76** |
| Canterbury | 16 | 2 | 2 | 4 | 3 | 1 | 9 | 5 | 8 | 2 | 1 | 3 | 9 | **65** |
| Gisborne | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Hawke's Bay | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | **5** |
| Manawatu-Wanganui | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | **7** |
| Marlborough | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | **7** |
| Nelson | 3 | 1 | 0 | 2 | 0 | 0 | 3 | 2 | 1 | 0 | 0 | 1 | 3 | **15** |
| Northland | 5 | 1 | 0 | 2 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 1 | 3 | **16** |
| Otago | 62 | 4 | 7 | 7 | 5 | 10 | 20 | 15 | 22 | 1 | 5 | 5 | 19 | **183** |
| Southland | 3 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 3 | **13** |
| Taranaki | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | **5** |
| Tasman | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Waikato | 19 | 3 | 3 | 6 | 2 | 1 | 12 | 7 | 9 | 2 | 2 | 5 | 13 | **83** |
| Wellington | 7 | 1 | 1 | 1 | 1 | 0 | 4 | 3 | 2 | 1 | 1 | 2 | 3 | **28** |
| West Coast | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | **5** |

**Table 15: International tourism expenditure by TSA ANZSIC group, visitors' country of origin and regional council for the year ending March 2012, $ (million), continued..**

| ANZSIC/REGION | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Food and beverage serving services** | **548** | **38** | **109** | **45** | **69** | **30** | **180** | **159** | **146** | **43** | **34** | **94** | **171** | **1,668** |
| Auckland | 219 | 13 | 52 | 13 | 39 | 21 | 66 | 59 | 68 | 32 | 18 | 49 | 67 | **713** |
| Bay of Plenty | 23 | 3 | 19 | 3 | 3 | 3 | 10 | 7 | 11 | 2 | 2 | 4 | 10 | **98** |
| Canterbury | 45 | 3 | 7 | 4 | 6 | 2 | 15 | 14 | 13 | 1 | 2 | 5 | 12 | **128** |
| Gisborne | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Hawke's Bay | 9 | 1 | 1 | 1 | 1 | 0 | 5 | 3 | 2 | 0 | 0 | 1 | 3 | **28** |
| Manawatu-Wanganui | 8 | 1 | 1 | 1 | 1 | 0 | 2 | 2 | 2 | 1 | 0 | 1 | 2 | **21** |
| Marlborough | 6 | 1 | 0 | 1 | 0 | 0 | 3 | 2 | 1 | 0 | 0 | 1 | 3 | **18** |
| Nelson | 2 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 2 | **11** |
| Northland | 14 | 2 | 1 | 3 | 1 | 0 | 8 | 4 | 2 | 1 | 1 | 2 | 7 | **45** |
| Otago | 103 | 5 | 17 | 6 | 10 | 3 | 25 | 29 | 24 | 1 | 5 | 9 | 23 | **260** |
| Southland | 9 | 1 | 2 | 2 | 1 | 0 | 4 | 4 | 3 | 0 | 1 | 1 | 5 | **32** |
| Taranaki | 5 | 1 | 0 | 0 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 1 | **12** |
| Tasman | 7 | 1 | 1 | 2 | 1 | 0 | 4 | 3 | 1 | 0 | 0 | 1 | 4 | **25** |
| Waikato | 26 | 2 | 3 | 3 | 3 | 1 | 11 | 7 | 4 | 2 | 1 | 4 | 9 | **76** |
| Wellington | 62 | 5 | 5 | 4 | 3 | 1 | 20 | 17 | 12 | 3 | 2 | 14 | 16 | **165** |
| West Coast | 9 | 1 | 1 | 2 | 0 | 0 | 4 | 5 | 3 | 0 | 1 | 1 | 5 | **32** |

**Table 15: International tourism expenditure by TSA ANZSIC group, visitors' country of origin and regional council for the year ending March 2012, $ (million), continued…**

| ANZSIC/REGION | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Retail sales - other** | **390** | **25** | **196** | **36** | **74** | **49** | **119** | **85** | **147** | **102** | **31** | **74** | **130** | **1,459** |
| Auckland | 154 | 9 | 113 | 11 | 41 | 25 | 47 | 30 | 79 | 80 | 18 | 40 | 63 | **709** |
| Bay of Plenty | 15 | 1 | 39 | 2 | 2 | 17 | 6 | 3 | 6 | 5 | 1 | 3 | 6 | **106** |
| Canterbury | 45 | 2 | 8 | 4 | 8 | 4 | 13 | 10 | 14 | 3 | 2 | 5 | 10 | **127** |
| Gisborne | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **4** |
| Hawke's Bay | 7 | 1 | 1 | 1 | 1 | 0 | 3 | 2 | 1 | 1 | 0 | 2 | 2 | **21** |
| Manawatu-Wanganui | 6 | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 2 | 1 | 0 | 1 | 2 | **18** |
| Marlborough | 4 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 2 | **13** |
| Nelson | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | **8** |
| Northland | 9 | 1 | 0 | 2 | 0 | 0 | 4 | 3 | 1 | 1 | 0 | 1 | 4 | **27** |
| Otago | 70 | 4 | 24 | 5 | 14 | 2 | 14 | 18 | 25 | 1 | 5 | 6 | 17 | **203** |
| Southland | 5 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 2 | **14** |
| Taranaki | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | **10** |
| Tasman | 4 | 0 | 0 | 1 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 2 | **14** |
| Waikato | 19 | 2 | 3 | 2 | 2 | 1 | 7 | 4 | 5 | 4 | 1 | 4 | 6 | **59** |
| Wellington | 41 | 3 | 6 | 4 | 3 | 1 | 13 | 8 | 10 | 6 | 2 | 7 | 10 | **113** |
| West Coast | 4 | 1 | 1 | 2 | 0 | 0 | 2 | 2 | 1 | 0 | 0 | 1 | 3 | **15** |
| **Retail sales - fuel and other** | **119** | **11** | **14** | **31** | **10** | **7** | **48** | **29** | **26** | **16** | **5** | **17** | **57** | **388** |
| Auckland | 24 | 2 | 6 | 3 | 3 | 4 | 8 | 5 | 8 | 11 | 1 | 5 | 7 | **87** |
| Bay of Plenty | 9 | 1 | 0 | 2 | 1 | 0 | 3 | 2 | 1 | 1 | 0 | 1 | 4 | **25** |
| Canterbury | 17 | 1 | 2 | 4 | 2 | 1 | 7 | 4 | 4 | 1 | 1 | 2 | 8 | **52** |
| Gisborne | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Hawke's Bay | 3 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | **7** |
| Manawatu-Wanganui | 4 | 1 | 1 | 1 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 3 | **14** |
| Marlborough | 3 | 0 | 0 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 2 | **10** |
| Nelson | 2 | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 3 | **11** |
| Northland | 6 | 1 | 0 | 3 | 0 | 0 | 3 | 2 | 1 | 0 | 0 | 1 | 4 | **21** |
| Otago | 15 | 1 | 1 | 3 | 1 | 0 | 5 | 3 | 4 | 0 | 1 | 1 | 6 | **41** |
| Southland | 6 | 1 | 1 | 2 | 0 | 0 | 3 | 2 | 2 | 0 | 0 | 1 | 4 | **21** |
| Taranaki | 2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | **6** |
| Tasman | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | **5** |
| Waikato | 13 | 1 | 1 | 3 | 1 | 0 | 5 | 3 | 2 | 2 | 1 | 2 | 6 | **40** |
| Wellington | 6 | 1 | 0 | 1 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 1 | 2 | **17** |
| West Coast | 7 | 1 | 1 | 3 | 0 | 0 | 4 | 3 | 2 | 0 | 0 | 1 | 6 | **27** |

**Table 15: International tourism expenditure by TSA ANZSIC group, visitors' country of origin and regional council for the year ending March 2012, $ (million)**

| ANZSIC/REGION | Australia | Canada | China | Germany | Japan | Korea | United Kingdom | United States | Rest of Asia | Rest of Oceania | Rest of Americas | Africa and Middle East | Rest of Europe | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Other passenger transport** | **238** | **20** | **48** | **43** | **25** | **19** | **95** | **62** | **108** | **26** | **13** | **48** | **117** | **862** |
| Auckland | 90 | 9 | 26 | 15 | 10 | 12 | 37 | 27 | 48 | 18 | 6 | 24 | 54 | **376** |
| Bay of Plenty | 5 | 1 | 0 | 1 | 0 | 0 | 2 | 1 | 2 | 0 | 1 | 3 | 2 | **19** |
| Canterbury | 47 | 2 | 6 | 9 | 7 | 2 | 15 | 10 | 24 | 1 | 1 | 7 | 20 | **151** |
| Gisborne | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1** |
| Hawke's Bay | 3 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | **8** |
| Manawatu-Wanganui | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Marlborough | 4 | 1 | 0 | 2 | 0 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 3 | **15** |
| Nelson | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 3 | 0 | 0 | 2 | **8** |
| Northland | 5 | 1 | 0 | 2 | 0 | 0 | 3 | 1 | 1 | 0 | 0 | 1 | 3 | **17** |
| Otago | 56 | 3 | 9 | 7 | 5 | 4 | 18 | 11 | 21 | 0 | 3 | 6 | 19 | **162** |
| Southland | 4 | 1 | 1 | 2 | 1 | 0 | 2 | 1 | 2 | 0 | 0 | 1 | 4 | **18** |
| Taranaki | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | **3** |
| Tasman | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 2 | **8** |
| Waikato | 3 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | **12** |
| Wellington | 10 | 1 | 2 | 1 | 0 | 0 | 5 | 3 | 3 | 2 | 1 | 2 | 3 | **35** |
| West Coast | 6 | 0 | 3 | 2 | 0 | 0 | 4 | 2 | 4 | 0 | 0 | 1 | 4 | **26** |
| **Total** | **1,818** | **135** | **521** | **235** | **247** | **144** | **626** | **501** | **623** | **252** | **112** | **324** | **675** | **6,213** |

Source: MBIE, Regional Tourism Estimates, 2012

# 11 REFERENCES

Deming, W.E. and Stephan, F.F. (1940). “On a least squares adjustment of a sampled frequency table when the exact expected marginals are known”. Annals of Mathematical Statistics. 11, 427 - 444

Tourism Research Australia (2011), Department of Resources, Energy and Tourism. “The economic importance of Tourism in Australia’s regions”. Downloadable at http://www.ret.gov.au/tourism/documents/tra/the_economic_importance_of_tourism_in_australia's_regions_final.pdf

newzealand.govt.nz