An Investigation into Crime, Tourism and the Relationship between the two

The Collaborators

Contents

1   Introduction

Tourism is critical to the health of the global economy - according to WTTC [2020], tourism represents 10.3% of the global GDP and is responsible for creating 1 in 10 jobs around the world. Therefore, it is fair to say that tourism is one of the most important industries in almost every nation globally.

However, when we as tourists think about visiting places, one of the criteria that we look for is how safe is it to travel to that place? Common sense tells us that visitors are most likely to visit safer places. In the context of international travel, tourists may defer from their visit, if the probability of victimization in that country is high. If this is one of the top items on a visitor's checklist, then it stands that the places with high crime rates should receive fewer visitors from abroad [Altindag, 2014].

In this investigative report, we will take a deep dive into crime and tourism trends globally and in Australia, after which we will attempt to establish whether there is a relationship between crime rates and tourism.

2   Crime trends throughout the world

The following section was compiled and edited by Varsha Ujjinni Vijay Kumar

In this section, we are looking at the crime rate throughout the world and the mean values of each of the eight crimes as in Table 1 in each of the 231 different regions reported in the source data. This dataset used is titled 'Intentional homicides and other crimes' and is sourced from the UN data webpage (UN [2020c]). Per the UN [2020a], all the data available provided on the UN Data website is available to be copied freely. It is, therefore, able to be used in the following analysis. Although this data is from a reputable source, a potential limitation of the data is that the actual crime rate within each country may be faulty due to fear of constitutional laws within the country or corruption.

Table 1: Different crimes recorded

x
Intentional homicide rates per 100,000
Percentage of male and female intentional homicide victims, Male
Percentage of male and female intentional homicide victims, Female
Assault rate per 100,000 population
Theft at the national level, rate per 100,000 population
Robbery at the national level, rate per 100,000 population
Total Sexual Violence at the national level, rate per 100,000
Kidnapping at the national level, rate per 100,000

This section covers the overall crime rate in the world data and what kind of crimes are at large in different parts of the world. The day-to-day incidents of crime such as robbery, burglary, assault and theft — may seem to be largely an urban phenomenon driven by local factors. Urban planning, crime prevention and police action may all appear to play an important role in decreasing the risk of crime victimization is on one end of the spectrum. And at the other end of the spectrum are forms of transnational organized crime, including trafficking in goods and persons, that can involve extended cross-national networks. Plot 1 depicts a column graph with year on the x-axis and counts on the y-axis, where the the years in the dataset vary from 2000 through to year 2016. Looking at this plot it can be inferred that the rate of crimes in the year 2010 was the highest with a count of more than 750 mean cases throughout the world. Followed by approximate values in 2005, 2015 and 2016 with mean counts of 760, 600 and 500 respectively. It also illustrates that with the years crime mean counts have decreased.

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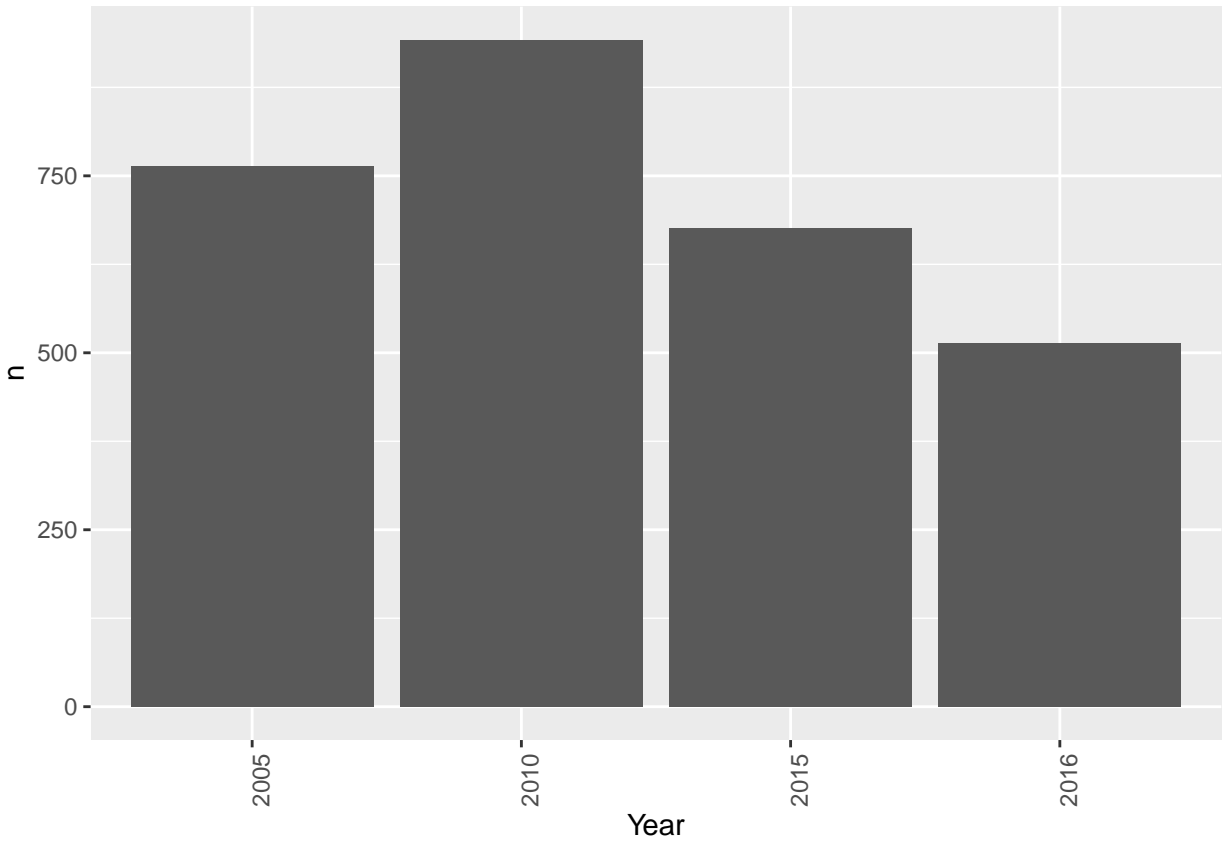
Figure 1: Mean crime rates throughout the years

Table 2: Countries with highest Intentional Homicide Rates in 2005

Year	Value	region
2005	64.4	El Salvador
2005	61.0	Jamaica
2005	43.6	Honduras
2005	41.8	Colombia
2005	40.8	Guatemala

Table 3: Countries with highest Intentional Homicide Rates in 2016

Year	Value	region
2016	82.8	El Salvador
2016	56.5	Honduras
2016	56.3	Venezuela (Boliv. Rep. of)
2016	47.0	Jamaica
2016	37.6	Belize

Now we understand that crime rates are trending downwards globally, let's form a perspective into some of the most dangerous countries. For the sake of our analysis, let's define this 'danger' as the likelihood that homicide might occur. Table 2 shows us that in 2005, El Salvador was the most 'dangerous' country with a

rate of 64.4 intentional homicides per 100,000 people. Jamaica followed closely with a rate of 61.1 intentional homicides per 100,000 people. By 2016, as can been seen in Table 3 Jamaica's rate had decreased to 47.0 intentional homicides per 100,000 people. Unfortunately, El Salvador remains at the top of the list with 82.8 intentional homicides per 100,000 people, followed by Honduras with a rate of 56.5.

3   Crime Trends in Australia

The following section was compiled and edited by Yawen Zhang.

In this section, we will focus our analysis on crime trends within Australia by attempting to explore the crime results in each state as well as the gender trend for crime offence in Australia. To do this, we will use the '4519.0 - Recorded Crime - Offenders' datasets from the ABS [2020a] which can be found for the years 2016-17 here and the years 2018-19 here. These datasets were combined and modified in Excel prior to being read in. Per the ABS [2020b], its data is supplied with Creative Commons Attribution 4.0 International licensing and is therefore free to be re-used in this analysis.

From the year 2016 onwards, the data suggest that the most frequently detected offence-types were drug offences, acts intended to cause injury, theft and public order offences as can be seen in Table 4. As a result, we will study the performance of each state in these four popular offences, as well as the trend for each year.

Table 4: Four Offence-types in Each State

Year	Offence	NSW	Vic.	Qld.	SA	WA	Tas.	NT	ACT
2019	02 Acts intended to cause injury	446.5	305.0	236.6	418.2	330.8	433.6	1282.8	184.4
2019	08 Theft	153.5	151.0	283.9	190.2	226.7	156.5	152.8	65.1
2019	10 Illicit drug offences	248.7	164.3	528.6	1007.1	381.4	240.8	653.8	96.4
2019	13 Public order offences	194.8	158.5	316.6	516.5	105.1	526.2	1821.5	79.8
2018	02 Acts intended to cause injury	429.5	312.0	251.0	437.9	354.9	448.4	1427.8	192.4
2018	08 Theft	161.6	143.6	280.4	228.4	236.5	188.3	141.1	71.3

Per Figure 2, VIC, ACT and WA are the three safer states in Australia as all these four offence-types are below 500 offenders per 100,000 persons from 2016 to 2019. Illicit drug offences are relatively higher in SA compared with the other states over four years. The offender rate of theft in SA and NSW sees a significant decrease from 500 to 250 offenders per 100,000 persons over the same period. The Northern Territory has the highest crime rate among the eight states, especially for public order offences. The maximum amount of public order offences was 2500 offenders per 100,000 persons and decreased to 1750 offenders per 100,000 persons in 2018. Despite this decrease, public order offences remained the most common principal offence.

Figure 3 shows that the male offender rate was two to four times higher than the female offender rate, but they have similar trends over the year. Acts intended to cause injury was the most common principal offence for male offenders with 600 male offenders per 100,000 males. Illicit drug offences were the most common principal offence for female offenders with 200 female offenders per 100,000 females. It is necessary mentioning that, both males and females in theft offences shown a downward trend from 2013 until now. In contrast, illicit drug offences provide an increasing trend by both males and females from the year 2015.

In conclusion, as can be seen from the two figures: Figure 2 and Figure 3, the crime rates of different states in Australia are different, and at the same time, the crime rate of males is higher than that of females.
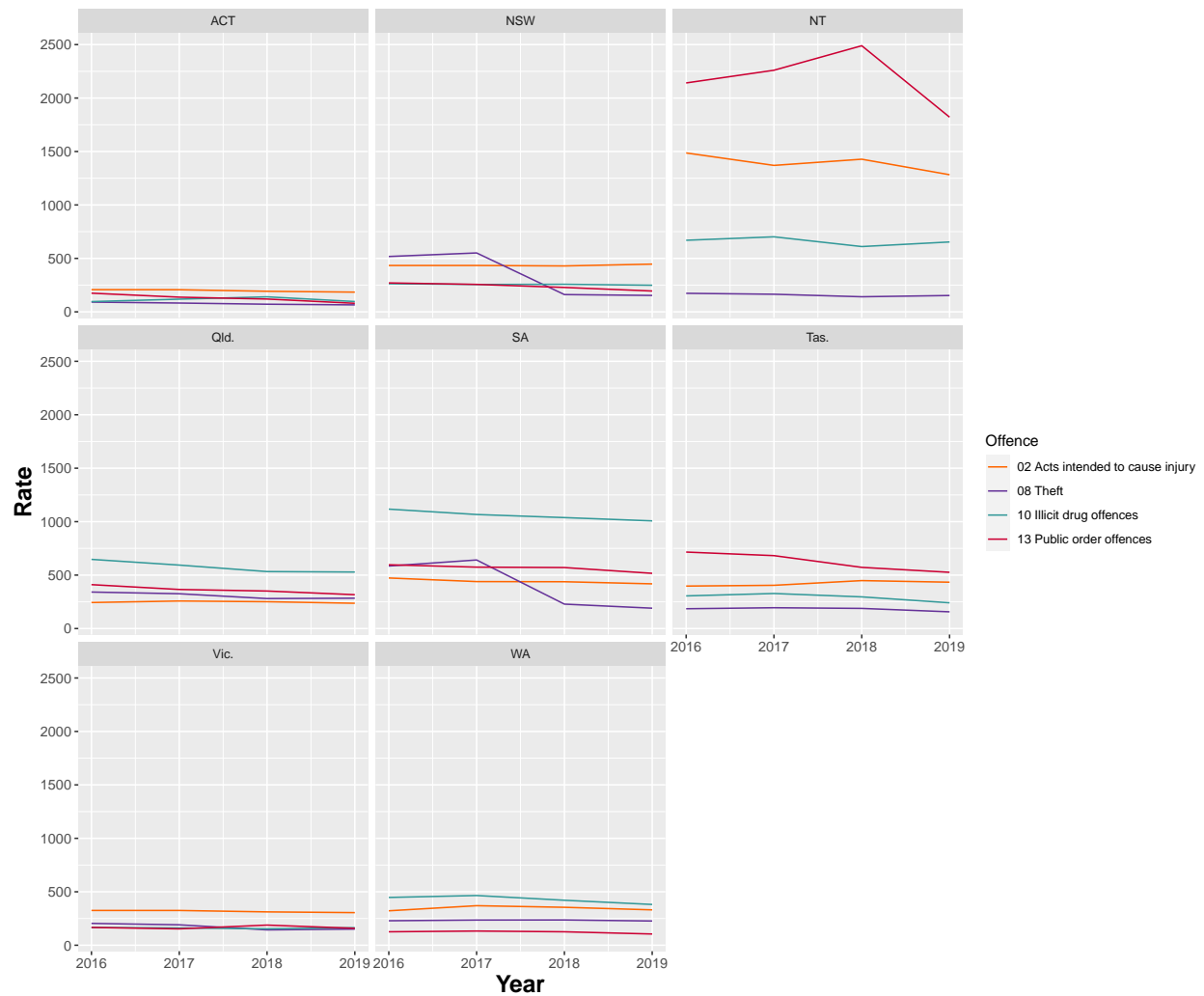
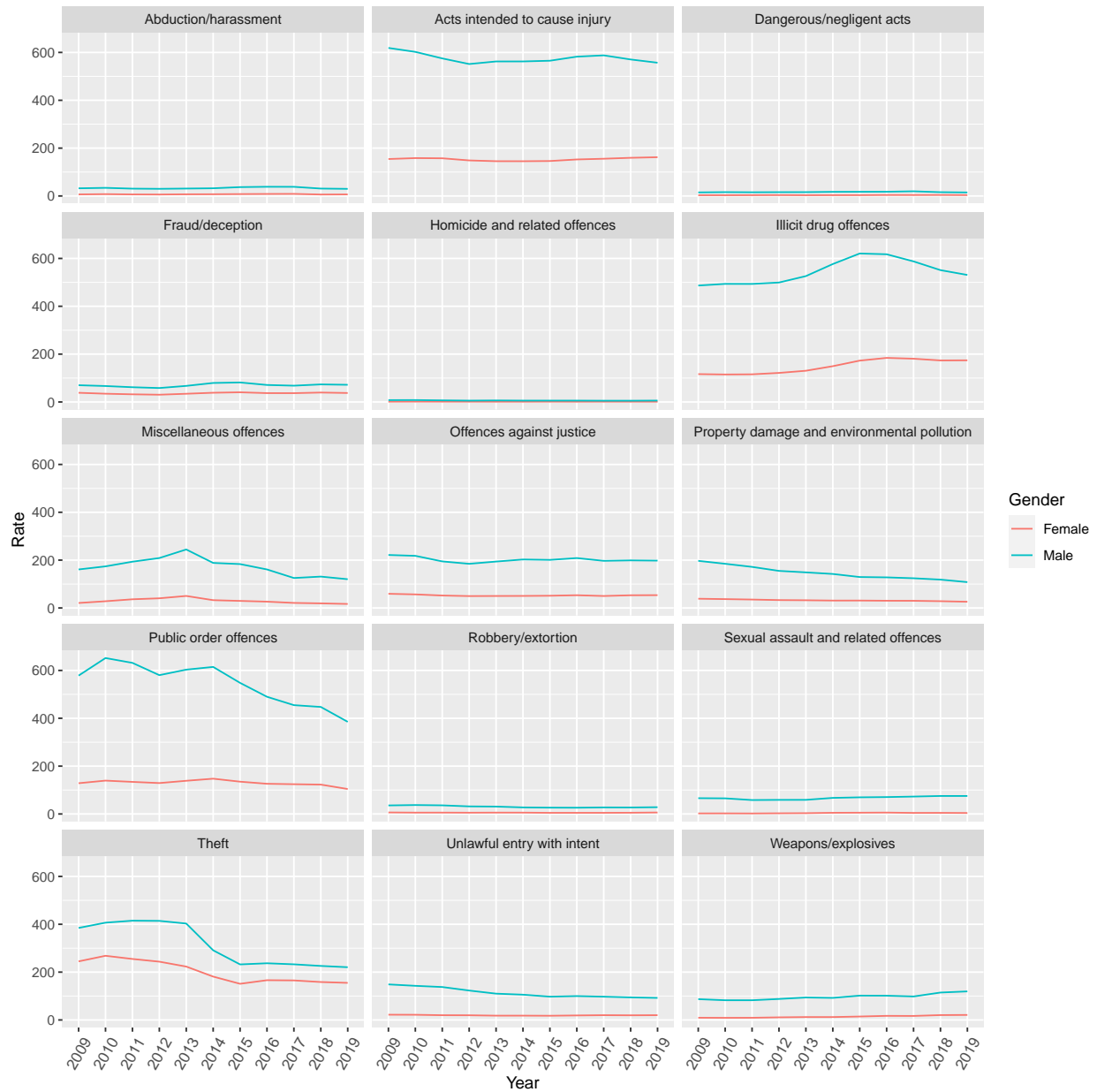Figure 2: Frequently Offence in Australia of Each State

Figure 3: Offenders in Each State by Genders

4   Tourism trends around the world

The following section was compiled and edited by Mayunk Bharadwaj.

Having looked at Crime trends around the world and in Australia, let's change tact and now look at Tourism trends. The data will be using is the UN's 'Tourist/visitor arrivals and tourism expenditure' dataset available on the UN data webpage (UN [2020b]). Per the UN [2020a], all the data available provided on the UN Data wesbite is available to be copied freely. It is, therefore, able to be used in the following analysis. The data provides information on Tourism Arrivals (how many tourists arrive in each country) and Tourism Expenditure (the amount of money tourists spend in a country they are visiting). Data was collected in the years 1995, 2005, 2010, 2016, 2017 and 2018. In some instances, a full view of Tourism Arrival and Tourism Expenditure was not available for every single country in all of the years. As such, these countries were removed to preserve the integrity of analysis when comparing global tourism trends from year to year.

So, let's dive into specifics. The below analysis will look at two main variables - the number of 'tourists' in thousands of people (measured by tourist arrivals in each country) and global tourist expenditure (that is, the amount of money spent by tourists) measured in millions of U.S. dollars.

Table 5: Global Tourism Trends by Year

Year	Global Tourist Arrivals in thousands of people	Global Tourist Expenditure in millions of U.S. dollars
1995	387302.2	366438.1
2005	558668.8	600624.6
2010	649453.7	811551.7
2016	861981.0	1054204.4
2017	915500.1	1130029.3
2018	956957.0	1207846.6

Table 5 shows us how Global Tourist Arrivals and their Expenditure has changed over the years. In 1995, there were ~387.30 million tourist arrivals around the globe. By 2018, this number had ballooned to just under a billion people at ~956.96 million tourist arrivals around the globe. This represents a 147% growth rate. Expenditure by these tourists has similarly grown. In 1995, tourists were spending 366,438 million U.S. dollars. By 2018, this number had grown by a whopping 230% to $1,207,846.6 million U.S. dollars. The growth in amount of tourists is outpaced by the growth in amount these tourists are spending!

Table 6: Top 3 Tourist Destinations in 1995 in thousands of people

Country	Arrivals
France	60033
United States of America	43318
Spain	32971

Table 7: Top 3 Tourist Destinations in 2018 in thousands of people

Country	Arrivals
France	89322.00
Spain	82773.00
United States of America	79745.92

So, where are these tourists actually going? As we can see in Table 6, France was the most popular destination with ~60 million tourists visiting, followed by the United States of America and then Spain. By 2018, as evidenced in Table 7 these three destinations remained the most popular with France still leading the way. Spain had overtaken the U.S., however, as the second most popular destination.

Figure 4 shows us the top 20 countries in 2018 in Average Expenditure per Tourist. Australia leads the way with the average tourist visiting Australia spending in excess of 5000 U.S. dollars. Interestingly, of the most popular tourist destinations of 2018 outlined in Table 7, only the U.S. makes the top 20 list for average expenditure per tourist.
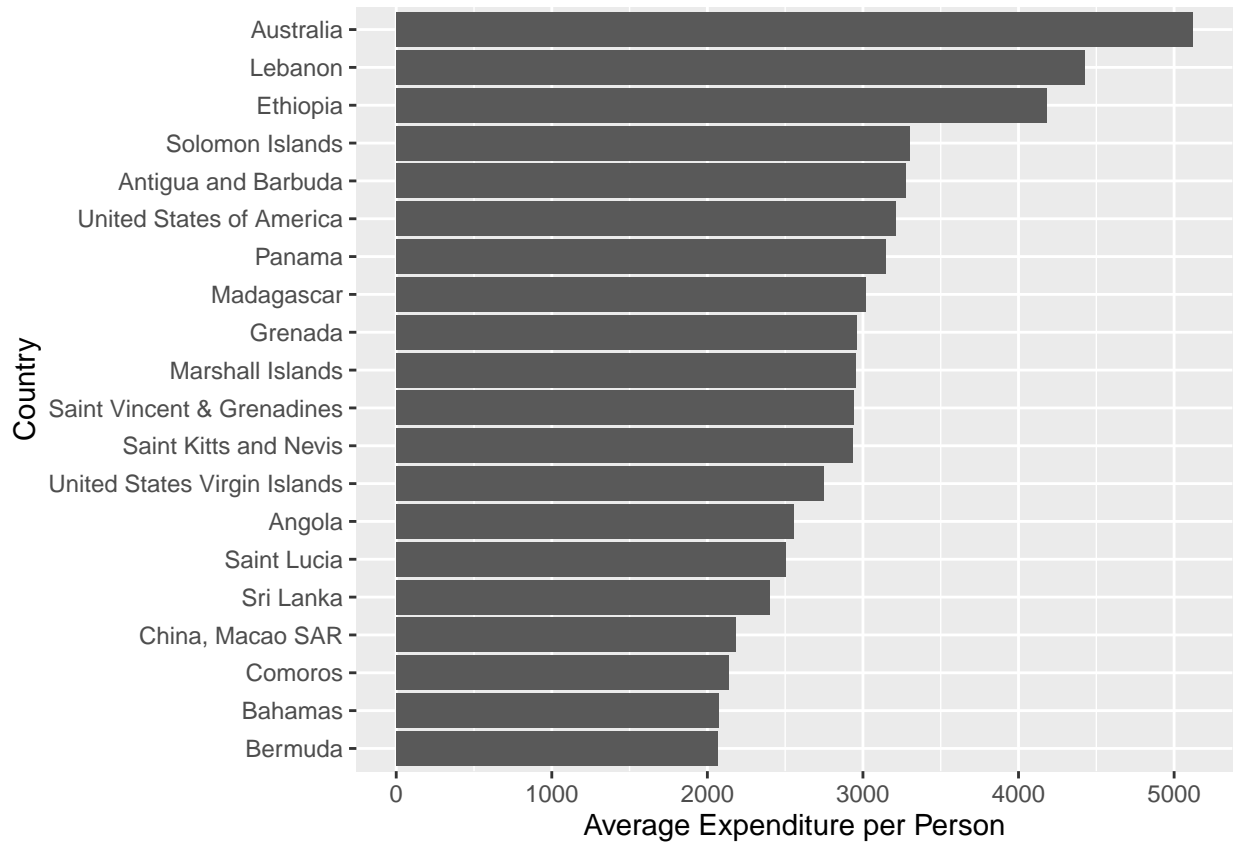

Figure 4: Average Expenditure per Tourist in 2018 by Country

5   Tourism in Australia

The following section was compiled and edited by Ankush Vemagal

Now let's look at Tourism trends in Australia. The following analysis was conducted with the use of the same dataset as the previous section - the UN's 'Tourist/visitor arrivals and tourism expenditure' dataset.

Australia (also known as Australasia), is large country reaching from the tropics to mid-latitudes in the Oceania continent. The Aussie mainland is the world's largest island and the driest continent. It has a land area of 8 million km^2 and a population of 25.5 million as of 2020. (Hennessy [2007])

Australia is world famous for its natural wonders and wide spaces, beaches, deserts, bushes. It is one of the world's most highly urbanised countries and is known for the attractions of its large cities such as Melbourne, Sydney, Brisbane and Perth. Some of most visited tourist attractions in Australia are:

- The Great Barrier Reef, Queensland
- Sydney Opera House and Harbour Bridge, New South Wales
- Great Ocean Road, Victoria
- Uluru, Northern Territory
- Kangaroo Island, South Australia

Table 8 shows the number of tourists ('000) and the tourism expenditure (millions of US dollars) - that is the amount that is spent by tourists.

Table 8: Tourist Arrivals vs Tourism Expenditure in Australia

Country	Year	Tourist/visitor arrivals (thousands)	Tourism expenditure (millions of US dollars)
Australia	1995	3726	10370
Australia	2005	5499	19719
Australia	2010	5790	31064
Australia	2016	8269	39059
Australia	2017	8815	43975
Australia	2018	9246	47327

- In the financial year 2018/19, Australia experienced a growth of 3.5% over the previous year and generated $ 60.8 billion in direct tourism Gross Domestic Product (GDP). [Australia]
- In that, international travellers spent an amount of $44.6 billion, which 5% more than the previous year. [Australia, 2019]

On a standardised scale, Figure 5 is a representation of the tourist arrivals in and the expenditure contributed by them on their visit to Australia. We can understand, the travel and tourism sector is a major attraction and the results shows the number keep increasing every year.
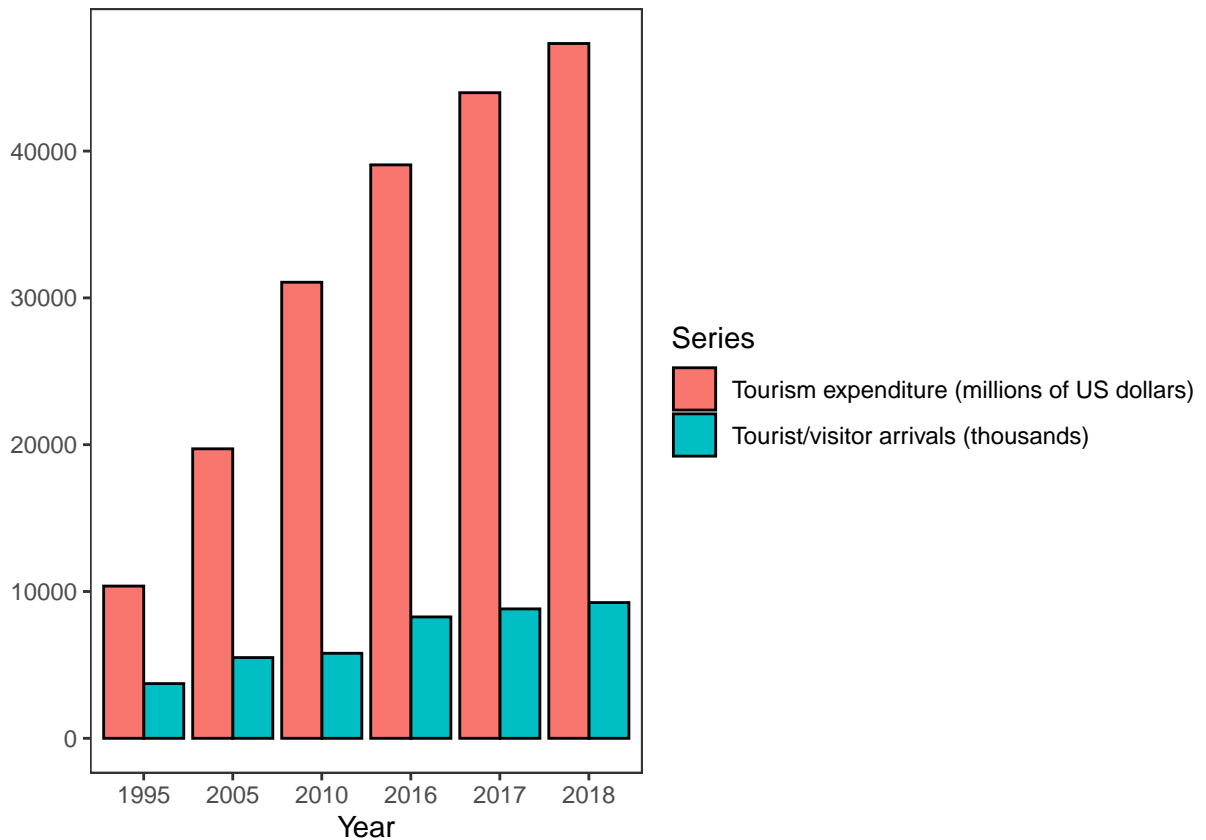

Figure 5: Bar plot of expenditure and arrivals by tourists in Australia

In Figure 6 , the cross mark indicated the average (mean) value of the respective series. We observe the following:

- The average tourism expenditure ranges between 30,000 - 35,000 USD (millions).
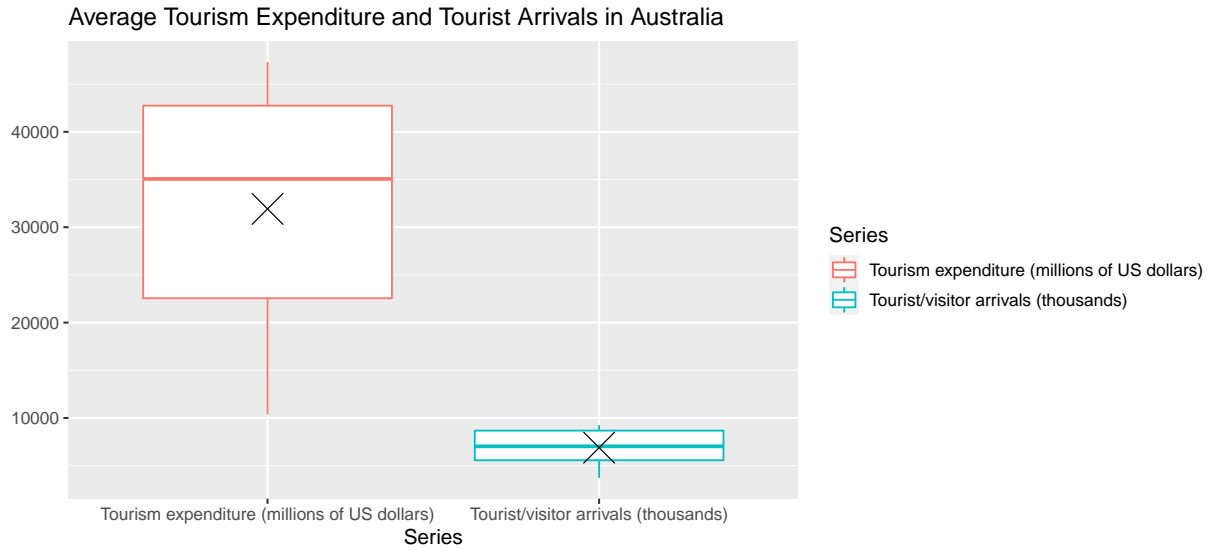- The average tourist arrivals ranges between 5,000 - 8,000 (thousands).

Figure 6: Boxplot of tourism expenditure and tourist arrivals in Australia

Tourism Expenditure

Figure 7 is a pie chart comprising of the cumulative expenditure by tourist on their visit to Australia during the respective years. 24.71%, was the highest expenditure contribution by tourist which took place in the year 2018 and 5.41% was the least contribution by tourist in the year 1995.
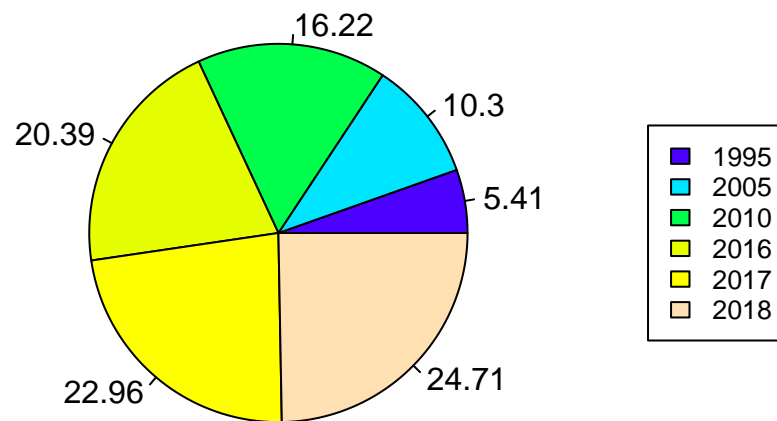
Expenditure of Tourist in Australia in different years (%)

Figure 7: Percentage of expenditure by tourist

Tourist/Visitor Arrivals

Figure 8 is pie chart showing the cumulative percentage contribution of the tourist arrivals over the years between 199-2018. 22.36%, was a major part of the tourist arrival contribution came in the year 2018 and the least was 9.01% which came in the year 1995.
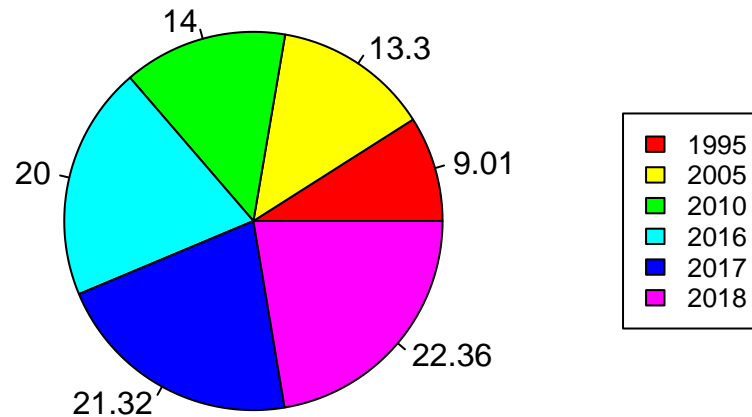
Tourist Arrivals in Australia in different years (%)

Figure 8: Percentage of arrivals/visitors in Australia

Update:

- Australia had a record 9.5 million visitors arrivals in 2019.
- 47% of visitors arrive in Australia for holiday purpose. (ABS [2019])

6   Relationship between Crime and Tourism

The following section was compiled and edited by Yuheng Cui.

In this section we try to find the relationship between tourism and crime. The data used are the UN Crime and Tourism datasets described in previous sections. For tourism, the number of visitor arrivals and visitor spending are two important indicators, therefore, we built two models for both of the indicators, respectively. Before creating models, we must remove the variables with too many missing values. Figure 9 specifies the missing values in the crime data set. We only kept Intentional homicide rates per 100,000 and removed other variables. Table 9 is table combined with crime and tourism. The missing values still existed, but they are few.
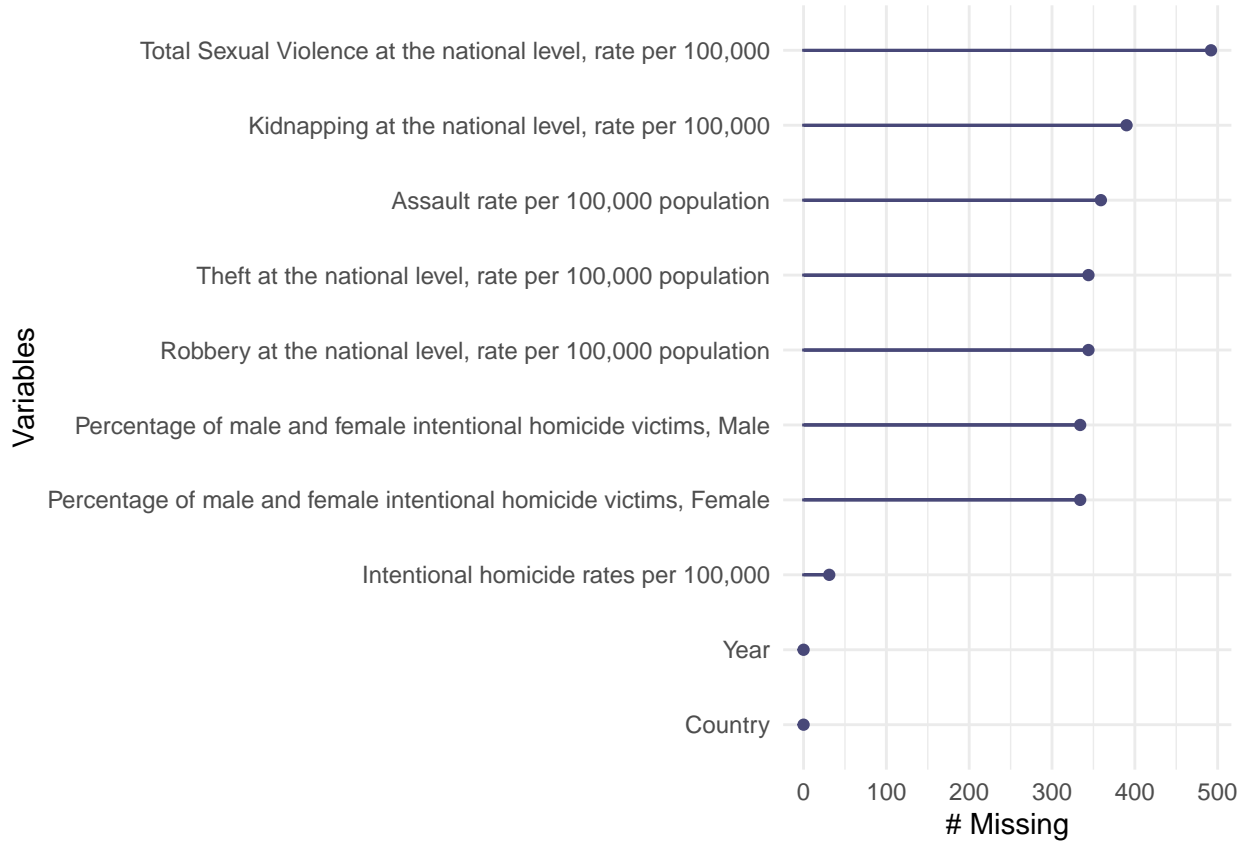

Figure 9: missing value in crime data set

Table 9: tourism/crime table

country	year	tour_exp_millionsusd	visitor_thousands	intentional_homicide_rates_per_100_000
Afghanistan	2010	147	NA	3.4
Albania	2010	1778	2191	4.3
Albania	2016	1821	4070	2.7
Albania	2005	880	NA	5.0
Algeria	2005	477	1443	0.6
Algeria	2010	324	2070	0.7

Table 10: Comparison between two models

model	r.squared	adj.r.squared
1	0.0651423	0.0607326
2	0.9751287	0.9545272

We created two linear models for visitor arrivals. They are similar, except Model 2 used country as additional explanatory variable while Model 1 did not. In Table 10, Model 2 had much higher R^2 than Model 1. 97.5% of the variation of the explanatory variables can be explained by Model 2 for visitor arrivals. In sum, country was a dominant explanatory variable in the model.

Figure 10 depicts the predicted values and residual values. The model performed well in the range from 0 to 10000; and most observations were in this range. Beyond 10000, fewer observations spread, the outliers were few.
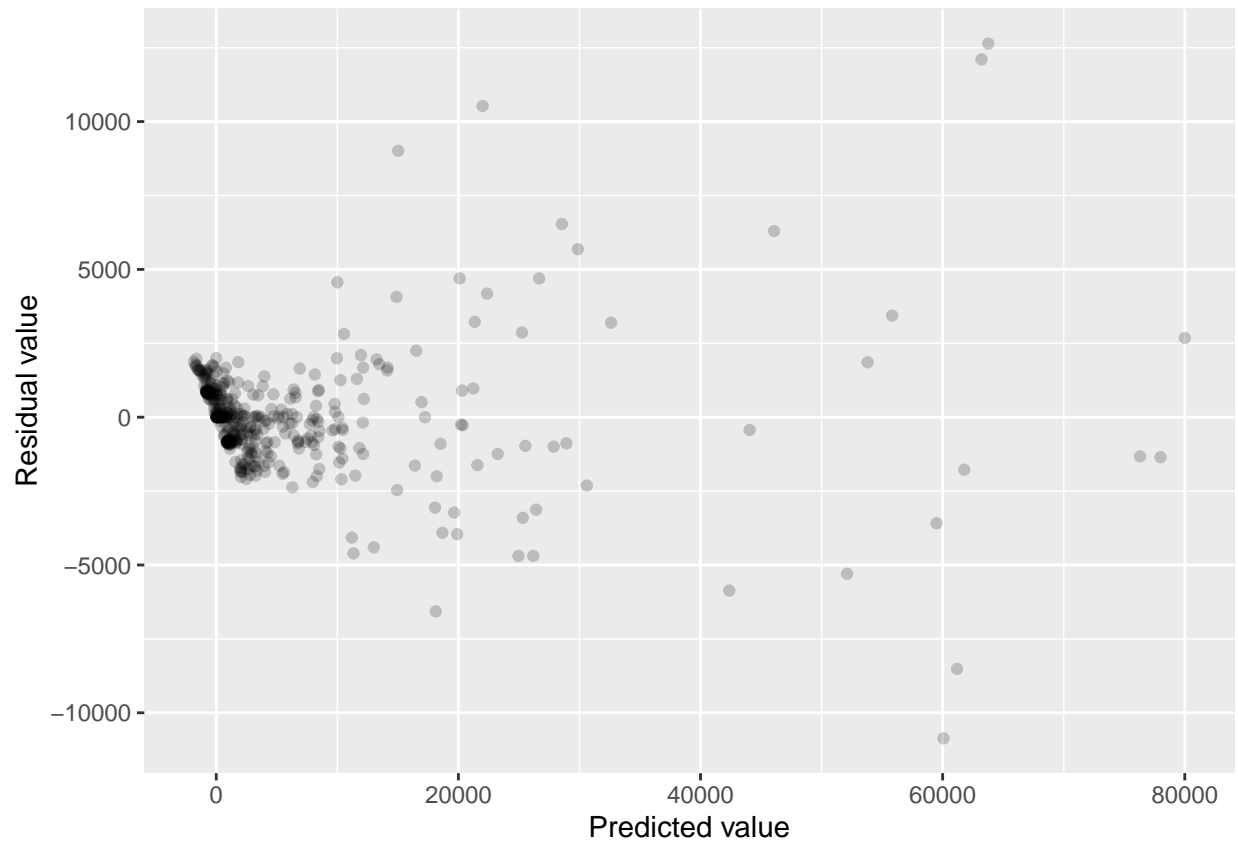

Figure 10: Predicted value and Residual value (the model of visitor arrivals)

Table 11: The fitness of visitor spending model

model	r.squared	adj.r.squared
1	0.9357137	0.8827720
2	0.9653206	0.9370460
3	0.9654975	0.9357371

Next, we built three linear models for visitor spending. Three models all used country and year as explanatory variables. However, in Model 1, we used intentional homicide rates as additional explanatory variable; in Model 2, we used visitor arrivals as additional explanatory variable; in Model 3, we used both intentional homicide rates and visitor arrivals. Table 11 shows Model 3 had the highest R^2 value. 96.54% of variations in explanatory variables could be explained by model 2. In sum, the number of visitor arrivals had bigger influence than crime rate on the fitness of the model. That is, holding crime rate and year constant, some countries were more attractive to tourists.
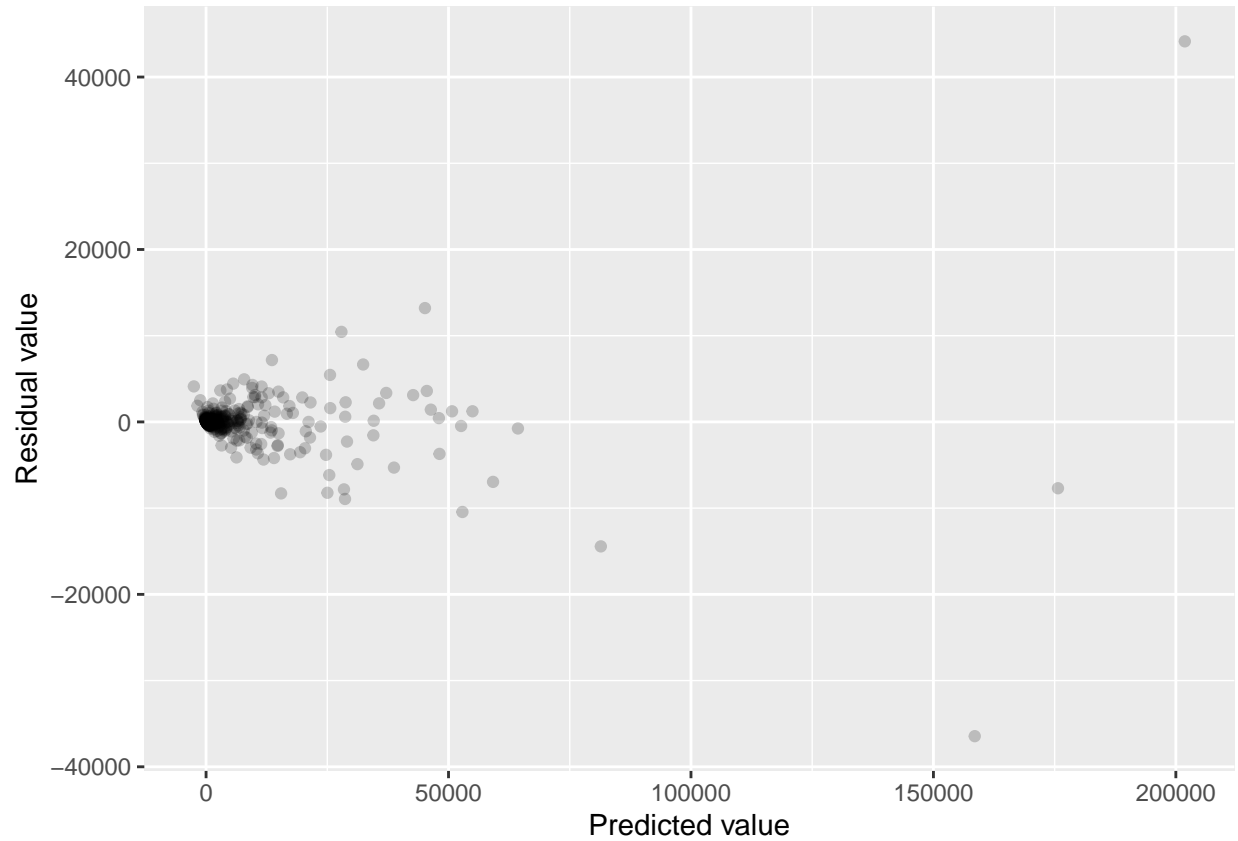
Figure 11: Predicted value and Residual value (the model of visitor spending)

Figure 11 specifies that the model did well in the range below 75000. There were few outliers above 75000.

In sum, the linear models above are good models and may be used to respectively predict visitor arrivals and visitor spending. The relationships among crime rate, number of tourists and tourist spending do exist.

7   Conclusion

In conclusion, the crime rates for every country is a problem, it decrease the boost in the economy and with the tables we were able to find that El Salvador was considered to be the most dangerous country in the world both in the years of 2005 and 2016 even though there was a huge gap between the these years for improvement.

Crime offence rates in Australia of each state are different from 2016 to 2019. The states with the highest crime rate are National Territories for drug offences, acts intended to cause injury, theft and public order offences. Then, crime rate of male is higher than female in each type of offence, but they have same trend in recent ten years.

Tourism remains an industry vital to the global economy, evidenced by the incredible growth in both number of tourists and the money they spend while on tour. France, Spain and the U.S. have been and still are the most popular tourist destinations. Tourists themselves spend the most money in Australia at over 5000 USD per person.

Tourism provides a source of income to the economy of Australia and is a major employer of Australians as it helps in generating jobs, investment and growth in communities. With the tourist arrivals and tourism expenditure growing on a yearly basis, a large number of regions in Australia are benefited as they rely significantly on tourism as their economic base.

Finally, the relationship between crime and tourism does exist. However, country and visitor arrival are the dominant explanatory variables in two models, respectively. We may deduce that holding crime rate and year constant, some countries could attract more tourists than other countries. This is logical because some countries have more landmarks than other countries. In additional, due to the high R^2 values, two linear models may be used for predicting visitor arrival and visitor spending in the future.

8   Acknowledgements

The packages used to produce this report are:

ggplot2 [Wickham, 2016], broom [Robinson and Hayes, 2020], naniar [Tierney et al., 2020], readxl[Wickham and Bryan, 2019], ggthemes[Arnold, 2019], knitr [Xie, 2014], kableExtra [Zhu, 2019], tidyverse [Wickham et al., 2019], janitor [Firke, 2020], readr [Wickham et al., 2018], lubridate [Grolemund and Wickham, 2011], base [R Core Team, 2020a], graphics [R Core Team, 2020b], dplyr [Wickham et al., 2020], here [Müller, 2017], png [Urbanek, 2013].

We use renv [Ushey, 2020] to ensure the report is reproducible.

References

ABS. Main features - visitor arrivals annually - 2019, 2019. URL https://www.abs.gov.au/AUSSTATS.

ABS. 4519.0 - recorded crime - offenders. 2020a. URL https://www.abs.gov.au/ausstats/abs@.nsf/PrimaryMainFeatures/4519.0?OpenDocument.

ABS. Creative commons licensing. 2020b. URL https://www.abs.gov.au/websitedbs/D3310114.nsf/Home/Creative%20Commons%20licensing.

Duha T Altindag. Crime and international tourism. *Journal of Labor Research*, 35(1):1–14, 2014.

Jeffrey B. Arnold. *ggthemes: Extra Themes, Scales and Geoms for 'ggplot2'*, 2019. URL https://CRAN.R-project.org/package=ggthemes. R package version 4.2.0.

Tourism Australia. International visitor spend - corporate - tourism australia. URL https://www.tourism.australia.com/en/markets-and-stats/tourism-statistics/the-economic-importance-of-tourism.html.

Tourism Australia. Tourism australia annual report 2018/19, 2019.

Sam Firke. *janitor: Simple Tools for Examining and Cleaning Dirty Data*, 2020. URL https://CRAN.R-project.org/package=janitor. R package version 2.0.1.

Garrett Grolemund and Hadley Wickham. Dates and times made easy with lubridate. *Journal of Statistical Software*, 40(3):1–25, 2011. URL http://www.jstatsoft.org/v40/i03/.

K Hennessy. Australia and new zealand. 2007.

Kirill Müller. *here: A Simpler Way to Find Your Files*, 2017. URL https://CRAN.R-project.org/package=here. R package version 0.1.

R Core Team. *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria, 2020a. URL https://www.R-project.org/.

R Core Team. *R: A Language and Environment for Statistical Computing.* R Foundation for Statistical Computing, Vienna, Austria, 2020b. URL https://www.R-project.org/.

David Robinson and Alex Hayes. *broom: Convert Statistical Analysis Objects into Tidy Tibbles*, 2020. URL https://CRAN.R-project.org/package=broom. R package version 0.5.6.

Nicholas Tierney, Di Cook, Miles McBain, and Colin Fay. *naniar: Data Structures, Summaries, and Visualisations for Missing Data*, 2020. URL https://CRAN.R-project.org/package=naniar. R package version 0.5.1.

UN. Terms and conditions of use. 2020a. URL https://data.un.org/Host.aspx?Content=UNdataUse.

UN. Tourist/visitor arrivals and tourism expenditure. 2020b. URL http://ideas.repec.org/a/jss/jstsof/27i03.html.

UN. Intentional homicides and other crimes. 2020c. URL http://ideas.repec.org/a/jss/jstsof/27i03.html.

Simon Urbanek. *png: Read and write PNG images*, 2013. URL https://CRAN.R-project.org/package=png. R package version 0.1-7.

Kevin Ushey. *renv: Project Environments*, 2020. URL https://CRAN.R-project.org/package=renv. R package version 0.10.0.

Hadley Wickham. *ggplot2: Elegant Graphics for Data Analysis.* Springer-Verlag New York, 2016. ISBN 978-3-319-24277-4. URL https://ggplot2.tidyverse.org.

Hadley Wickham and Jennifer Bryan. *readxl: Read Excel Files*, 2019. URL https://CRAN.R-project.org/package=readxl. R package version 1.3.1.

Hadley Wickham, Jim Hester, and Romain Francois. *readr: Read Rectangular Text Data*, 2018. URL https://CRAN.R-project.org/package=readr. R package version 1.3.1.

Hadley Wickham, Mara Averick, Jennifer Bryan, Winston Chang, Lucy D'Agostino McGowan, Romain François, Garrett Grolemund, Alex Hayes, Lionel Henry, Jim Hester, Max Kuhn, Thomas Lin Pedersen, Evan Miller, Stephan Milton Bache, Kirill Müller, Jeroen Ooms, David Robinson, Dana Paige Seidel, Vitalie Spinu, Kohske Takahashi, Davis Vaughan, Claus Wilke, Kara Woo, and Hiroaki Yutani. Welcome to the tidyverse. *Journal of Open Source Software*, 4(43):1686, 2019. doi: 10.21105/joss.01686.

Hadley Wickham, Romain François, Lionel Henry, and Kirill Müller. *dplyr: A Grammar of Data Manipulation*, 2020. URL https://CRAN.R-project.org/package=dplyr. R package version 1.0.0.

WTTC. Economic impact reports. 2020. URL https://wttc.org/Research/Economic-Impact.

Yihui Xie. knitr: A comprehensive tool for reproducible research in R. In Victoria Stodden, Friedrich Leisch, and Roger D. Peng, editors, *Implementing Reproducible Computational Research.* Chapman and Hall/CRC, 2014. URL http://www.crcpress.com/product/isbn/9781466561595. ISBN 978-1466561595.

Hao Zhu. *kableExtra: Construct Complex Table with 'kable' and Pipe Syntax*, 2019. URL https://CRAN.R-project.org/package=kableExtra. R package version 1.1.0.