Singapore's Travel Bubble

Context

I was reading the Economist's article "Could travel bubbles offer a route to economic recovery?" and get curious which country will be beneficial for Singapore to form travel bubbles with. The article describes a potential selective travel agreement during COVID-19 pandemic. On the one hand, allowing travel between trading partners enable business activities to continue. On the other, increasing travel also increases the possibility of imported cases. One possible solution will be selective in countries to open borders with. The article also says that it is more likely for countries to open borders with countries who are handling the COVID-19 situation equally well, if not better. I tried to get a sense of Singapore's potential travel partners by comparing the active COVID-19 cases and trade volumes between Singapore and Singapore's trading partners. It seems like most of our potential partners will be in Asia.

Link to article: https://www.economist.com/finance-and-economics/2020/05/14/could-travel-bubbles-offer-a-route-to-economic-recovery

Data

Trade Data

Goods import and export data taken from Singapore's Department of Statistics, Singapore Data filtered to only 2019 data

```
#Import
str(goods_import)
```

```
## tibble [112 x 4] (S3: tbl_df/tbl/data.frame)
##  $ Country: chr [1:112] "Mainland China" "United States" "Malaysia" "Taiwan" ...
##  $ Year   : chr [1:112] "2019" "2019" "2019" "2019" ...
##  $ Trade  : num [1:112] 6.69e+10 5.97e+10 5.69e+10 4.42e+10 2.64e+10 ...
##  $ Rank   : int [1:112] 1 2 3 4 5 6 7 8 9 10 ...
```

```
#Top 5 countries Singapore import from
knitr::kable(head(goods_import,5))
```

Country	Year	Trade	Rank
Mainland China	2019	66890480000	1
United States	2019	59712562000	2
Malaysia	2019	56873014000	3
Taiwan	2019	44167777000	4
Japan	2019	26427086000	5

```
#Export
str(goods_export)
```

```
## tibble [84 x 4] (S3: tbl_df/tbl/data.frame)
##  $ Country: chr [1:84] "Mainland China" "Hong Kong" "Malaysia" "United States" ...
##  $ Year   : chr [1:84] "2019" "2019" "2019" "2019" ...
##  $ Trade  : num [1:84] 7.04e+10 6.05e+10 5.61e+10 4.53e+10 3.73e+10 ...
##  $ Rank   : int [1:84] 1 2 3 4 5 6 7 8 9 10 ...
```

```
#Top 5 countries Singapore export to
knitr::kable(head(goods_export,5))
```

Country	Year	Trade	Rank
Mainland China	2019	70421986000	1
Hong Kong	2019	60542274000	2
Malaysia	2019	56142609000	3
United States	2019	45311700000	4
Indonesia	2019	37324868000	5

COVID-19 Data

Covid figure taken from Jogns Hopkins University on 17 May 2020

```
#COVID-19
str(covid_data)
```

```
## tibble [196 x 6] (S3: tbl_df/tbl/data.frame)
##  $ Country  : chr [1:196] "United States" "Russia" "United Kingdom" "Brazil" ...
##  $ Confirmed: num [1:196] 1467820 272043 241461 233511 179630 ...
##  $ Deaths   : num [1:196] 88754 2537 34546 15662 27532 ...
##  $ Recovered: num [1:196] 268376 63166 1058 89672 60562 ...
##  $ Active   : num [1:196] 1111939 206340 205857 128177 91536 ...
##  $ Rank     : int [1:196] 1 2 3 4 5 6 7 8 9 10 ...
```

```
#Top 10 countries by active case count
knitr::kable(head(covid_data,10))
```

Country	Confirmed	Deaths	Recovered	Active	Rank
United States	1467820	88754	268376	1111939	1
Russia	272043	2537	63166	206340	2
United Kingdom	241461	34546	1058	205857	3
Brazil	233511	15662	89672	128177	4
France	179630	27532	60562	91536	5
Italy	224760	31763	122810	70187	6
Peru	88541	2523	28272	57746	7
Spain	230698	27563	146446	56689	8
India	90648	2871	34224	53553	9
Netherlands	44070	5689	167	38214	10

```
#Singapore's ranking
knitr::kable(covid_data %>% filter(Country=="Singapore"))
```

Country	Confirmed	Deaths	Recovered	Active	Rank
Singapore	27356	22	8342	18992	22

Trade Data & COVID-19 Data

Singapore's trade data is joined with COVID-19 data after some data preprocessing A new rank is computed by comparing Singapore's active cases to other trading partners

```
#Trade & COVID-19
str(trade_covid_data)
```

```
## tibble [84 x 14] (S3: tbl_df/tbl/data.frame)
##  $ Country      : chr [1:84] "United States" "United Kingdom" "Brazil" "France" ...
##  $ Year         : chr [1:84] "2019" "2019" "2019" "2019" ...
##  $ Trade_export : num [1:84] 4.53e+10 5.98e+09 1.82e+09 5.42e+09 1.05e+09 ...
##  $ Rank_export  : int [1:84] 4 19 29 21 39 69 41 12 14 33 ...
##  $ Trade_import : num [1:84] 5.97e+10 1.21e+10 2.01e+09 1.66e+10 5.66e+09 ...
##  $ Rank_import  : int [1:84] 2 11 30 8 21 75 32 17 25 29 ...
##  $ Net_trade    : num [1:84] -1.44e+10 -6.09e+09 -1.92e+08 -1.12e+10 -4.61e+09 ...
##  $ Rank_net_trade: num [1:84] 83 79 61 82 75 43 69 7 6 70 ...
##  $ Confirmed    : num [1:84] 1467820 241461 233511 179630 224760 ...
##  $ Deaths       : num [1:84] 88754 34546 15662 27532 31763 ...
##  $ Recovered    : num [1:84] 268376 1058 89672 60562 122810 ...
##  $ Active       : num [1:84] 1111939 205857 128177 91536 70187 ...
##  $ Rank_covid   : int [1:84] 1 2 3 4 5 6 7 8 9 10 ...
##  $ Potential    : logi [1:84] FALSE FALSE FALSE FALSE FALSE FALSE ...
```

```
#Singapore ranking compared to trading partners
knitr::kable(data.frame(covid_data %>% filter(Country=="Singapore") %>% select(-Rank), Rank=sg_rank))
```

Country	Confirmed	Deaths	Recovered	Active	Rank
Singapore	27356	22	8342	18992	19

```
#Top 10 countries by active case count, when compared to Singapore
knitr::kable(head(trade_covid_data,10) %>%
             select(Country, Net_trade, Confirmed, Deaths, Recovered, Active, Rank_covid))
```

Country	Net_trade	Confirmed	Deaths	Recovered	Active	Rank_covid
United States	-14400862000	1467820	88754	268376	1111939	1
United Kingdom	-6089580000	241461	34546	1058	205857	2
Brazil	-192335000	233511	15662	89672	128177	3
France	-11169567000	179630	27532	60562	91536	4
Italy	-4606543000	224760	31763	122810	70187	5
Peru	50369000	88541	2523	28272	57746	6
Spain	-778850000	230698	27563	146446	56689	7
India	6922692000	90648	2871	34224	53553	8
Netherlands	7452698000	44070	5689	167	38214	9
Canada	-1160858000	77206	5800	37832	33574	10

Data issue

I maintained Singapore's naming convention for the country names. However, there are a few issues. 1.
Countries with no COVID-19 figures

```r
#Countries with no COVID-19 figures
knitr::kable(missing_country)
```

Country
Other Countries In Oceania
Solomon Islands

2. Potential wrong COVID-19 calculation
   - Singapore clusters countries in Oceania and Africa, there are a few countries in these region with no COVID-19 figures

```r
#Countries in Oceania with no COVID-19 figures
knitr::kable(data.frame(Country=missing_oceania_countries))
```

Country
Vanuatu
Samoa
Kiribati
Federated States of Micronesia
Tonga
American Samoa
Northern Mariana Islands
Marshall Islands
Palau
Cook Islands
Wallis and Futuna
Tuvalu
Nauru
Norfolk Island
Niue
Tokelau
Pitcairn Islands
Total

```r
#Countries in Africa with no COVID-19 figures
knitr::kable(data.frame(Country=missing_african_countries))
```

Country
Ivory Coast
Réunion (France)
Cape Verde
Mayotte (France)
Saint Helena, Ascension and Tristan da Cunha (UK)

3. Clustering issue
   - As mentioned previously, Singapore clusters countries together. I referred to Singapore's Ministry of Foreign Affairs website for definition of Oceania countries
   - Oceania countries therefore contains Australia and New Zealand
   - Link: https://www.mfa.gov.sg/SINGAPORES-FOREIGN-POLICY/Countries-and-Regions/ Oceania
4. Countries in region
   - A branch out issue with clustering is the list of countries in the specific region
   - I used wikipedia's list of countries in Oceania and Africa
   - African countries: https://en.wikipedia.org/wiki/List_of_African_countries_by_population
   - Oceanian countries: https://en.wikipedia.org/wiki/List_of_Oceanian_countries_by_population

Analyse

I classify all countries with lesser active COVID-19 cases than Singapore as potential partners I used Tableau to create the maps

```
+ The numbers represent active COVID-19 cases.
+ The colours represent net trade, trade deficit (red) and trade surplus (blue)
```
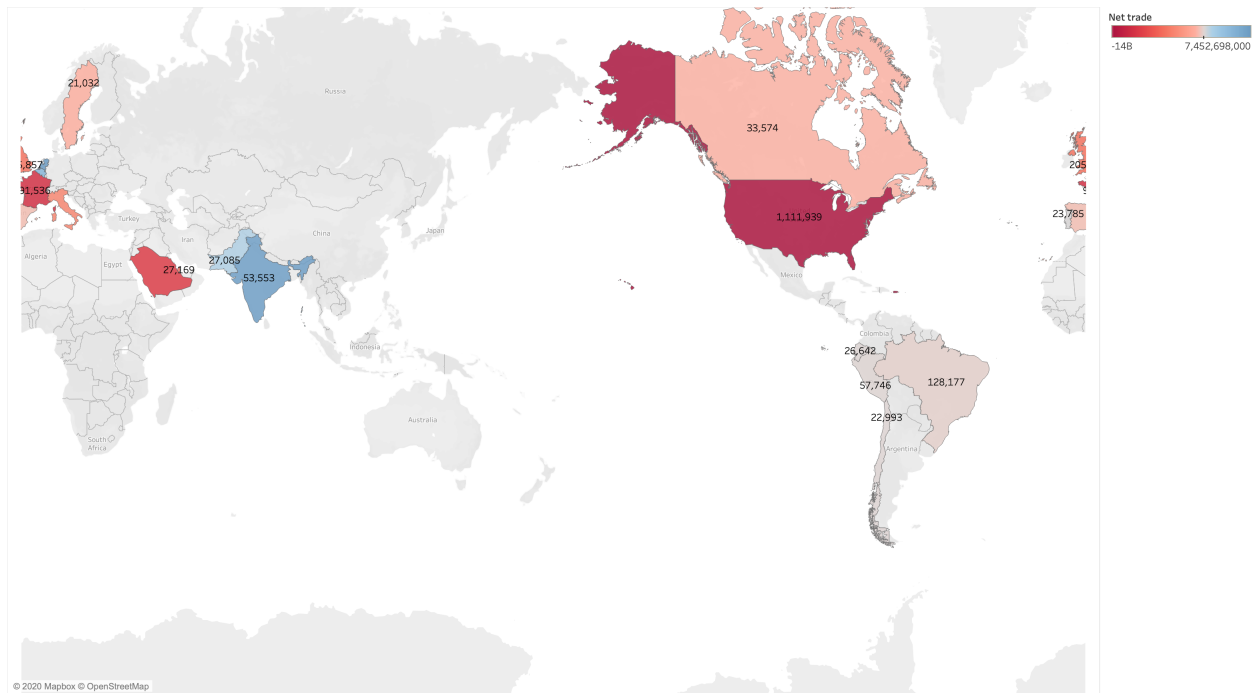
Worldwide

Potential Partners

The main potential partners are concentrated in Asia and majority of them provides trade surplus to Singapore
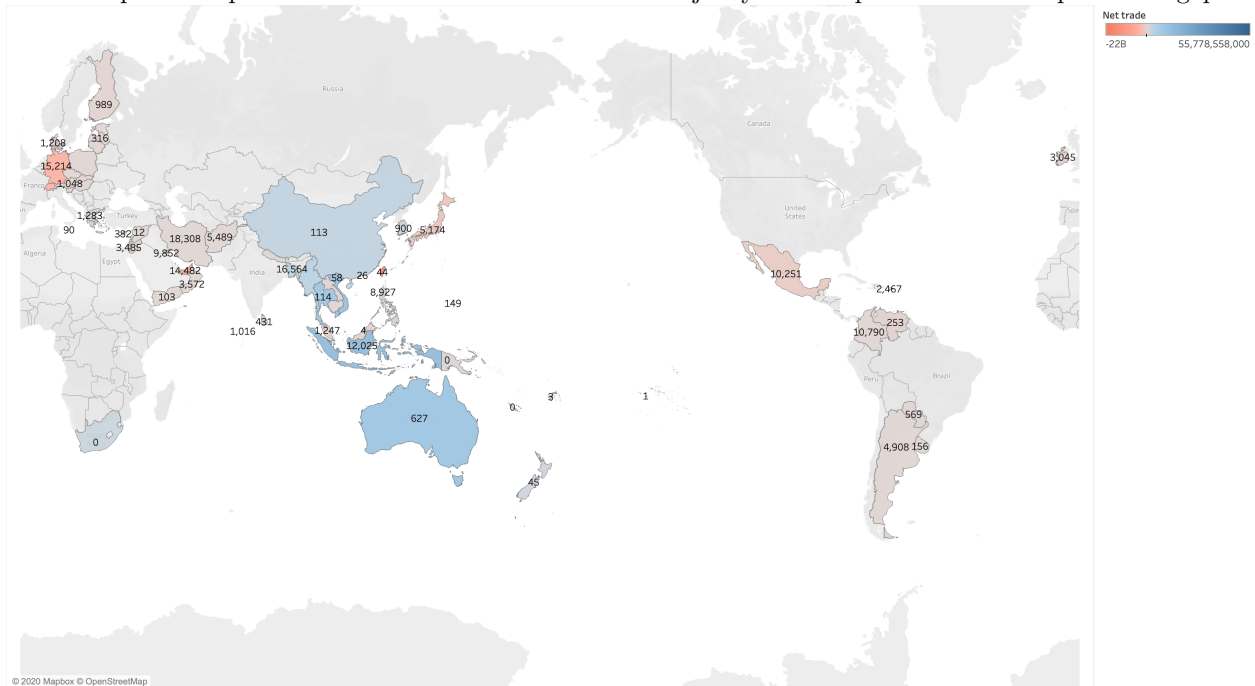
Not Potential Partners

Majority of countries that Singapore might not be able to partner with are in America, and most of these countries are net importers to Singapore

Asia

Net trade
-22B — 55,778,558,000

491
167
4
54
283
382 629
18,308   5,489   113   900   5,174
3,485
9,852   254
14,482   16,564   26   44
3,572   80   58
103   5   114   8,927
0   149
431
1,016   1,247   4
12,025   0

3   1
0
627

45

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8
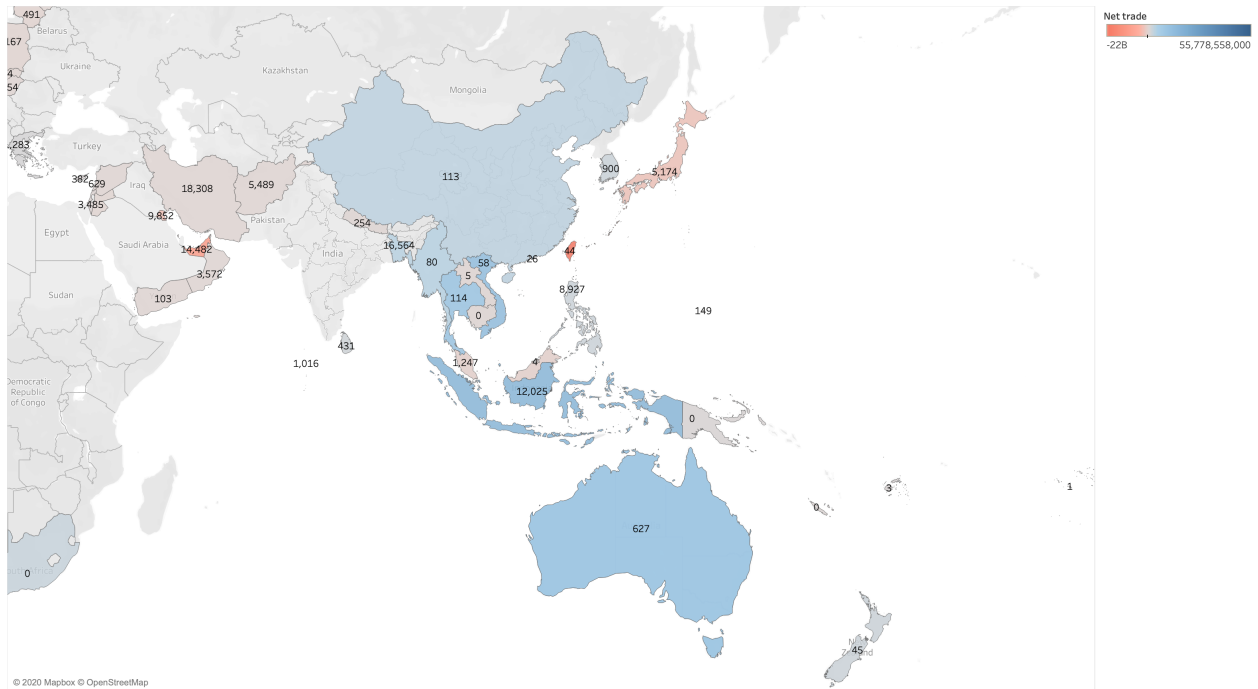
Southeast Asia

Limitations

There are other factors beside trade figures and active COVID-19 numbers which may affect the travel bubble. One important factor is the 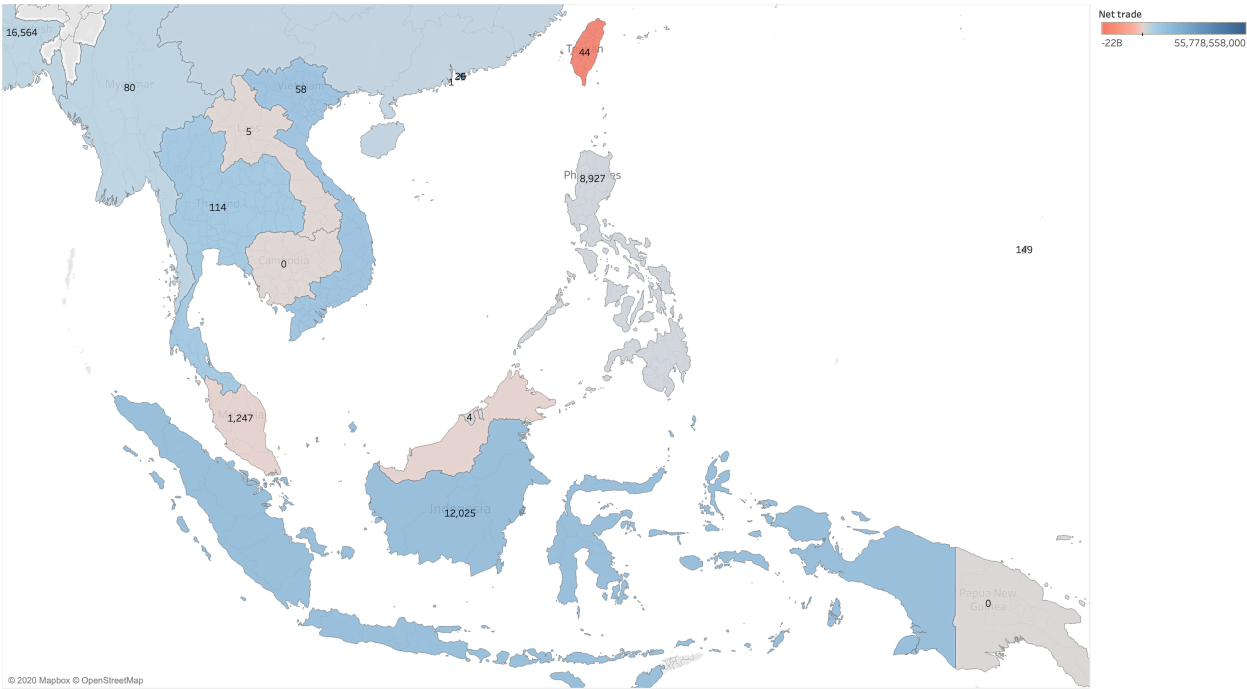relationships between countries. For example, Singapore and New Zealand signed a Declaration on Trade in Essential Goods for Combating the Covid-19 Pandemic on 15 April.

Link: https://www.straitstimes.com/opinion/spore-and-new-zealand-standing-together-amid-covid-19-challenges

Conclusion

If we look purely at the trade figures and active COVID-19 numbers, it seems like Singapore will be willing to partner with almost all the close neighbours in Asia and Oceania. However, this does not mean that Singapore's trading partner will want to form travel bubbles with Singapore. Especially considering many of the close neighbours now have lesser active cases than Singapore. I hope we will be able to control the situation and lower the number of active cases in order for us to resume trading and travelling to other countries.

Full data

```
#full table
knitr::kable(trade_covid_data %>%
            mutate(`Export(rank)`=Rank_export, `Import(rank)`=Rank_import,
                   `Net trade(rank)`=Rank_net_trade, `Active cases`=Active,
                   `Partner?`=Potential) %>%
            select(Country, `Export(rank)`, `Import(rank)`, `Net trade(rank)`,
                   `Active cases`, `Partner?`),
            longtable=TRUE)
```

Country	Export(rank)	Import(rank)	Net trade(rank)	Active cases	Partner?
United States	4	2	83	1111939	FALSE
United Kingdom	19	11	79	205857	FALSE
Brazil	29	30	61	128177	FALSE
France	21	8	82	91536	FALSE
Italy	39	21	75	70187	FALSE
Peru	69	75	43	57746	FALSE
Spain	41	32	69	56689	FALSE
India	12	17	7	53553	FALSE
Netherlands	14	25	6	38214	FALSE
Canada	33	29	70	33574	FALSE
Belgium	18	31	9	31524	FALSE
Saudi Arabia	37	12	80	28048	FALSE
Qatar	35	19	78	27169	FALSE
Pakistan	36	62	21	27085	FALSE
Ecuador	67	76	37	26642	FALSE
Portugal	43	45	32	23785	FALSE
Chile	64	66	39	22993	FALSE
Sweden	55	34	71	21032	FALSE
Iran (Islamic Republic Of)	76	82	47	18308	TRUE
Bangladesh	24	49	12	16564	TRUE
Germany, Federal Republic Of	16	10	77	15214	TRUE
United Arab Emirates	20	9	81	14482	TRUE
Indonesia	5	6	2	12025	TRUE
Colombia	63	57	56	10790	TRUE
Mexico	28	26	72	10251	TRUE
Poland	47	41	60	10167	TRUE
Kuwait	58	27	74	9852	TRUE
Philippines	15	15	16	8927	TRUE
Afghanistan	74	92	44	5489	TRUE
Japan	7	5	73	5174	TRUE
Argentina	61	64	36	4908	TRUE
Bahrain	57	46	59	3973	TRUE
Oman	54	51	40	3572	TRUE
Israel	40	38	31	3485	TRUE
Ireland	48	36	65	3045	TRUE
Czech Republic	44	40	54	2737	TRUE
Puerto Rico	32	56	19	2467	TRUE
Hungary	50	47	38	1654	TRUE
Switzerland	25	16	76	1293	TRUE
Greece	38	54	22	1283	TRUE
Malaysia	3	3	68	1247	TRUE
Denmark	59	39	64	1208	TRUE

Country	Export(rank)	Import(rank)	Net trade(rank)	Active cases	Partner?
Slovenia	72	65	55	1090	TRUE
Austria	53	37	67	1048	TRUE
Maldives, Republic Of	51	94	28	1016	TRUE
Finland	66	44	63	989	TRUE
Republic Of Korea	10	7	15	900	TRUE
Estonia	77	59	58	773	TRUE
Lebanon	75	86	45	629	TRUE
Oceania	6	14	3	627	TRUE
Australia	13	18	8	582	TRUE
Paraguay	83	91	51	569	TRUE
Lithuania	80	55	62	491	TRUE
Sri Lanka	31	60	18	431	TRUE
Cyprus	45	70	26	382	TRUE
Latvia	73	72	48	316	TRUE
Slovak Republic (Slovakia)	78	61	57	314	TRUE
Nepal	60	84	34	254	TRUE
Venezuela	84	43	66	253	TRUE
Jordan	68	63	52	194	TRUE
Uruguay	79	69	53	156	TRUE
Guam	49	99	27	149	TRUE
Luxembourg	62	58	46	127	TRUE
Thailand	9	13	5	114	TRUE
Mainland China	1	1	13	113	TRUE
Yemen	81	83	49	103	TRUE
Malta	30	48	20	90	TRUE
Myanmar	22	52	11	80	TRUE
Vietnam, Socialist Republic Of	11	23	4	58	TRUE
New Zealand	26	35	17	45	TRUE
Taiwan	8	4	84	44	TRUE
Hong Kong	2	24	1	26	TRUE
Syrian Arab Republic	82	106	50	12	TRUE
Laos People's Democratic Republic	70	80	42	5	TRUE
Brunei Darussalam	34	42	23	4	TRUE
Fiji	46	81	25	3	TRUE
Macau	56	78	30	1	TRUE
French Polynesia	65	88	35	1	TRUE
Africa	17	22	14	0	TRUE
Papua New Guinea	42	53	24	0	TRUE
New Caledonia	52	100	29	0	TRUE
Cambodia	27	28	33	0	TRUE
Other Countries In Oceania	23	77	10	NA	NA
Solomon Islands	71	89	41	NA	NA