Visa Requirements Network

Get outta here with ease.

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Motivation

- Comprehensive visa information at a glance
- Compare across different countries their visa requirements and capture underlying relations
- Identify countries with different levels of openness

Data Source

Project Visa

www.projectvisa.com

Visa information for all countries.

Countryname	Region
Afghanistan	Asia
Albania	Europe
Algeria	Africa
American Samoa	Australasia
Andorra	Europe
Angola	Africa
Anguilla	Caribbean
Antigua and Barbuda	Caribbean
Argentina	South America
Armenia	Europe

Visa Information for Australia

Visa Information

All travelers to Australia, other than Australian and New Zealand citizens, are required to hold a valid visa to travel to Australia.

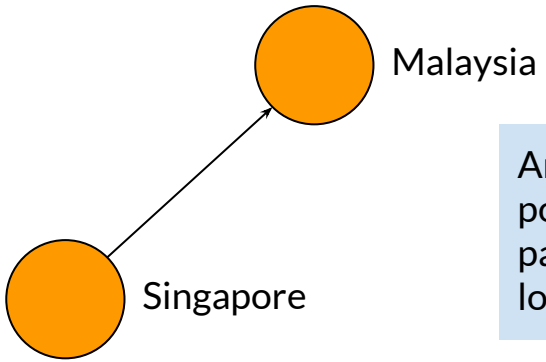
Visitors from Andorra, Austria, Belgium, Brunei, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Italy, Japan, Liechtenstein, Luxembourg, Malaysia, Malta, Monaco, Norway,Netherlands, Portugal, San Marino, Singapore, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom, USA and Vatican City can apply for an ETA that allows you to visit for up to 3 months per visit in a 12 month period. The visa is free but you need to pay a service fee (A$20) to apply.

Network Generation

Different Levels of Visa Curtailment

Exemption
Free Visa
Visa on Arrival
Different Length
Different Cost

- Create a full list of countries as nodes;
- Create edges if there is easy visa requirement relation between two countries.

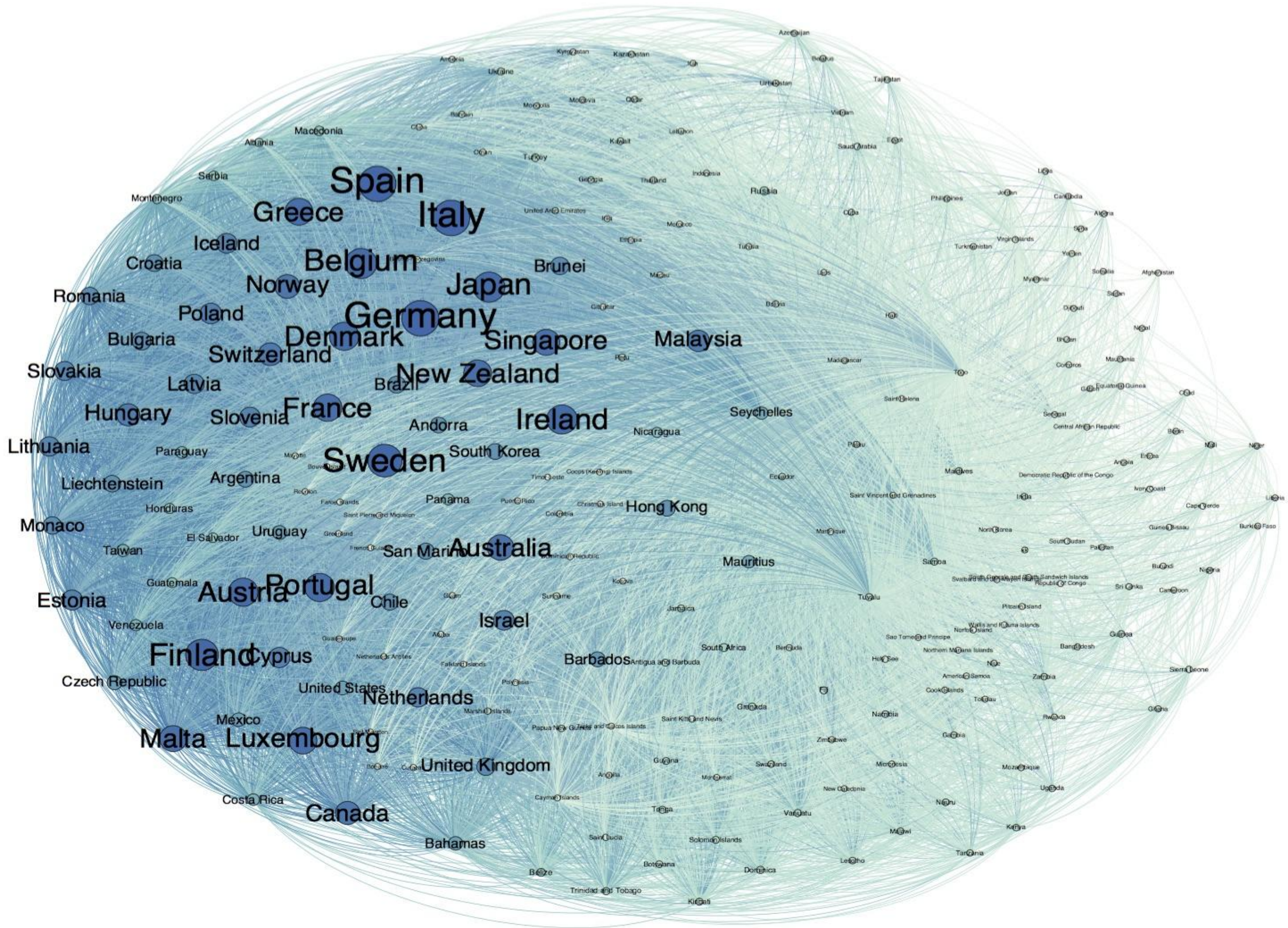


An edge is created from Singapore pointing to Malaysia if Singapore passport holder can visit Malaysia with loosened visa requirements.

Parsing Methods

[ ] do not need a visa	Create edges with all the countries in [ ]
Only [ ] need a visa	Create edges with all the countries except the ones in [ ]
[A] need a visa, [B] do not	Create edges only with the countries in [A]
[EU] do not need a visa	Create edges with countries in the predefined EU list
Same as A	Replicate the in-neighbors of node A

Our Network


Macedonia
Albania
Serbia
Montenegro
Spain
Italy
Greece
Iceland
Croatia
Belgium
Brunei
Japan
Norway
Romania
Poland
Germany
Bulgaria
Denmark
Singapore
Malaysia
Switzerland
Slovakia
New Zealand
Latvia
Brazil
Hungary
Slovenia
France
Andorra
Ireland
Seychelles
Nicaragua
Lithuania
Paraguay
Sweden
South Korea
Liechtenstein
Argentina
Honduras
Panama
Hong Kong
Monaco
El Salvador
Uruguay
Taiwan
San Marino
Australia
Mauritius
Guatemala
Austria
Portugal
Estonia
Chile
Israel
Venezuela
Finland
Cyprus
Barbados
South Africa
Czech Republic
United States
Netherlands
Mexico
Malta
Luxembourg
United Kingdom
Costa Rica
Canada
Bahamas

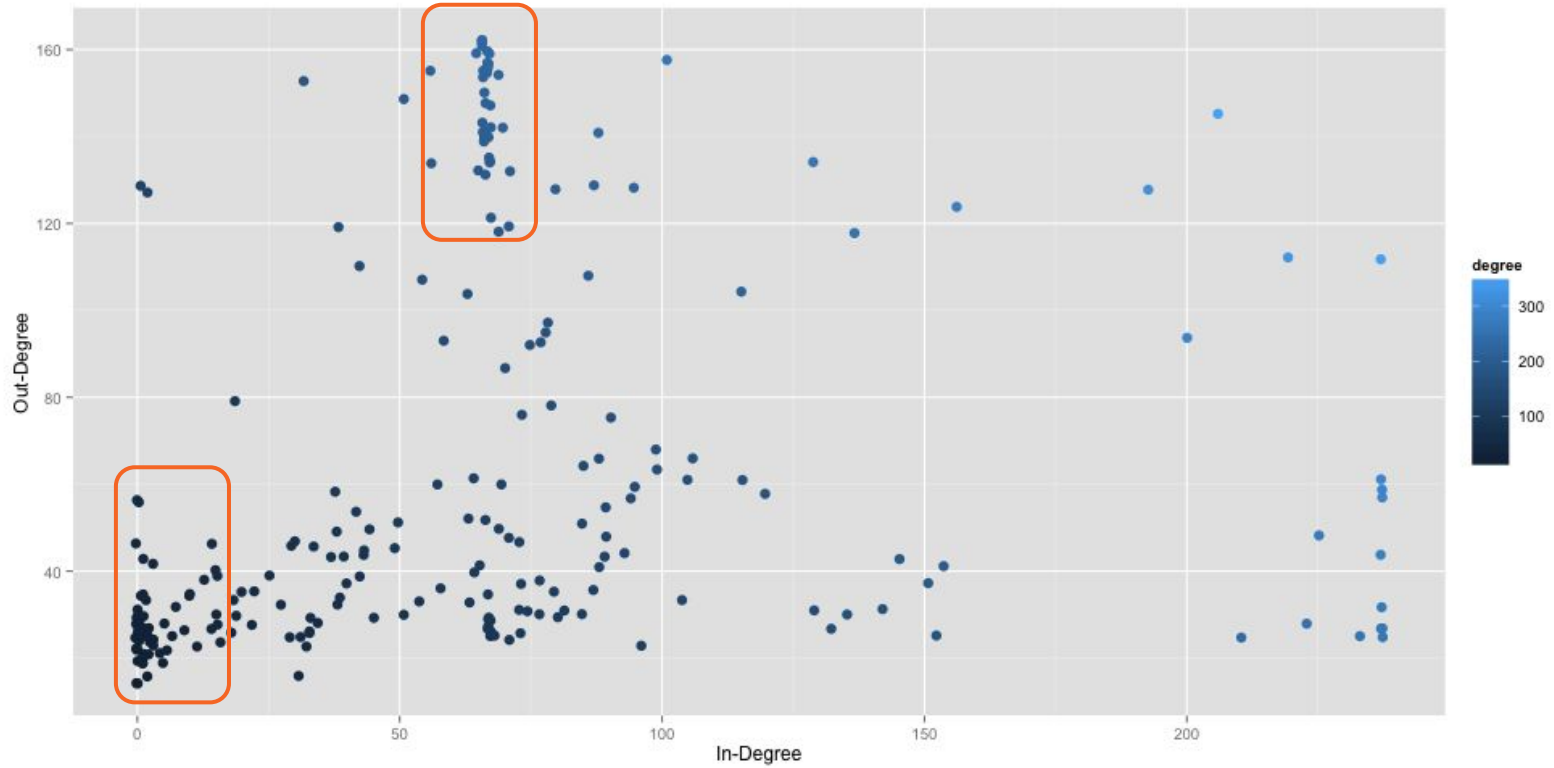
Basic Parameters

Singapore

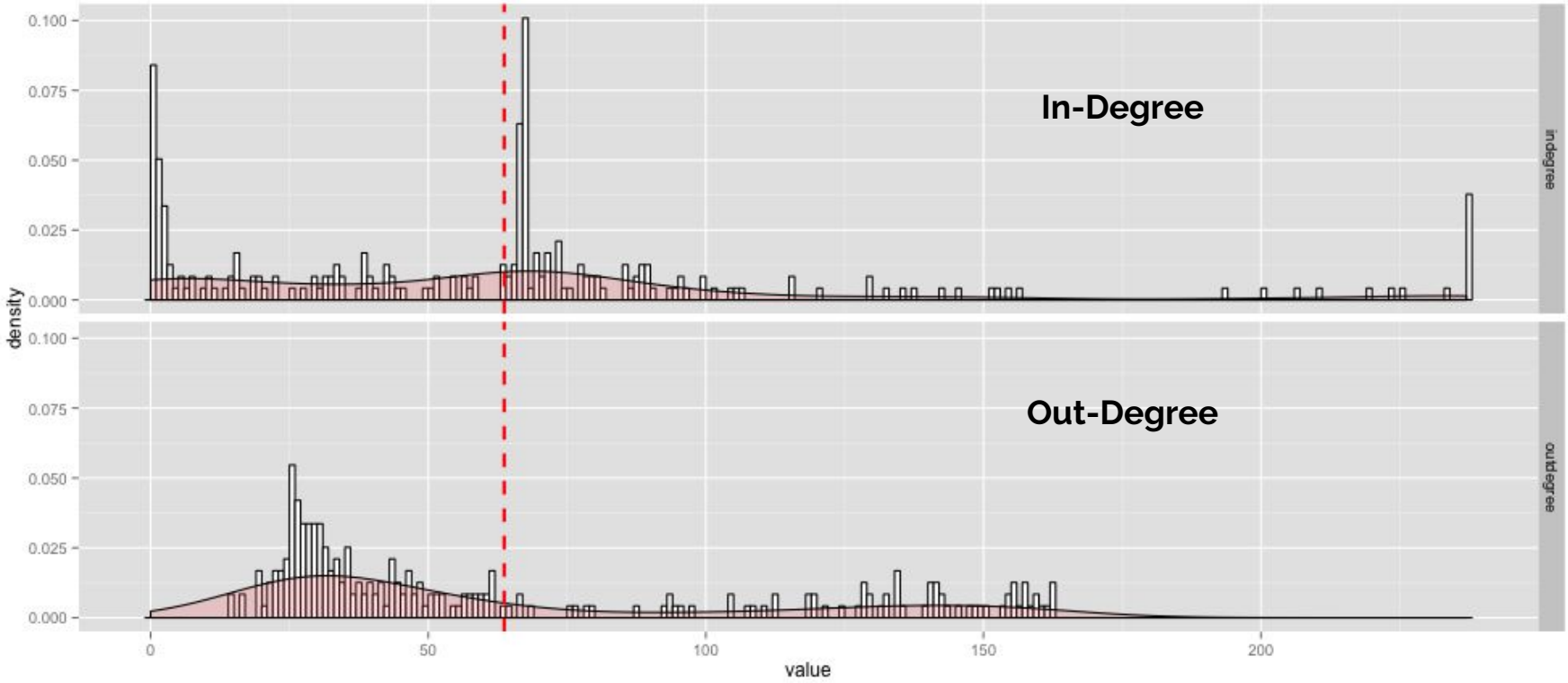
in-degree
69
out-degree
154

Type	# Vertices
directed unweighted	238

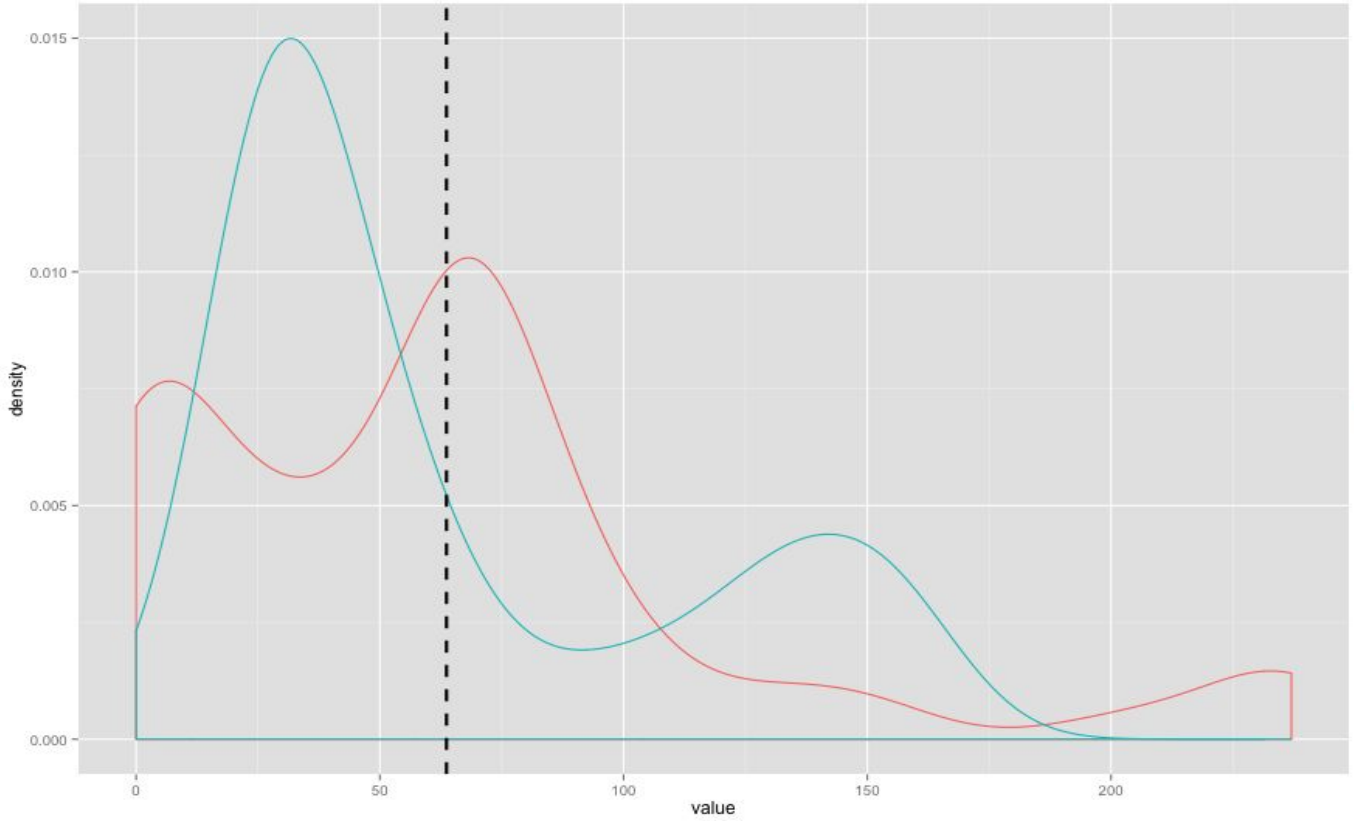
# Edges	Mean Degree
15156	63



Degree Distribution



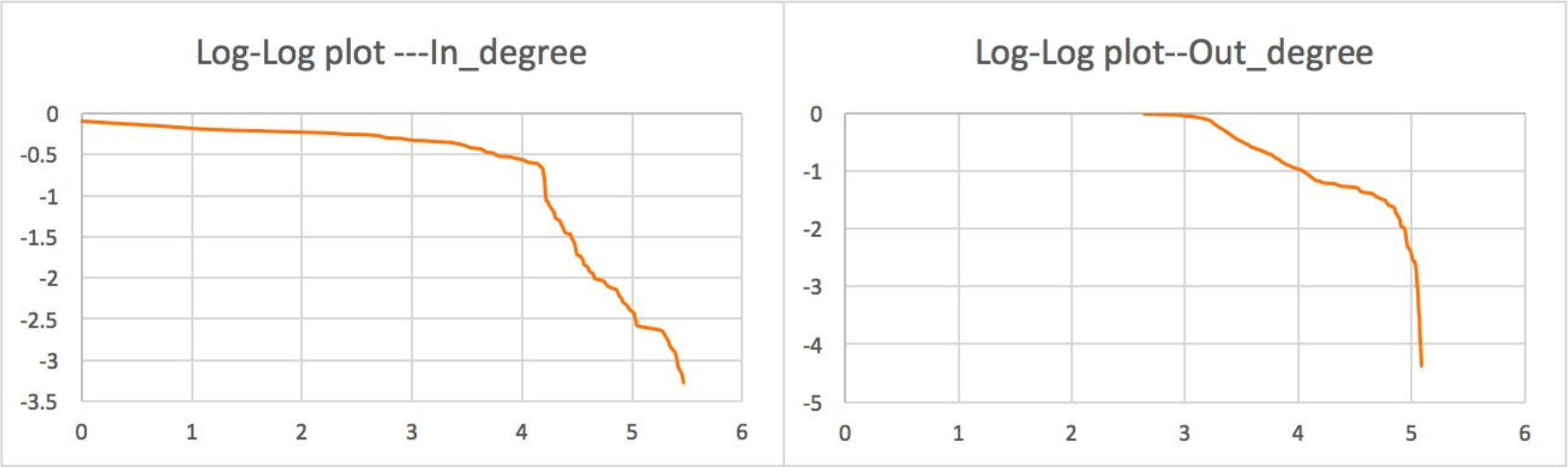
Degree Distribution



In-Degree

Out-Degree

Degree Distribution



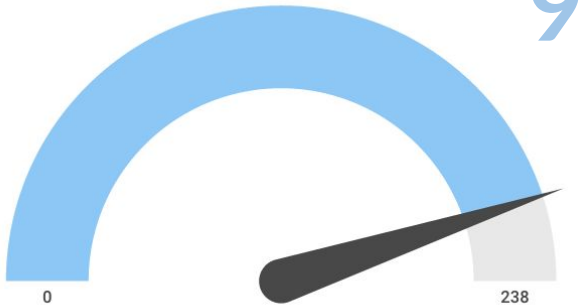
Degree Distribution - Power Law

Structure and Components

49%

Largest K-Core: 86-Core

91%

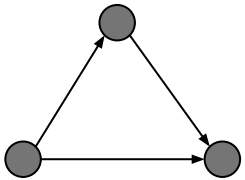


Largest Strongly-connected Component

Transitivity

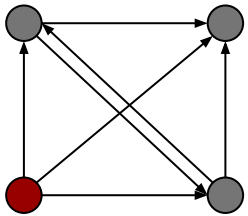
54%

Global Clustering Coefficient

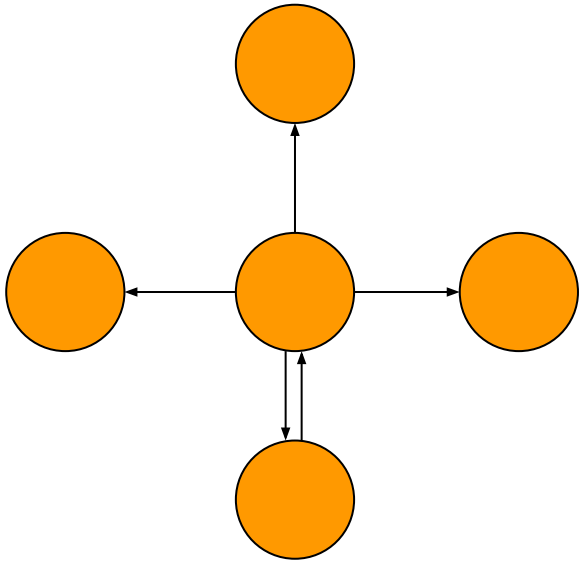


67%

Network Average Clustering Coefficient



Reciprocity



Reciprocity of this network is 0.4339

Countries that are reciprocal with Singapore

Cocitation & Bibliographic Coupling

Interpretations
Most archipelago nations have the same degree of opening to the whole world . Their tourism industry might be a leading factor.

Cocitation		
Madagascar	236	Maldives
Madagascar	236	Palau
Madagascar	236	Saint Helena
Madagascar	236	Saint Vincent and Grenadines
Madagascar	236	Samoa

Cocitation & Bibliographic Coupling

Interpretations
Many Europe countries are acknowledged internationally to a similar extent. Some countries are open to the entire EU.

Bibliography		
Finland	159	Germany
Germany	159	Italy
Germany	159	Spain
Germany	159	Sweden
Italy	159	Spain

Cocitation & Bibliographic Coupling

Cocitation		*Bibliography*	
Singapore	Ecuador	Singapore	Finland
Singapore	Laos	Singapore	Germany
Singapore	Madagascar	Singapore	Italy
Singapore	Maldives	Singapore	Spain
Singapore	Martinique	Singapore	Sweden

Interpretations
Because our network has a very large mean degree, the results of these couplings can be sometimes trivial and subject to countries with highest degrees.

Centrality

Centrality Methods	Degree (Out)	Eigenvector (Left)	Katz (Left)	PageRank (Left)
1.	Germany	Italy	Italy	Italy
2.	Italy	Spain	Spain	Spain
3.	Spain	Germany	Germany	France
4.	Sweden	Sweden	Sweden	New Zealand
5.	Finland	Finland	Finland	Norway

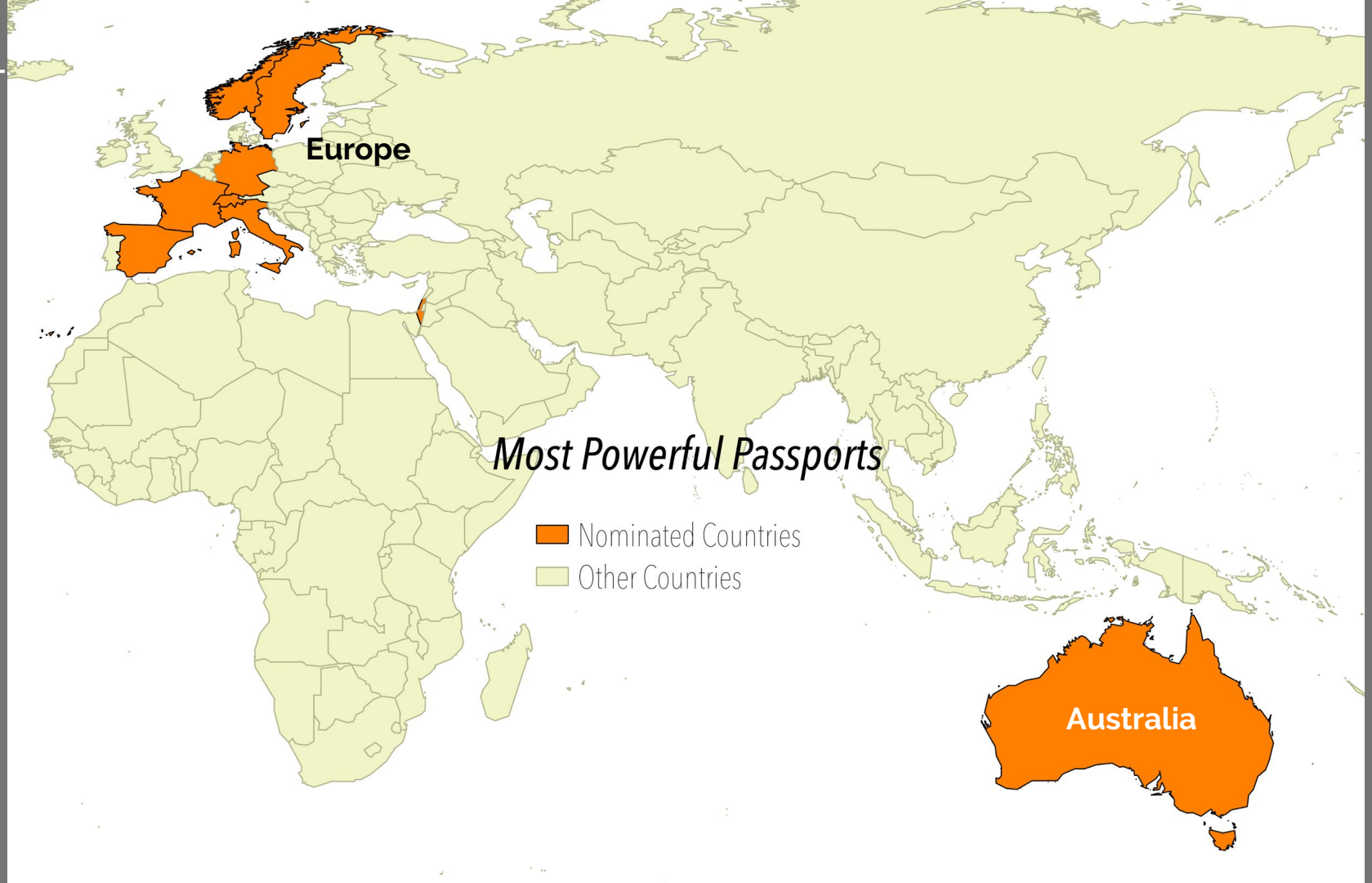
Centrality

Method

PageRank
Left Eigenvector
Out-neighbors
Descending

What are the *most powerful* passports

1. Italy (27.6948)	6. Norway (15.5794)
2. Spain (20.4539)	7. Australia (15.2893)
3. France (19.7658)	8. Switzerland (14.8847)
4. New Zealand (17.2965)	9. Germany (14.8063)
5. Israel (16.9520)	10. Sweden (14.6957)


Europe
Most Powerful Passports
Nominated Countries
Other Countries
Australia

Centrality

Method

PageRank
Left Eigenvector
Out-neighbors
Ascending

What are the *least powerful* passports

1. Somalia (1.2246)	6. Democratic Republic of the Congo (1.4623)
2. Ethiopia (1.2627)	7. South Sudan (1.4743)
3. Eritrea (1.3294)	8. Comoros (1.5438)
4. Djibouti (1.3432)	9. Lebanon (1.5469)
5. Afghanistan (1.3636)	10. Timor-Leste (1.5668)


South Asia
East Africa
Least Powerful Passports
Nominated Countries
Other Countries

Centrality

What are the countries that *everyone* can visit

Method
PageRank
Right Eigenvector
In-neighbors
Descending

Maldives	Madagascar
Palau	Samoa
Saint Helena	Seychelles
Saint Vincent and Grenadines	Tuvalu
Togo	Haiti

Centrality

Method

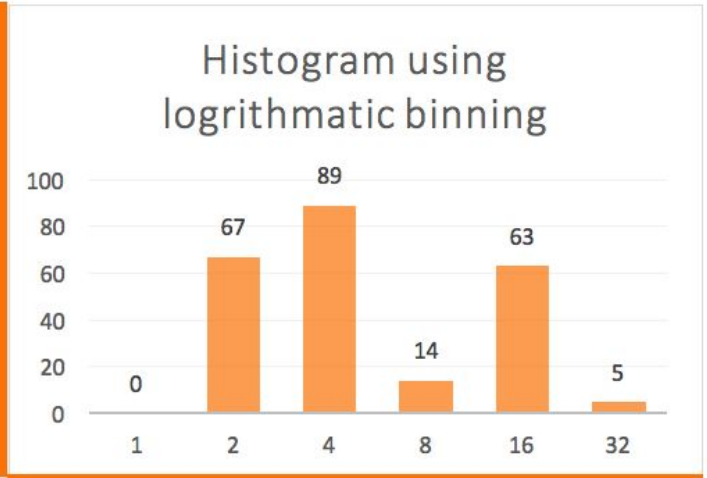
PageRank
Left Eigenvector
Out-neighbors
Ascending

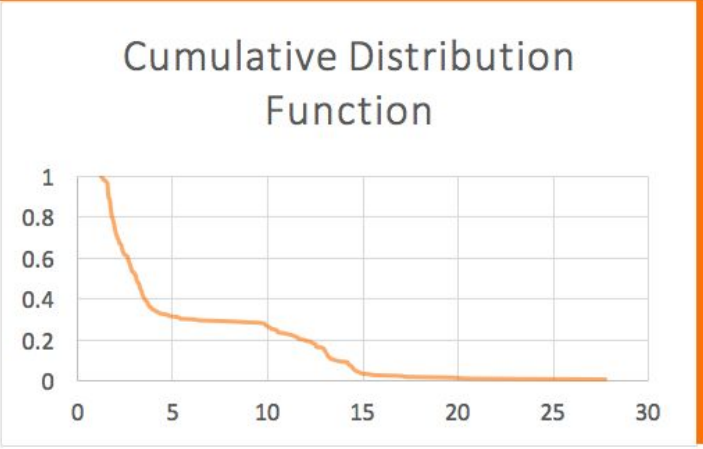
Which countries are the *hardest* to visit

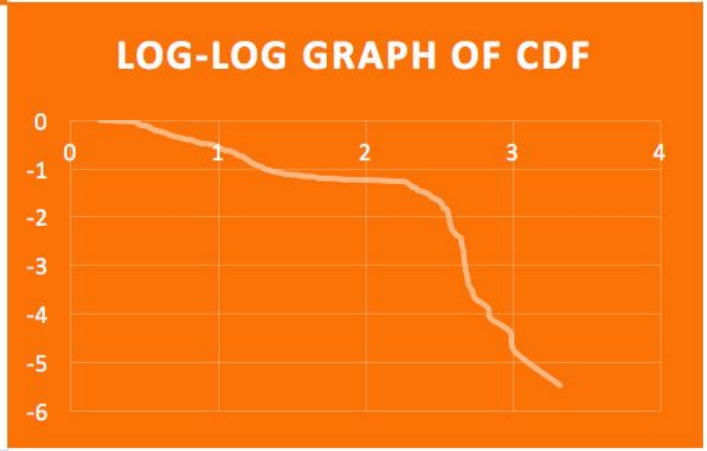
Guinea	Comoros
Gabon	Democratic Republic of the Congo
Afghanistan	Djibouti
American Samoa	North Korea
Benin	Libya

Power Law?


PAGE RANK CENTRALITY DISTRIBUTION
80
60
40
20
0
2.0
3.7
5.5
7.2
8.9
10.7
12.4
14.1
15.9
17.6
19.3
21.1
22.8
24.5
26.3
28.0


Histogram using logrithmatic binning
100
80
60
40
20
0
0
67
89
14
63
5
1
2
4
8
16
32

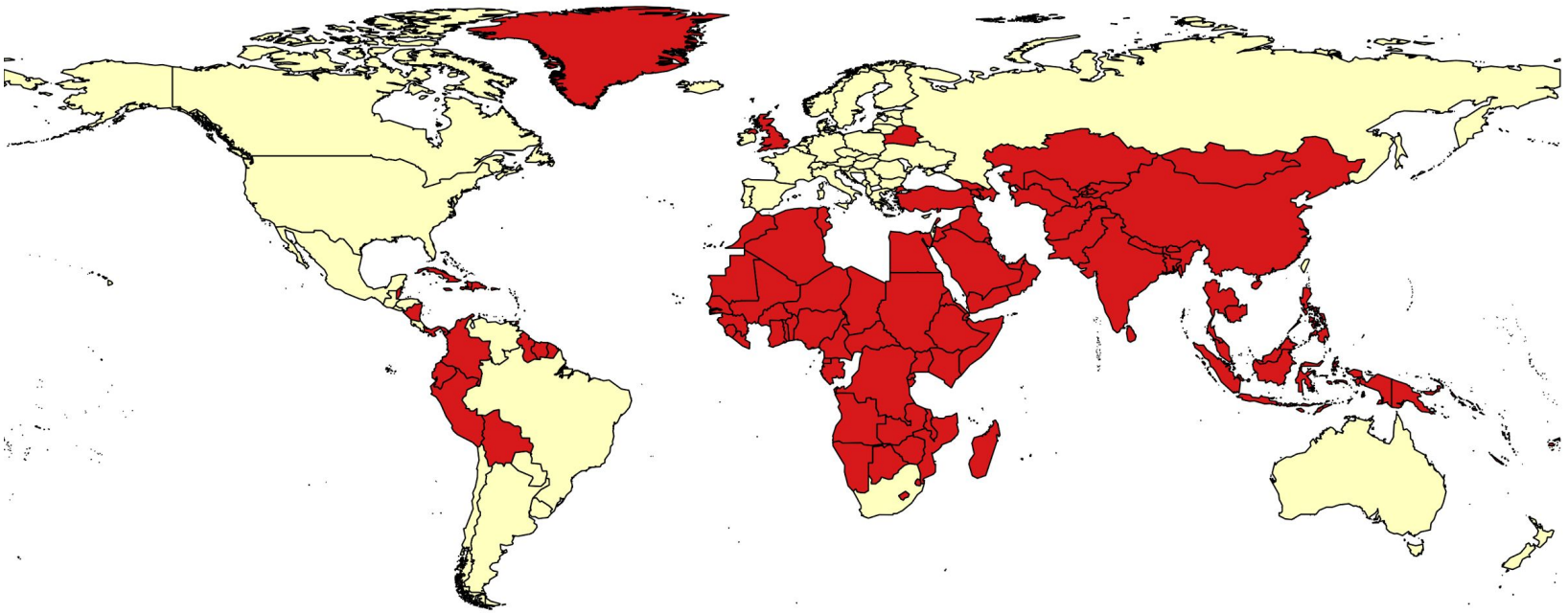

Cumulative Distribution Function
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
25
30


LOG-LOG GRAPH OF CDF
0
-1
-2
-3
-4
-5
-6
0
1
2
3
4

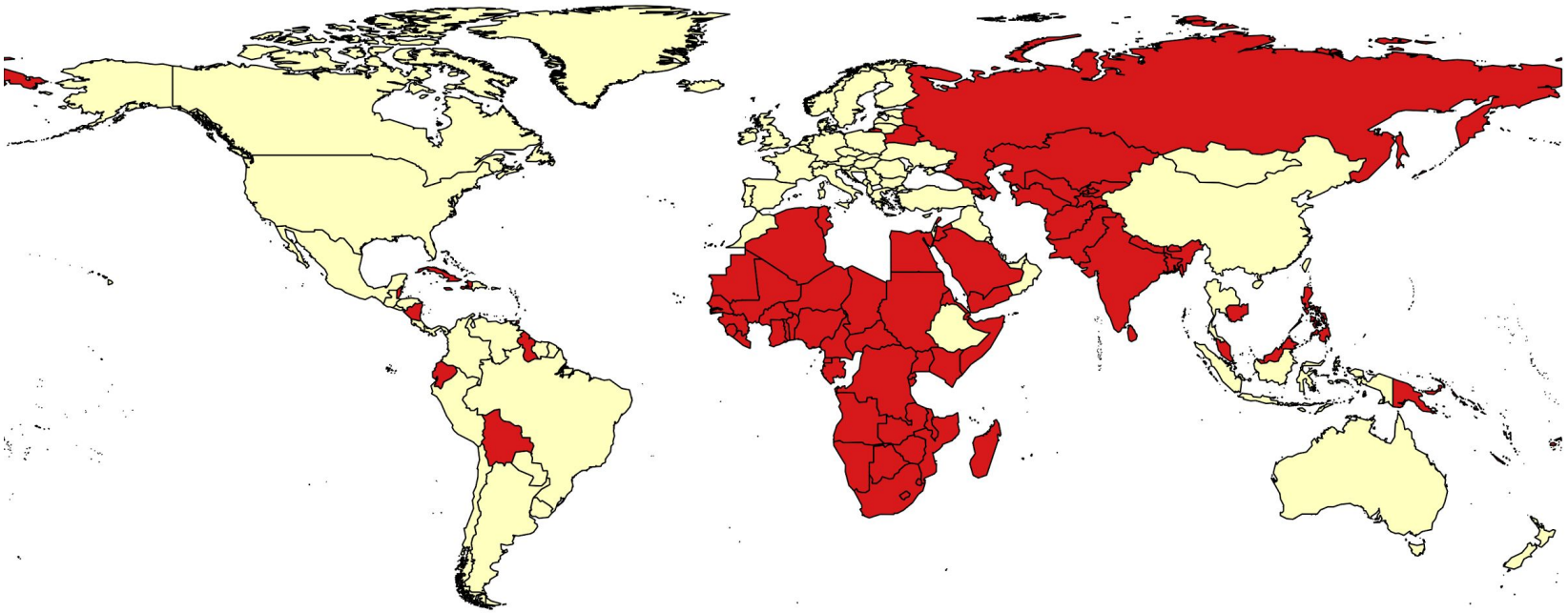
Assortativity

Interpretations
Grouping by Africa countries and Non-Africa countries gives the highest assortativity coefficient

Group according to	**Modularity: (Q, Qmax)**	**Assortativity Coefficient**
Continent	(0.0799, 0.8406)	0.0951
Level of Development	(0.0661, 0.5130)	0.1288
Africa & Non-Africa	(0.0476, 0.2554)	0.1863



Spectral Modularity Maximization (0.26)



Simple Modularity Maximization (0.34)

Assortative Mixing by Degree

- Correlation Coefficient equals to 0.2020 > 0
- Countries are more willing to loosen access to countries that have popular passports
- Indicate the bilateral feature of visa reduction relationship

Summary

- Structural density of visa requirement network
- Cocitation & bibliographic coupling
- Centrality as a measure of power of passport
- Assortative mixing by geography
- A good model to organize information and gain insights

Future Improvements

There is always more to do.

- Minimise manual inspection
- Differentiate different levels of visa policies
- Explore more geo-political factors