DATA DELIVERY TRAVEL TIMES AND DISTANCES BOLIVIA GOV. OFFICES

I. DATASETS:

1. muni_latlon.dta - "True" centroids by municipality.
2. caps_centroids.dta - Centroids provided by gov. at: www.municipio.com.bo
3. travel_latlon.dta - Travel times and distances to offices from true centroids
4. caps_latlon.dta - Travel times and distances to offices from gov. centroids

II. Dataset's description (and variables)

i. "True" centroids by municipality - muni_latlon

Description: Contains the latitude and longitude of the geographical centroid of each municipality—own calculations.

NAME	Description
dept_code	Department code
dept_name	Department name
prov_code	Province code
prov_name	Province name
muni_code	Municipality code
muni_name	Municipality name
lon	Centroid longitude
lat	Centroid latitude

ii. "Centroids provided by gov.- caps_centroids

Description: Contains the latitude and longitude of the geographical centroid reported by the government at www.municipio.com.bo. Web scraping.

NAME	Description
dept_code	Department code
dept_name	Department name
prov_code	Province code
prov_name	Province name
muni_code	Municipality code

muni_name	Municipality name
lon	Reported capital longitude
lat	Reported capital latitude
dept_link	Government URL with dept characteristics
muni_link	Government URL with muni characteristics (source)

iii. Travel times and distances to offices from true centroids

Description: Contains the travel information, time in minutes and distance in kilometres from the true centroids to the nearest government office. Two measures are used to define the closest office. First, we estimate the shortest possible between the points or "as crow flies" distance. Second, we check for the fastest possible travel by driving, optimising the travel time. Notably, a missing in travel information indicates that there is no existing network of routes connecting the points.

NAME	Description
dept_code	Department code
dept_name	Department name
prov_code	Province code
prov_name	Province name
muni_code	Municipality code
muni_name	Municipality name
lon	Reported capital longitude
lat	Reported capital latitude
dist	<<as the crow flies>> distance
office_dist	Closest office - <<as the crow flies>> distance
lat_gov_dist	Latitude closest office - <<as the crow flies>>
lon_gov_dist	Longitude closest office - <<as the crow flies>>
ttime	Driving travel time
tdist	Driving distance - travel time
office_ttime	Closest office - travel time
lat_gov_ttime	Latitude closest office - travel time
lon_gov_ttime	Longitude closest office - travel time

iv. Travel times and distances to offices from gov. centroids

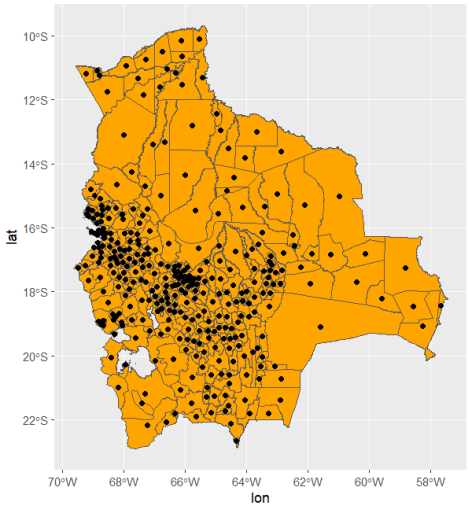
Description: Contains the travel information, time in minutes and distance in kilometres from the government centroids to the nearest government office. Two measures are used to define the closest office. First, we estimate the shortest possible between the points or "as crow flies" distance. Second, we check for the fastest possible travel by driving, optimising the travel time. Notably, a missing in travel information indicates that there is no existing network of routes connecting the points. We avoid this problem by using geocoded centroids (Bing) when the issue arises.

NAME	Description
dept_code	Department code
dept_name	Department name
prov_code	Province code
prov_name	Province name
muni_code	Municipality code
muni_name	Municipality name
lon	Reported capital longitude
lat	Reported capital latitude
dist	<<as the crow flies>> distance
office_dist	Closest office - <<as the crow flies>> distance
lat_gov_dist	Latitude closest office - <<as the crow flies>>
lon_gov_dist	Longitude closest office - <<as the crow flies>>
ttime	Driving travel time
tdist	Driving distance - travel time
office_ttime	Closest office - travel time
lat_gov_ttime	Latitude closest office - travel time
lon_gov_ttime	Longitude closest office - travel time
bing_latlon	Dummy - Travel time and distance from Bing <<centroid>>
bing_lat	Latitude - Bing's reference point for municipality
bing_lon	Longitude - Bing's reference point for municipality
bing_dist	<<as the crow flies>> distance to Bing's reference point

III. Briefing on the data construction

i. "True" centroids by municipality

Using a raster of the municipalities of Bolivia, the middle point (or the closest thing to it) is selected as the centroid. Making sure that the centroid always lay inside the municipality's area.



ii. Centroids provided by gov.

These are obtained by performing a web-scraping of the site www.municipio.com.bo. Which contains official information on the overall municipality characteristics, including location as a latitude and longitude. (See, for example, https://www.municipio.com.bo/municipio-las-carreras.html)

iii. Travel times and distances

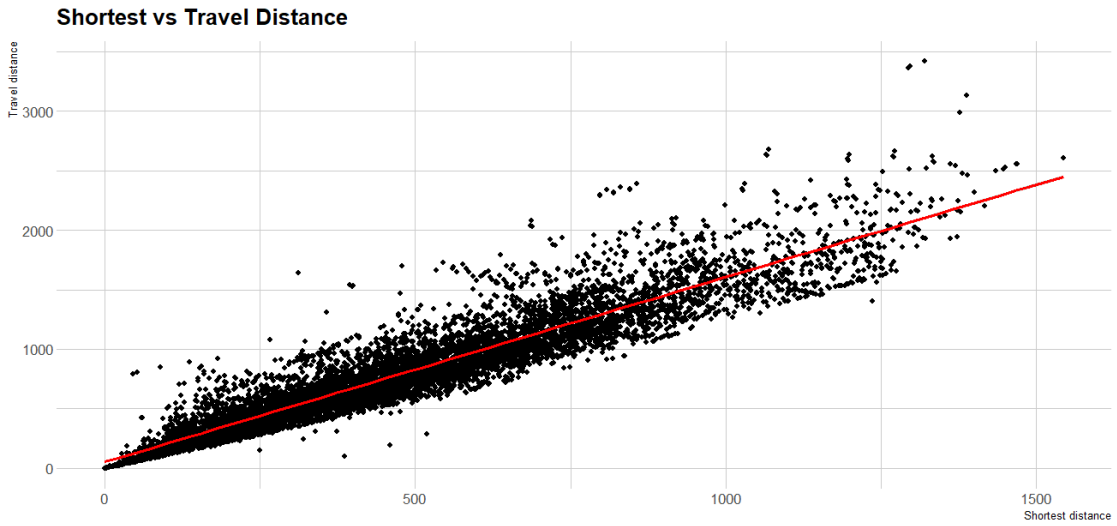
Travel times and distances are constructed using Bing Maps API. Please refer to: https://docs.microsoft.com/en-us/bingmaps/rest-services/routes/calculate-a-route

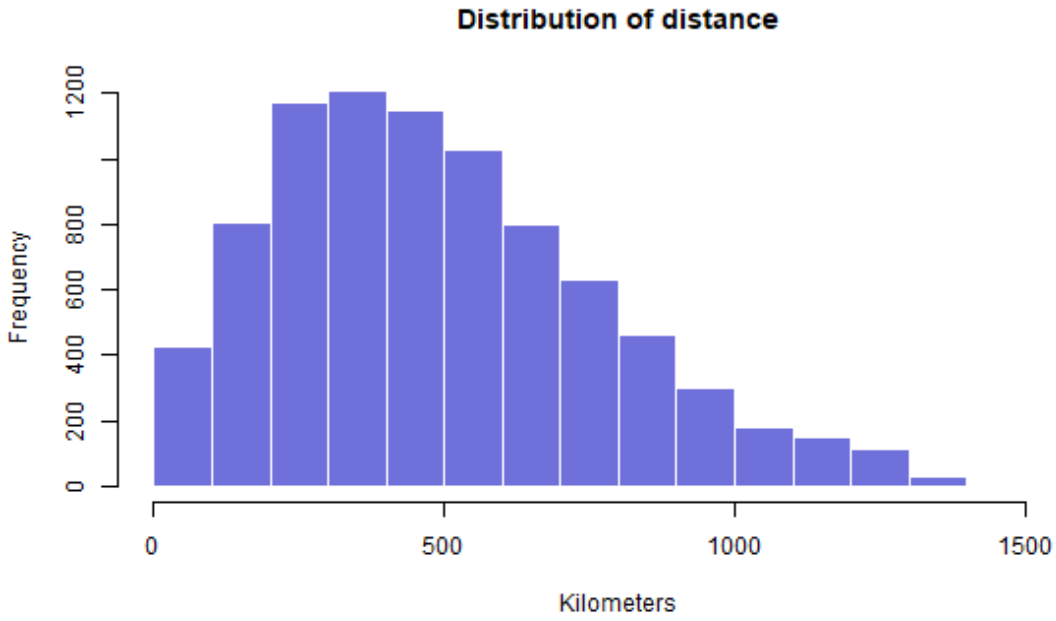
For each point (centroid), the travel distance and time to the movement offices in the record are calculated (about 8400+ combinations). Then for each municipality, we keep the travel information to the office with the fastest travel by car. Importantly, the algorithm is set to request the API to optimise travel time; therefore, the selected routes are the least time-consuming, although shorter routes may be possible.

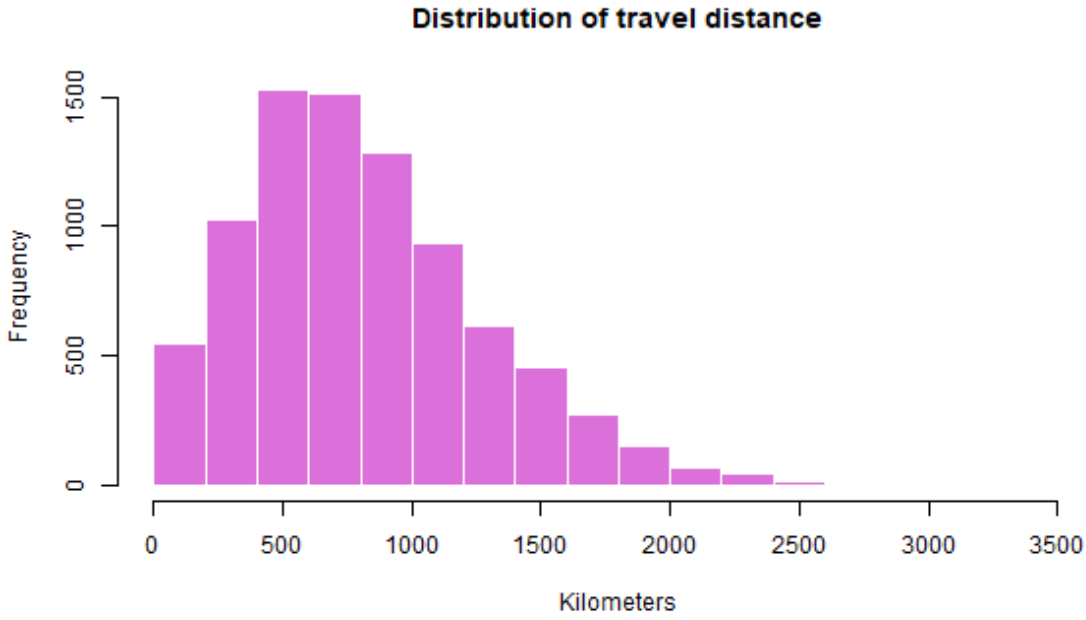
An important note: As some of the centroids (true and gov.) were located far from roads (and possible from people) is not always possible to find a route. In the case of true centroids, this is represented

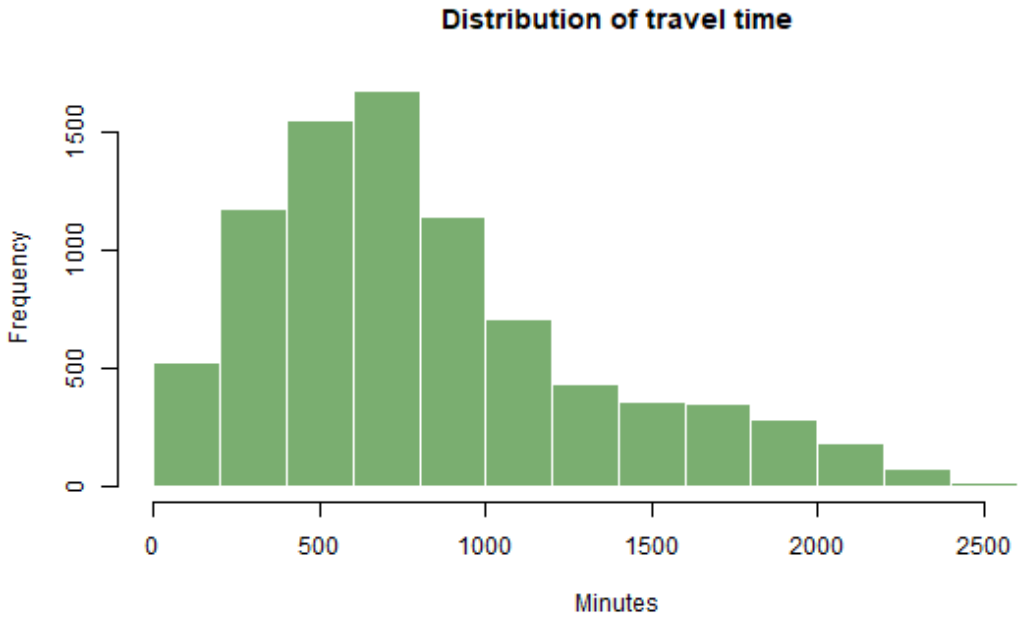
as missing information. However, for the government centroids travel dataset, a fix was implemented. If the gov. centroid resulted in a no-route situation, we geo-localise the municipality using Bing Maps. Here we feed the algorithm a rough location as "las Carreras, Chuquisaca, Bolivia", from which we get a precise location that we later use to calculate travel routes.

The travel distance measure seems correct, being heavily correlated with the "as the crow flies" distance but with considerably greater values.




Distribution of distance
Frequency
0
200
400
600
800
1200
0
500
1000
1500
Kilometers


Distribution of travel distance
Frequency
0
500
1000
1500
0
500
1000
1500
2000
2500
3000
3500
Kilometers


Distribution of travel time
Frequency
0
500
1000
1500
0
500
1000
1500
2000
2500
Minutes