

The Battle of Neighbourhoods: London vs. Birmingham

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January, 2021

Introduction

Background

The United Kingdom has a thriving Chinese community in all its major cities. With over 400,000 British-Chinese nationwide, each year sees a new flock of immigrants seeking to live in UK. This is not a big decision to make, with many factors to be considered such as the culture, community, rent prices, prospective work, and living costs. The Chinese community has widely been agreed to be a central feature of many cities of UK, in particular Birmingham Chinatown and London Chinatown, two of the largest populations of Chinese immigrants.

Problem

This project aims to address the question of "Which is the best place to open up a Chinese restaurant as a Chinese immigrant?". By studying the data of living costs, density of the Chinese population, and similar venues nearby, we may predict which city, London or Birmingham, propose the most ideal location.

Interest

This information will gather most interest from prospective Chinese immigrants seeking to move to UK. For such a major decision, it is important for those looking to move, and also for those expecting an influx of immigration.

Data Wrangling

Data Sources

We will be scraping data on the list of [London boroughs](#) and list of [Birmingham neighbourhoods](#) which will be used with geocoder to locate latitude and longitudinal positions. Foursquare will be used to determine density of Chinese venues such as Chinese restaurants, takeaways, supermarkets, and stores. We will assume that this density is representative of the density of the Chinese population. This can be found using the latitude and longitudinal positions retrieved from web scraping. Finally, the average cost of living is found to be approximately [£4,866pm](#) for London, and [£3,388pm](#) for Birmingham, each for a family of four. The difference in cost will provide an idea of what the extra cost for living in London will pay for.

Data Cleaning

Each city had its data scraped from the web into its own respective table. Scraping information for London was much easier due to a pre-made table in use, however, information on Birmingham was much harder to scrape and so the list was converted to a CSV file before being imported with pandas.

The data on London proved to be challenged to clean. The column headers had contained hidden characters due to the html code and so they all had to be renamed before proceeding. I decided that columns on Postcode District, Dial Code, and OS Grid Ref were unnecessary and was therefore dropped. Postcode district also had the issue that some boroughs spanned multiple districts. Though it was possible to separate the boroughs into its constituent districts, I decided to move on without separating them as I believed the given information will provide an accurate representation of each neighbourhood.

Furthermore, the Location column contained entries that causes the geocoder to return "None" such as "Marylebone (also known as St Marylebone)", as such, these entries had to be renamed. There was one value "Somerstown", that could not return coordinates, therefore I opted to drop from the data instead of manually seeking a geographical coordinate.

The table on Birmingham neighbourhood was simple, containing only neighbourhood names. However, some cleaning was also required for neighbourhoods that also returned "None" through the geocoder. These results were omitted from the final result table. This resulted in minimal actual cleaning required, only the addition of city name was required for the next process of determining geographical location with Foursquare.

Feature Selection

With the data of each table, I used geocoder to find the geographical location of each area for each entry. This resulted in an address containing latitude and longitudinal values. These two values were kept whilst the rest was deemed unnecessary. Now, the tables for both cities contain only the valuable features: Neighbourhood name, Borough name (Birmingham for the Birmingham Table), latitude, and longitude.

Methodology

Visualising Neighbourhoods

The first step after cleaning the data was to ensure it was usable with geocoder. To do this, the "apply" function was applied to the pandas dataframe, any results that returned a "None" was either cleaned or dropped. After, the result was split to return the latitude and longitudinal positions. Using the folium package, position of each neighbourhood was plotted on a map to help us visualise the locations within each city. The resulting tables are shown in [1](#) and [3](#) with the maps in [2](#) and [4](#).

Extracting Venue Data

Using the Foursquare API, venue data was extracted from each neighbourhood within a radius of 500m with a query that the venues must be "Chinese". This will represent our density of the Chinese community. For London neighbourhoods, this returned a total of 333 Chinese venues as shown in [5](#). For Birmingham neighbourhoods, this returned 37 venues as shown in [6](#).

Next, one-hot encoding was used for each list where a value of 1 represents a venues, and 0 represents no venue. The venues category was collated and grouped by area to allow us to determine which neighbourhood contains which categories of venues. In order to cluster the data with K-Means Clustering, we first want to find the most common venues. For London, this was the top 10 venues. However, due to lack of venues in Birmingham only the top 7 venues were found.

Clustering

Using K-Means Clustering, the neighbourhoods were clustered into 5 areas that represented the main areas of each city that contained Chinese venues. By merging the clustered table with neighbourhood information, we can plot the clustered neighbourhoods with folium to visualise the locations of each cluster of neighbourhoods that contain the most Chinese venues. The most common Chinese venues in London can be seen in [7](#) and the Birmingham venues in [9](#) with its respective clustering in [8](#) and [10](#).

	Neighbourhood	Borough	Coordinates	Latitude	Longitude
0	Abbey Wood	Bexley, Greenwich	(Abbey Wood, Royal Borough of Greenwich, London, Greater London)	51.487621	0.114050
1	Acton	Ealing, Hammersmith and Fulham	(Acton, London Borough of Ealing, London, Greater London)	51.508140	-0.273261
2	Aldgate	City	(Aldgate, St Boltoph Row, Aldgate, City of London, Greater London)	51.514248	-0.075719
3	Aldwych	Westminster	(Aldwych, St Clement Danes, Covent Garden, City of Westminster, Greater London)	51.512200	-0.118896
4	Anerley	Bromley	(Anerley, Penge, London Borough of Bromley, London, Greater London)	51.407599	-0.061939
...
291	Wood Green	Haringey	(Wood Green, London, Greater London, England, United Kingdom)	51.597205	-0.109959
292	Woodford	Redbridge	(Woodford, Charteris Road, Woodford, London Borough of Redbridge, Greater London)	51.606806	0.034027
293	Woodside Park	Barnet	(Woodside Park, Station Approach, Woodside Park, London Borough of Barnet, Greater London)	51.617948	-0.185579
294	Woolwich	Greenwich	(Woolwich, London, Greater London, England, SE18, United Kingdom)	51.482670	0.062334
295	Wormwood Scrubs	Hammersmith and Fulham	(Wormwood Scrubs, London Borough of Hammersmith and Fulham, Greater London)	51.521380	-0.240439

	Neighbourhood	Borough	Coordinates	Latitude	Longitude
0	Acocks Green	Birmingham	(Acocks Green, Great Western Court, Acocks Gre...	52.449530	-1.819238
1	Alum Rock	Birmingham	(Alum Rock, Birmingham, West Midlands Combined...	52.487071	-1.831530
2	Ashted	Birmingham	(Ashted Tunnel, Digbeth, Vauxhall, Birmingham,...	52.486083	-1.883813
3	Aston	Birmingham	(Aston, Birmingham, West Midlands Combined Aut...	52.500692	-1.884192
4	Aston Cross	Birmingham	(Aston Cross, Aston, Birmingham, West Midlands...	52.498174	-1.883584
...
180	Woodcock Hill	Birmingham	(Woodcock Lane Allotments, Acocks Green, Birmi...	52.445915	-1.813956
181	Woodgate	Birmingham	(Woodgate, Birmingham, West Midlands Combined ...	52.437353	-2.010760
182	Wylde Green	Birmingham	(Wylde Green, Station Road, Sutton Coldfield, ...	52.545628	-1.831425
183	Yardley	Birmingham	(Yardley, Birmingham, West Midlands Combined A...	52.470956	-1.815944
184	Yardley Wood	Birmingham	(Yardley Wood, Highfield Close, Yardley Wood, ...	52.421013	-1.854589

Figure 3: Table of Birmingham neighbourhoods.

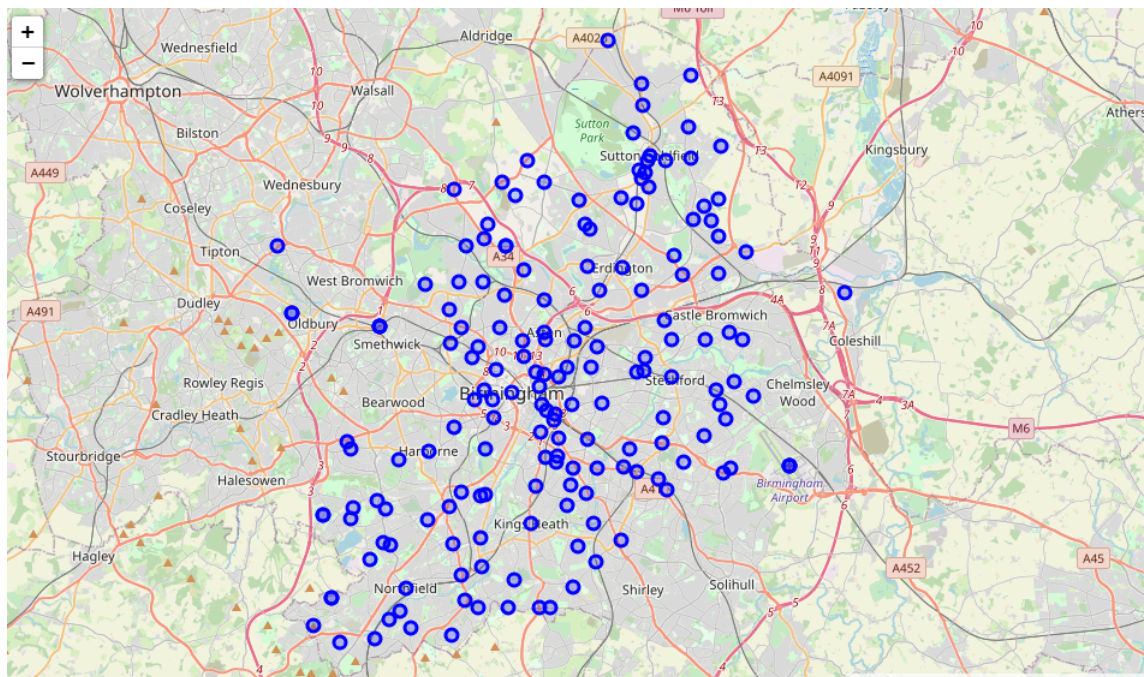


Figure 4: Map of Birmingham neighbourhoods.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Category
0	Acton	51.508140	-0.273261	North China Restaurant	Chinese Restaurant
1	Acton	51.508140	-0.273261	Ming's	Chinese Restaurant
2	Aldgate	51.514248	-0.075719	Xi'an Biang Biang Noodles	Chinese Restaurant
3	Aldgate	51.514248	-0.075719	My Old Place	Szechuan Restaurant
4	Aldgate	51.514248	-0.075719	Shikumen	Chinese Restaurant
...
455	Wood Green	51.597205	-0.109959	JRC Global Buffet	Chinese Restaurant
456	Wood Green	51.597205	-0.109959	一三八 Woodgreen Chinese restaurant	Chinese Restaurant
457	Wood Green	51.597205	-0.109959	Aroma	Chinese Restaurant
458	Wood Green	51.597205	-0.109959	Chopstix Noodle Bar	Chinese Restaurant
459	Woodford	51.606806	0.034027	The White Swan	Chinese Restaurant

Figure 5: Table of London venues.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Category
0	Bournbrook	52.445334	-1.931602	SuiZen's Noodle Bar 廣東樓	Chinese Restaurant
1	Bournbrook	52.445334	-1.931602	Golden City	Chinese Restaurant
2	Brindleyplace	52.477497	-1.913394	Jimmy Spice's	Buffet
3	Castle Vale	52.521259	-1.784549	Wing Wo	Chinese Restaurant
4	Digbeth	52.475854	-1.885460	Sing Fat Chinese Supermarket	Grocery Store
5	Doe Bank	52.479699	-1.902691	Tattu	Chinese Restaurant
6	Doe Bank	52.479699	-1.902691	Tiger Bites Pig	Chinese Restaurant
7	Doe Bank	52.479699	-1.902691	Shangri-La 香格里拉	Chinese Restaurant
8	Doe Bank	52.479699	-1.902691	Han Dynasty 汉朝	Chinese Restaurant
9	Doe Bank	52.479699	-1.902691	Bugis Street Brasserie	Asian Restaurant
15	Driffold	52.557326	-1.830094	Lee Garden	Chinese Restaurant

Figure 6: Table of first 16 entries of Birmingham venues.

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
1	Acton	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
6	Archway	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
7	Arnos Grove	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
9	Bankside	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
10	Barbican	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
12	Barnsbury	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
14	Bayswater	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
16	Belgravia	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
19	Bermondsey	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
20	Bethnal Green	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
22	Blackheath	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant
23	Blackheath Royal Standard	0.0	Chinese Restaurant	Xinjiang Restaurant	Thai Restaurant	Beijing Restaurant	Café	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Embassy / Consulate	Fast Food Restaurant

Figure 7: Table of cluster with most venues for London.

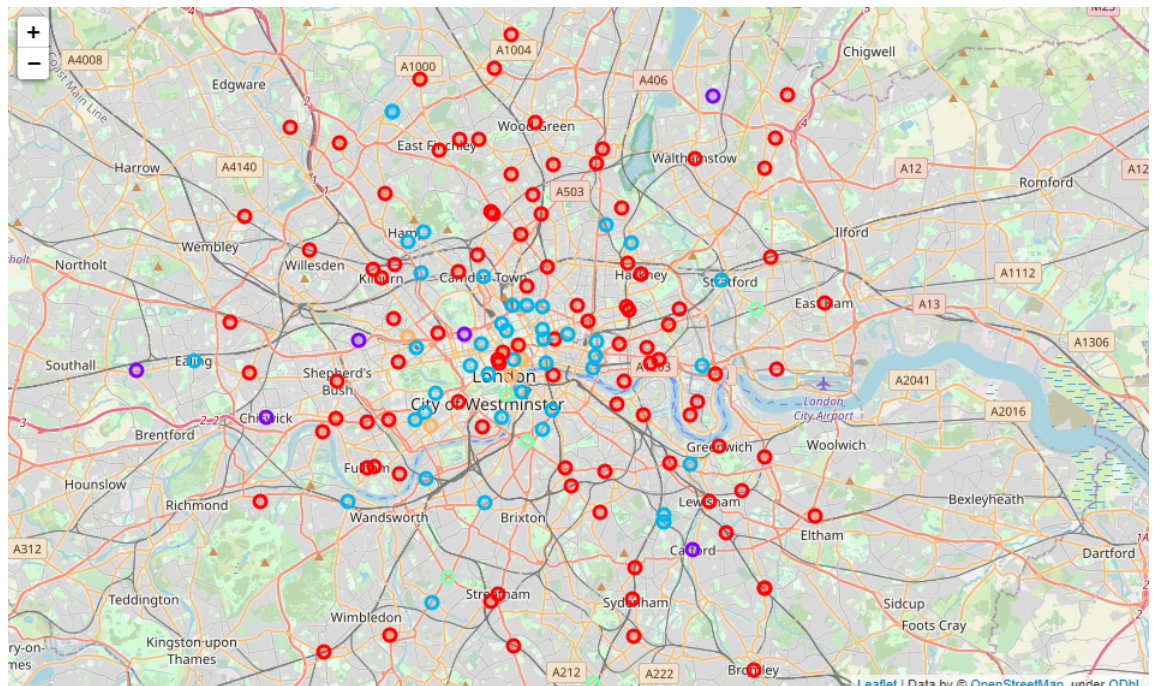


Figure 8: Clustering of Chinese venues in Birmingham.

	Neighbourhood	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue
18	Bournbrook	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
27	Castle Vale	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
38	Driffold	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
76	Jewellery Quarter	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
78	Kings Heath	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
93	Maney	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
100	Nechells	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
148	Stockland Green	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
150	Ten Acres	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
163	Walker's Heath	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant
167	Warstock	1.0	Chinese Restaurant	Szechuan Restaurant	Grocery Store	Dim Sum Restaurant	Cantonese Restaurant	Buffet	Asian Restaurant

Figure 9: Table of cluster with most venues for Birmingham.

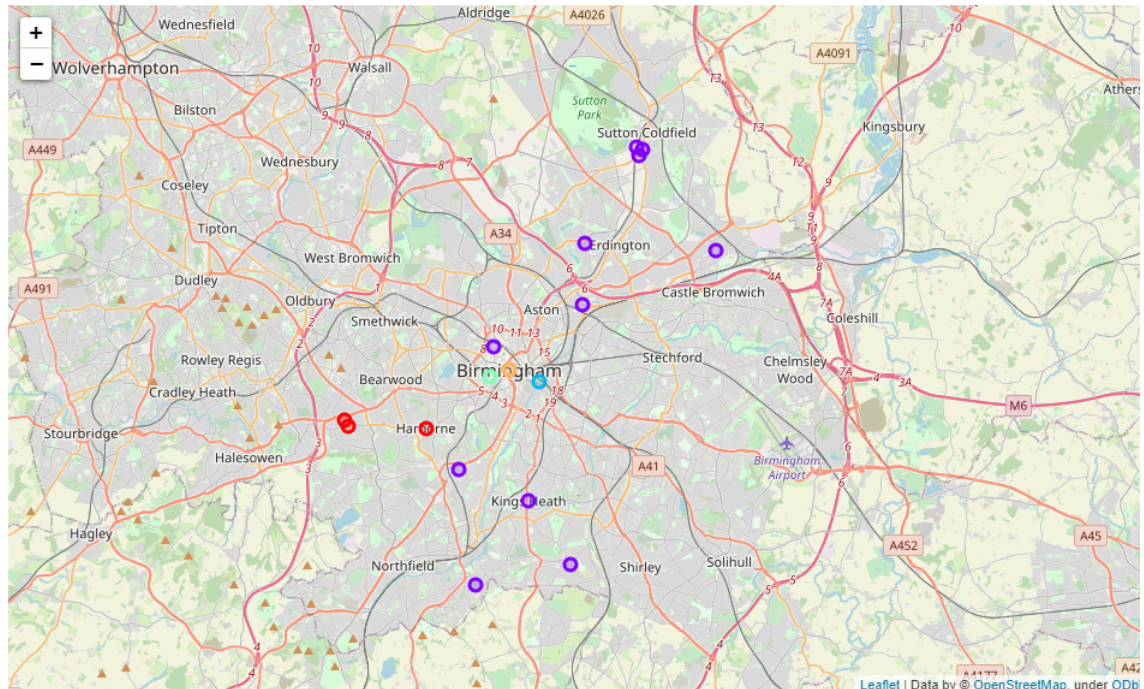


Figure 10: Clustering of Chinese venues in Birmingham.

Results

After gathering, exploring, and clustering all of our data, we find a network of large clusters of Chinese venues in London, while Birmingham has much sparser clusters, one cluster containing no venues at all. Cluster 0 in London contains the most amount of venues, whereas cluster 1 in Birmingham contains the most venues. Both cities contain predominantly Chinese restaurants as their top venue, while only London clusters contained a wider variety of Chinese venues such as Consulates and Cafes and different styles of Chinese restaurants. In Birmingham, the most venues are restaurants with few grocery stores and a lack of many other categories of Chinese venues.

Discussion

This poses an interesting decision for Chinese immigrants seeking to choose a location to move to. The average cost of living in London is £4,866pm while it is £1,478 cheaper in Birmingham at £3,388pm. However, we can see from our map of London that there is an abundance of Chinese venues representing a much larger and extensive Chinese community as compared to a less dense venues in Birmingham. Both venues are predominantly restaurant oriented style venues, however, the presence of Chinese consulates and variety of Chinese venues in London may prove to be appealing to prospective immigrants despite the extra cost of living.

Conclusion

In this report, we have gathered data on the neighbourhoods of two cities, London and Birmingham. The geographical location of each neighbourhood was found, and visualised using folium. with the Foursquare API, Chinese venues around each neighbourhood was identified, allowing us to cluster each neighbourhood by their most popular venues. Finally, the clusters were visualised and compared to find the differences between the two cities, and what the extra cost in living in London will pay for in terms of selection of venues and density of Chinese communities. With these comparisons in hand, it is up to the people of interest to make a decision on which city would be most ideal to move to for their situation.