SPATIAL PATTERNS OF CHINESE IMMIGRANTS IN ROTTERDAM

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Enschede, The Netherlands, February, 2018

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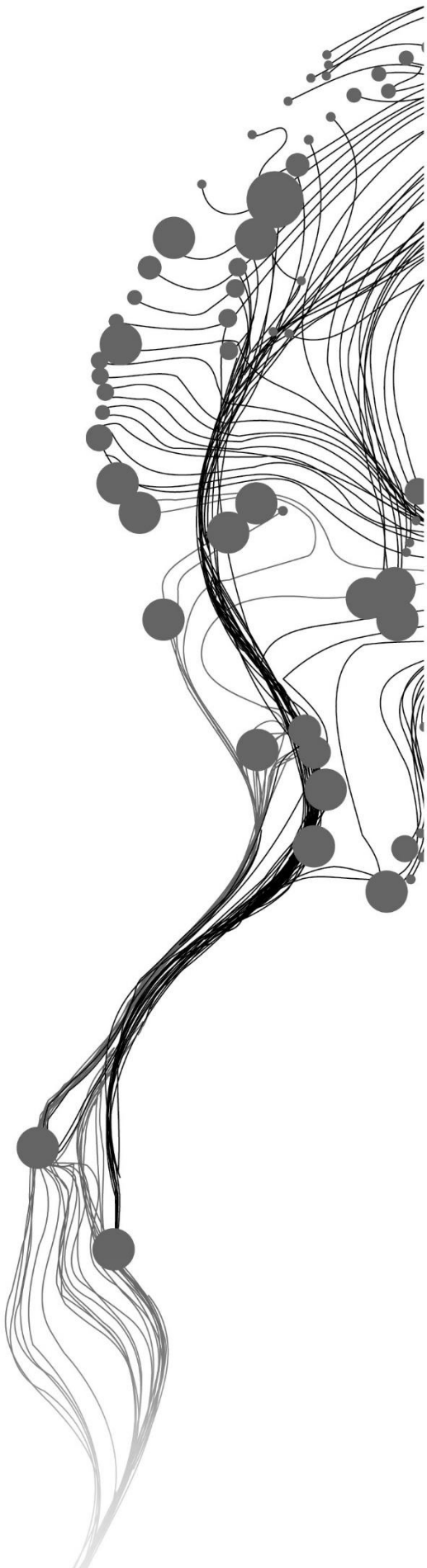

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Enschede, The Netherlands, February, 2018

Thesis submitted to the Faculty of Geo-Information Science and Earth Observation of the University of Twente in partial fulfilment of the requirements for the degree of Master of Science in Geo-information Science and Earth Observation.
Specialization: Urban Planning and Management

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ABSTRACT

Immigrants tend to aggregate in some specific neighbourhoods, which impede their participation in the destination country, hinder their integration in the host society and create social conflicts. In the study of urban segregation, residential spatial patterns can reveal the aggregated or dispersed patterns of residential distribution of minority or immigrant groups. More recently, daily activity spatial patterns, which can influence away-home intergroup contacts, had been explored as part of urban segregation study.

Since the 1960s, an increasing number of immigrants has been coming to the Netherlands and reshaped Dutch society, especially in metropolitan cities. The Chinese ethnic group is the fifth biggest non-western minority in the Netherlands. Recent research had showed that Chinese immigrants are more easily involved in the Dutch society than other non-western groups. But referring to the urban segregation study, the spatial patterns on Chinese immigrants in the Dutch context haven't been found.

To understand the variations in the spatial distribution patterns Chinese immigrants, this thesis analyses the residential and daily activity spatial patterns of Chinese immigrants in Rotterdam as a case study. Based on the statistics data, a dynamic of residential spatial patterns was explored on the platform of GIS to discuss its development trend of 25 years. More details on its characteristics of residential spatial pattern was discussed and compared about the spatial patterns of its three main sub-groups which includes the first and second generation immigrants and knowledge and study immigrants. With a survey and participatory mapping, an empirical study helped us to understand the characteristics of daily activity spatial patterns of the Chinese immigrants as an entirety and its three main sub-groups.

Generally, the Chinese immigrants the in the city shows a dispersive spatial pattern with slightly aggregation. Therefore, the spatial patterns of its sub-groups demonstrates remarkable differences and the various reasons underlying this phenomenon has been found.

Key word: Chinese immigrants, urban segregation, residential spatial pattern, daily activity spatial pattern, Rotterdam

ACKNOWLEDGEMENTS

Primarily, I would first like to acknowledge my supervisors Dr. M. Madureira and Dr. J.A. Martinez Martin of the faculty of geo-information science and earth observation (ITC) at University of Twente. The door to their office was always open whenever I got into trouble or had a question about my research or writing. I got a lot of guidance, suggestions and feedbacks from each meeting with Dr. M. Madureira and Dr. J.A. Martinez Martin. Especially, Dr. M. Madureira offer me a lot of helps to improve my poor writing. Dr. J.A. Martinez Martin offer me different approaches and channels in data collection. They consistently allowed this paper to be my own work, but steered me in the right the direction.

I would first like to acknowledge Dr. Han Lei of the faculty of geo-science and resource at University Chang'an University, China, who offered me guidance in thesis writing.

I would also like to thank the Onderzoek en Business Intelligence (OBI), Municipality of Rotterdam offer the secondary on Chinese immigrants. Without their helps, this study could not have been successfully conducted.

I would also like to thank the Chinese immigrants who accepted my interview. Without their passionate participation and helps, the information and knowledge couldn't be found.

Finally, I must express my very profound gratitude to my parents and to my parents for providing me with unfailing support and continuous encouragement throughout my period of study in the Netherlands and through the process of researching and writing this thesis. This accomplishment would not have been possible without them. Thank you.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

This chapter gives a brief introduction for the study on the spatial patterns of Chinese immigrants in Rotterdam. It is comprised of background and justification, research problem, research question, hypothesis and conceptual framework.

1.1 Background and justification

After the second world war, an immigration movement spread around the world with the trend of increasing globalization (Martin, 2008). Until 2013, more than 232 million international migrants, about four percent of the world's population, immigrated to countries not their own (United Nation, 2013). Based on their immigration motivation, people immigrating to western countries have been classified into labour immigrants, business immigrants, highly skilled immigrants, and decolonization immigrants (Zorlu & Hartog, 2002). In some immigration countries like USA and Canada, immigrants had a strong influence in the local society in their destination countries (Frazier, Tettey-Fio, & Henry, 2006). Europe was also becoming more multi-ethnic and multi-cultural after people from developing countries came to a variety of EU member states (Gentin, 2011).

International immigration, whose influences are complex, brings both negative and positive impacts to the host society. On the one hand, immigrants bring more international businesses and networks to the destination country, which benefits its local economy (Freeman, 2006). Immigrants also bring dialogues of different civilizations, which turns the host country into a multicultural society with diversity, creativity and generation of new knowledge (Cruse, 2010). One the other hand, immigrants can create religious conflicts and ethnic division because of their heterogeneity and due to discrimination (Vorrath & Krebs, 2009). Anxiety on poverty and violence that immigrants might bring also arise due to the low educated background and high employment rate of the immigrants (Runner, Yoshihama, & Novick, 2009). The arrival of massive immigrants also might have negative impact on the indigenous culture because some of them refuse to accept and get integrated the local society in their destination country (Rowthorn, 2015).

There is a trend that immigrants or minority groups tend to aggregate in cities and neighbourhoods where they can find a similar lifestyle, religion, common language and ethnicity (Frazier et al., 2006), which can hinder the integration and participation in local society (Musterd & Deurloo, 2002). Immigrants also tend to be able to settle in poorer neighbourhoods where it is affordable for them or in neighbourhoods where the local inhabitants do not like to live in. These areas, less popular with the host city residents, have higher vacancy rates and thus make it easier for newcomers to move in. Some of the poor immigrants aggregated areas in cities developed into "slums", which are considered as fragments in cities (Logan, Zhang, & Miao, 2015).

The phenomenon of the isolated patches in an urban area where immigrants settle is called urban segregation. Urban segregation is one of dominant immigrant issues being concerned as unsecure or unstable factor by the local and national government (Musterd & Deurloo, 2002), which is supposed to be addressed. The topic of segregation in city is discussed widely in the context of divided city, dual city or quartered city (Peter, 1993). Therefore, studies have pointed to how the aggregation of minority or ethnic groups in certain areas of a city may create social conflict between ethnicities, with the host community and breed crime more easily (Alesina & Eliana La Ferrara, 2005).

Excluding dwelling aggregation, the aggregation of daily activity among the members of the ethnic groups in urban public space is also concerned for immigrant segregation (Kaplan & Douzet, 2011). Because of their similar custom and common cultural background, members of a foreign ethnic group tend to go to some specific places to shop, meet or entertain, where they build their social network (Roger Waldinger,

2005). Then, their daily activities aggregation increase self-segregation and reduce the opportunities to intergroup contacts (United Nations, 2008).

Since the 1960s, a growing number of immigrants has been coming to the Netherlands and most settled in the four major cities: Amsterdam, Rotterdam, the Hague and Utrecht (Huis, Nicolaas, & Croes, 1997). Thus, Dutch metropolitan cities have been reshaped into societies with a diversity of ethnicities and cultures (Vasta, 2006). There are five major non-western immigrants groups in the Netherlands: Turkish, Surinamese, Moroccans, Antillean, Indonesian and Chinese (Zorlu & Hartog, 2002). The population of Surinamese, Turkish and Moroccans in Dutch major cities is much larger than the other minorities (Crul & Heering, 2008).

The Chinese ethnic group is seen as the fifth biggest non-western minority in the Netherlands (Minghuan, 1999). The members of Chinese ethnic group mainly settle in the major coastal Dutch cities like Amsterdam, Rotterdam and Den Haag, where they established the Chinatowns in 20 century (Jinling, Kasper, Sjaak, & Jan, 2012). The number of Chinese immigrants increased in the past years and roughly 71500 Chinese immigrants and their descendants were living in the Netherlands until 2011(Gijsberts, Huijnk, & Vogels, 2011). Meanwhile, during the past decades, the demographic composition of the ethnic group has been changed and the social-economic status of Chinese immigrants has improved gradually (Frank & Oostrom, 2011).

Recent research had showed that the Chinese immigrants are more easily involved in the Dutch society than other non-western ethnic groups, especially in the Dutch labour market (Mandin & Gsir, 2015). The first generation of Chinese immigrants work hard for their owned business but aren't integrated in the local society, which makes it known as an isolated quiet group by the natives (Minghuan, 1999). The majority of the Chinese immigrants who arrived in the Netherlands in the second half of 20 century ran restaurants for living so that the indigenous Dutch call them "Restaurant Chinese"(Ma Mung, Pieke, & Guillon, 1992). However, adaptation to the host society happens more frequently in the second generation of Chinese immigrants, who have a higher educational background and achieve a higher economic status, standing out as an excellent immigrants group (Gijsberts et al., 2011). However, the second generation and the current study and knowledge immigrants are more likely to specialize in a variety of fields with high-tech skills or international business (Mandin & Gsir, 2015).

The reasons why Chinese immigrants tend to be easily integrated have not been completely found. Some researchers maintain that most of Chinese immigrants are more willing to work hard than the other ethnic groups so that they get involved in the formal labour market sooner than other non-western groups (Frank & Oostrom, 2011). It is argued that the Chinese culture influence the Chinese immigrants character, which effect their willing to struggle for their better live in their destination country (Gijsberts et al., 2011). It is considered that residential characteristics of the Chinese also influence and daily activity of immigrants in the host city might play a role in their process of integration.

Spatial patterns allow us to analyse the immigrants life. The spatial patterns of a specific group of people are seen as an important cause for the segregation or integration in urban areas for this minority group (Johnston & Pattie, 2016). The residential geographic distribution of Chinese immigrants in the Dutch cities can reveal their general residential spatial patterns while daily activity in the city can demonstrate individual the spatial patterns for shopping, working, socializing and entertaining (Spencer & Cooper, 2006). Investigation on the spatial patterns of Chinese immigrants may get some clues on immigration integration, which will offer some suggestions relevant for other ethnic group to reduce barriers, get adapted and integrated into the local society in the Netherlands. The experience of spatial patterns for Chinese immigrants in cities may help the government or policymakers to plan or control the distribution of other ethnic groups, manage their settlement patterns and arrange the space to affect their integration.

1.2 Research problem

Currently, there was a research gap in the field of the spatial patterns on Chinese immigrants in the Dutch context. Indeed, spatial patterns of immigrants in a city were a significant factor related to its segregation or integration in their destination city. At the beginning, I have no idea whether the Chinese immigrants are segregated or integrated in Rotterdam. The initial assumption for this thesis work is that the Chinese immigrants are segregated when they first migrate in to the Netherlands. Then, I started to explore how segregated the Chinese immigrants are.

Traditional segregation research in the 20 century focused on residential spatial patterns of different groups while some young researchers explored the daily activity spatial patterns of different social-economic groups recently (Wang, Li, & Chai, 2012). The residential spatial patterns reveal whether the residential distribution patterns of an ethnic group is aggregated or dispersed. The daily activity spatial patterns, which is seen as an extension for residential spatial patterns (Palmer, 2013) can demonstrate whether the daily activities urban space of an ethnic group is aggregated or disseminative. However, there are no scholars focusing on both of those spatial patterns of Chinese immigrant in Dutch cities.

The research problem is the lack of understanding on the spatial patterns of Chinese immigrants in the Dutch major cities. To understand the patterns of segregation and integration of Chinese immigrants, the spatial patterns of Chinese immigrants should be explored in Dutch cities.

Rotterdam was chosen to discuss the Dutch situation of Chinese immigrants in this study. Primarily, what is important is that among the Dutch cities, Rotterdam has the largest Chinese immigrants population (Gijsberts, Huijnk, & Vogels, 2011). Secondly, the city of Rotterdam is a prosperous port city and a transport hub connecting the Netherlands with the rest of the world, where numerous immigrants settle (Tab.1-1) (Melorose, Perroy, & Careas, 2007). Rotterdam has a long history of immigration and since the 19 century, a large number of immigrants have arrived in the port of Rotterdam and settled in the city as labour immigrants (Entzinger & Engbersen, 2014). Thirdly, Rotterdam is highly segregated, because of the aggregated settlements of several different immigrants origin: Turkey, Morocco, Dutch Caribbean, Chinese Suriname, Indonesian and other European (Entzinger & Engbersen, 2014), which make it a challenge to the policymakers. So it is pertinent to discuss the Chinese immigrants in the case of Rotterdam.

1.3 Research objectives

General objective:

To analyse the spatial patterns of Chinese immigrants in a major Dutch city for investigating how segregated the Chinese immigrants are.

Sub objective:

(1) To explore methods to investigate the spatial patterns of Chinese immigrants

(2) To analyse the residential spatial patterns of Chinese immigrants in Rotterdam .

(3) To analyse the daily activity spatial patterns of Chinese immigrants in Rotterdam.

1.4 Research questions

Sub objective (1) to explore method to investigate the spatial patterns of Chinese immigrants

- What indicators have been used in previous research to measure and analyse residential

spatial patterns and daily activity spatial patterns?

- What indicators will be used in this thesis to measure and analyse residential spatial patterns and daily activity spatial patterns?

Sub objective (2) To analyse the residential spatial patterns of Chinese immigrants in Rotterdam.

- Where are Chinese immigrants residing in Rotterdam?
- How did the residential spatial patterns of Chinese immigrants in Rotterdam change in the period of 1990-2015?
- Which sub-group gets more segregated among the Chinese immigrants for the residence?
- What social-economic and demographic characteristics influence residential spatial patterns of Chinese immigrants in Rotterdam ?

Sub objective (3) To analyse the daily activity spatial patterns of Chinese immigrants in Rotterdam.

- Where do Chinese immigrants usually go for leisure/ work/ shopping in Rotterdam?
- Which sub-group gets more segregated among the Chinese immigrants for their daily activity?

1.5 Hypotheses or anticipated results

It is hypothesized that generally the Chinese immigrants in Dutch cities may have a disperse spatial patterns for both residential and daily activity spatial patterns.

It is anticipated that the sub-groups of Chinese immigrants (the first generation immigrants, second generation immigrants and the study and knowledge immigrants) in Dutch cities may have different spatial patterns. The first generation immigrants, living the longest in the Netherlands, were nevertheless expected to be less integrated in Dutch life and have a aggregated spatial patterns. The second generation, who were born and grown up in the Netherlands, was hypothesized to have a more diversified or bigger extend spatial patterns. The study and knowledge immigrants, who grew up and received education in China but moved to the Netherlands to for higher education studies or for highly qualified jobs, might be something in between. The stories of the three main sub-groups can be compared by residential spatial patterns and daily activity spatial patterns.

1.6 Conceptual framework

The segregation of a minority group can be reflected on the spatial patterns of living, working, shopping, socializing, entertaining, and so on of their members. The residential spatial patterns of immigrants only concern the place where they live. The daily activity spatial patterns might be used to discuss the spatial patterns for all kinds of daily activity away from home, which includes working, leisure and so on. Meanwhile, the social and economic characteristics effect their residence and the daily life. When I discuss the spatial patterns, I divide it into residential spatial patterns and daily activity pattern (Fig. 1-1).

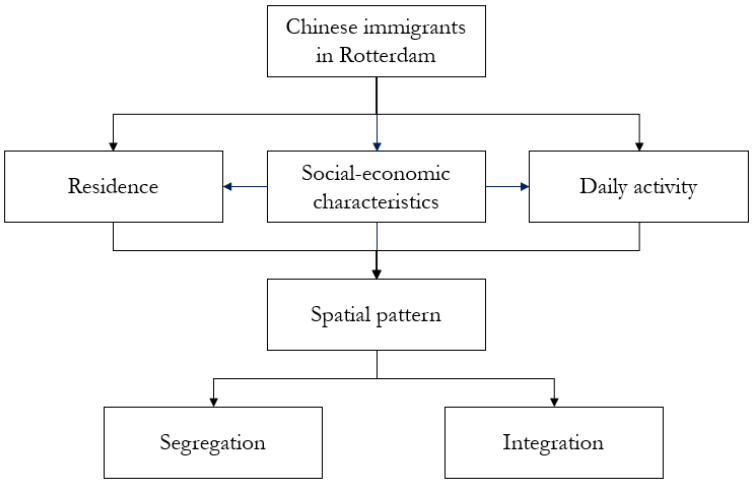

Figure 1-1: Conceptual framework

2. LITERATURE REVIEW

Spatial patterns allow us to analyse the immigrants' life in their destination country or host city. This chapter is a literature review on the previous research on spatial patterns and immigrants' segregation. The content includes the conceptualization of the key concepts, causes and impacts of segregation, methods to measure segregation and spatial patterns, and the Dutch experience of segregation.

2.1 Conceptualization of immigrant, spatial patterns and segregation

Spatial patterns can reveal the distribution characteristics and geographic feature of a group of people (Huynh, Makarov, Legara, Monterola, & Chew, 2016), which is able to express the segregation degree of immigrants (Musterd & Vos, 2007). This section focuses on the definitions of immigrant, spatial patterns, residential spatial patterns, daily activity spatial patterns and segregation.

2.1.1 Immigrant

According to the Oxford dictionary, an immigrant is defined as "an individual who comes to live permanently in a foreign country, especially to seek for better job or better living conditions". Meanwhile, the UN migration agency defined "immigrant" as any person who has moved across an international border to another country from his/her habitual place of residence or their home country (the UN migration agency, 2017), mostly for long term residence or permanent residence. In the language of Dutch, the word "allochtoon", which means "coming from another land", is almost equivalent literally with the English word "immigrants". The Central Bureau for Statistics of the Netherlands defined the "allochtoon" as someone who was born abroad or who have at least one parent who was born abroad (CBS, 2000). Within the "allochtoon" group, CBS distinguished first and second generation "allochtonen", second generation "allochtonen" are born in the Netherlands. More recently, the WRR criticized that "allochtonen" is incorrect for the second generation who were born in the Netherlands and that the term gave exclusive labels to non-native Dutch (WRR, 2016). Due to the negative connotations that the word "allochtoon" implied for some groups, CBS no longer used "allochtoon" to talk about non-native Dutch since the November of 2016 and replaced it with "personen met een migratieachtergrond" (persons with a migration background) (De Ree, 2016). In this study, the definition of "immigrants" follows the CBS's understanding on "allochtoon" or "personen met een migratieachtergrond", because I am discussing the immigrants in the Netherlands.

In the Netherlands, sociologists tend to understand the word "allochtoon"("personen met een migratieachtergrond") not based on their nationality or country of birth, but on ethnicity, according to the definition from CBS (Elrick, El-Cherkeh, Geyer, Münz, & Scheidler, 2007). The way that immigrants is defined by ethnicity makes it easy for the sociology research on discrimination, educational disadvantage, crime and health (WRR, 2016), because immigrants with different ethnic, alien cultural background, distinctive habits and behaviour always bring a series of political or social issue (European Commission, 2006). However, for the municipality statistics, it seems impossible to check the ethnicity origin for all of the citizens. In order to differentiate immigrants from the native Dutch by ethnicity, the Netherlands government considers that a person has a non-native Dutch origin ethnically in the statistics, if he/she was

born out of the Netherlands or at least one of his/her parent who was born outside the Netherlands (Elrick et al., 2007). So those people who are living in the Netherlands but were born out of the country are considered as first generation immigrants because they tend to have a foreign ethnical origin (Alders, 2001). Those Dutch-born people whose parent were born outside the Netherlands are also considered having a non-native Dutch origin ethnically even though they were born in the Netherlands and they are called by "the second generation immigrants" (Zorlu & Hartog, 2002).

A further distinction on immigrants in the Netherlands are western immigrants and non-western immigrants (CBS, 2000). A western immigrant is considered as less problematic than a non-western immigrants because of better education, similar habits and closer value. In this study, the Chinese immigrants in the Netherlands are the people with a Chinese ethnicity who are settling in the Netherlands. The group of Chinese immigrants is the non-western immigrants.

Among the different categories of immigrants, the most outstanding immigrants are the group named knowledge immigrants because they are international talents who devote to the host society most and benefit the economy most (Groot, Gessel, & Raspe, 2013). Knowledge immigrants, also called high-skilled immigrants, are those immigrants with high education background, highly qualified jobs and high income from abroad (Groot et al., 2013). These group of immigrants include international doctors, dentists, scientists, artists, IT professionals, architects, engineers, managers and some other high-skilled workers (Juzwiak, 2014). Knowledge immigrants play an role in knowledge-based economies modern society, which make it become a new trend in the age of globalization (Groot et al., 2013).

Like many researches, when talking about immigrants, I don't include refugees in this study. The most distinguished difference between refugee and immigrants is their motivation for immigration and their immigration life. In Oxford dictionary, refugee is defined as "a person forced to leave his/her home country to another for escaping war, political persecution or natural catastrophe". Refugees are considered as asylum seekers in their receiving country, people who need help and protection (Crisp & Dessalegne, 2002). But immigrants are those people who arrive in their destination country searching for better jobs, better life and economic security (Cortes, 2004).

2.1.2 Residential and daily activity spatial patterns

The concept of "spatial patterns" is defined by geologists as the distribution arrangement of population or objects in space and the geographic relationships among them (Chou, 1995). In the field of urban morphology, some urban researchers from Singapore maintained that "spatial patterns" is delineated by the physical distribution of urban population and infrastructure and shapes of urban entities (Huynh et al., 2016). Some urban experts on Global South use "spatial patterns" to discuss the current distribution of the population's ecological and socioeconomic functions in a city or to discover the dynamical processes of its transformation and development(Wray, Musango, Damon, Observatory, & Cheruiyot, 2013). In this study, I use the term "spatial patterns", whose definition is equivalent to Huynh's understanding, to discuss the physical distribution of the Chinese immigrants in the city of Rotterdam.

Spatial patterns of an immigrant group, which is also called geographic ethnic pattern, refers to the distribution structure and feature in specific immigrant receiving areas for a specific immigrant group (Water & Pineau, 2015). Mostly, the item is used to describe the mode of geographic characteristic for minority or ethnic group in a city or country, which can be observed by a picture or map. For example, spatial patterns

is used to discuss the issue of ethnic segregation between white Americans and African Americans in US Metropolitan cities (Dawkins, 2006).

The types of spatial patterns for immigrant groups are diverse, based on the different ethnic groups and different places (Zhang, 2013). Spatial patterns can be diversified relating to its size, scale, shape, density and its structure (Linard, Tatem, & Marius Gilbert, 2013). The spatial patterns of an ethnic group in a city can be aggregated, dispersed or randomly distributed (Waldinger, 1989). For example of Atlanta (Fig. 2-1), the low income groups aggregate in the city centre while the high income groups aggregate in the north (Louf & Barthelemy, 2016). But the middle income class is more dispersed. By comparing spatial patterns in a variety of stages, spatial and temporal dynamics of cities can be detected. For example (Fig. 2-2), a remarkable difference was found in Los Angeles that the spatial patterns of immigrants settlement was developed into dispersion in 20 years from a aggregation situation in 1980 (Pastor, 2009).

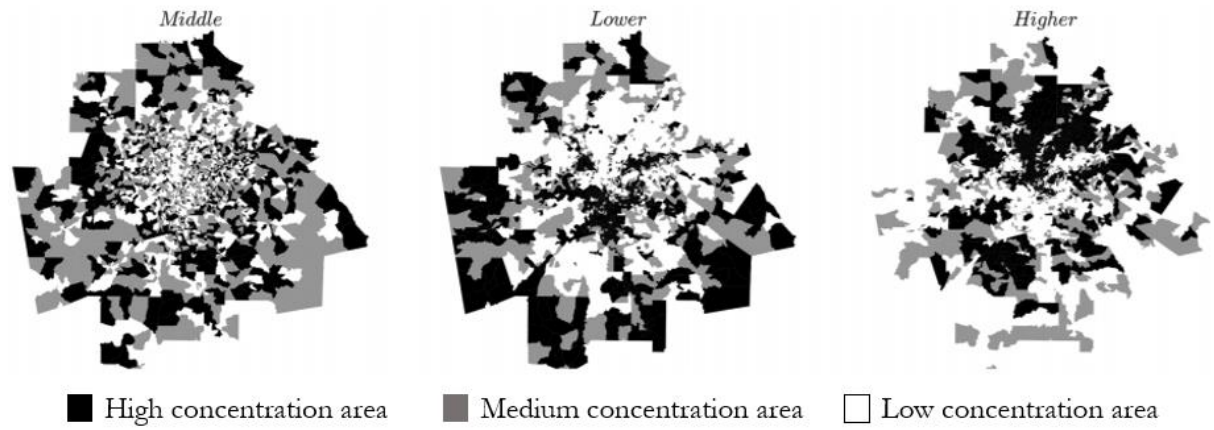

Figure 2-1 Spatial patterns of different income groups in Atlanta, USA (Louf & Barthelemy, 2016)

Based on the upper discussion, this study proposes to treat spatial patterns as an objective phenomenon to study the geographic ethnic aggregation of Chinese immigrants in the city of Rotterdam. In the study, the spatial patterns of Chinese immigrants is divided into residential spatial patterns and daily activity residential spatial patterns.

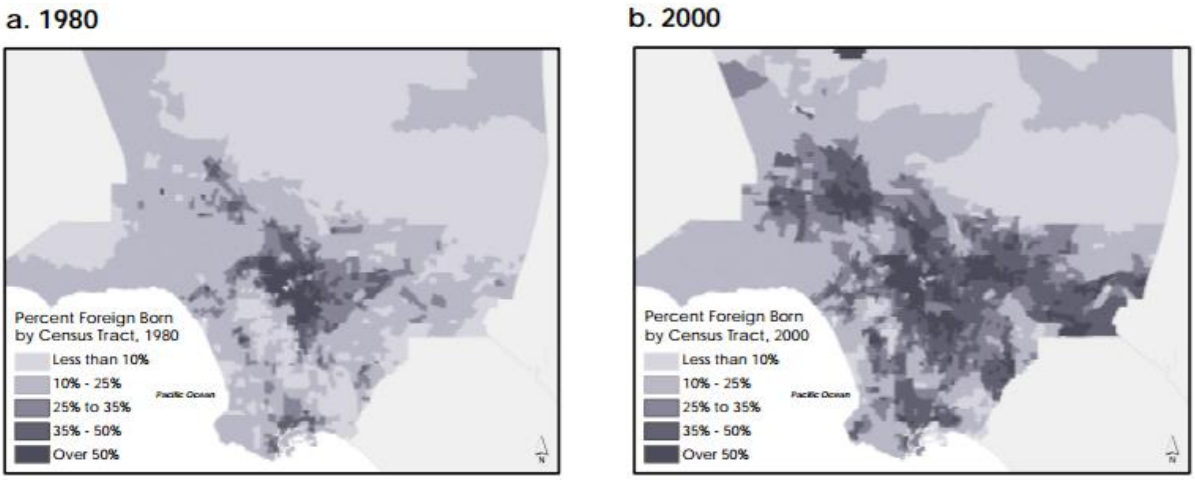

Figure 2-2: Spatial patterns of foreign born citizens in Los Angles in 1998 and 2000 (Pastor, 2009)

Residential spatial patterns is an angle to view the residential life. Residential spatial patterns is a concept defined as the dwelling distribution of a specific group of people in space and its geographic

relationships in a city. The pattern can be visualized and perceived by map or picture, which conveys the information of residential spatial characteristics (Chou, 1995).

The residential spatial patterns is applied to studies on residential segregation or residential integration prevailingly to describe the aggregated or dispersive patches of immigrants (Musterd & Ostendorf, 2009). Residential spatial patterns is a crucial scope to discuss the geographic distribution or dynamic change when researchers talk about spatial aggregation of ethnic or socioeconomic groups, which often results in a residential mosaics across urban spaces such as slums, immigrant enclaves, urban villages and gated communities (Hao, 2015).

Apart from the residential spatial patterns, daily activity spatial patterns is another angle to view the immigrants' life (Wang et al., 2012). It is maintained that the traditional spatial segregation studies, which treat the residential aggregation as the only case, neglect the fact that social separation also happens in the public space where minority group members conduct away-home daily activity (Krivo et al., 2013). Other researchers argued that the social study of spatial segregation can be extended from the conventional study aspect on residential location to daily activity space (Wang & Li, 2016). So all kinds of the away-home spatial segregation phenomenon can be clarified under the category of daily activity segregation.

Daily activity is an individual or private behaviour, which is related to personal mobility and the individual experience of space (Roux, Vallée, & Commenges, 2017). It is assumed that people from a specific group have some preference similarity or homogeneity in their daily activity patterns, based on their common ethnicity, cultural background or income level. he daily activity spatial patterns is about the distribution and its geographic characteristic of daily activity on different types of social circumstances, which a specific group of people are exposed to in their life (Wang & Li, 2016). In the topic of daily activity spatial patterns, scholars talk about the geographical distribution of schools, occupations, shops, entertainment, of members from different groups (Yang, 2000).

In this thesis, I talk about the daily activity spatial patterns of an ethnic group, which is the distribution and geographic characteristic of daily activity. Traditions, habits and customs have strong influences on the daily activity of people from an ethnic group, which might lead them have collective preferences on a specific public space (Amin, 2008). More important, the daily activity pattern of an ethnic group is also connected to spatial segregation, concerning those public places where ethnic minority aggregates but few of the majority population are willing to go. For instance it is considered as a daily activity segregation that school-age children in Chicago went to separate black or white schools in the 1960s (Fairclough, 2004). Therefore, the daily activity spatial patterns of an ethnic group can reveal their isolated situation and segregation extent.

2.1.3 Spatial segregation

The European Commission against Racism and Intolerance define the term "segregation" as "the act by which a person separates other persons or a group of people with discrimination on the basis of a ground such as race, colour, language, religion, nationality or ethnic origin, without an objective and reasonable justification(ECRI, 2002). Some sociologists maintained that segregation refers to the phenomenon whereby people of a different ethnicity, race, income or religion are kept apart so that they live, work, or study separately and that it can be reflected by spatial patterns of distribution (Uslaner, 2006). In this study, I follow the definition of "segregation" from Uslaner.

Spatial segregation, which implies spatial concentration, can be seen as the separation of groups within a broader population (Kempen & Ozuekren, 1998). Spatial concentration is a neutral term to describe the aggregation phenomenon in space, based on the theory that people with textual similarity tend to live and socialize together (Szanyi, Csizmadia, & Illéssy, 2010). For instance, at the end of 19 century, there was a

spatial aggregation of designers, painters, writers and musicians in the hill of Montmartre in Northern Paris, which brought a prosperous development of creative industry (OECD, 2005). Spatial segregation is not only concentration of disadvantaged group, but separation with discrimination, as a metaphor of "a bad thing" (Musterd, 2011). For example, in the middle of 20 century, Caucasians refused to or they were reluctant to go to those places where African Americans clustered to live in Chicago (Logan, Zhang, & Miao, 2015).

Spatial segregation includes residential segregation and daily activity segregation (Wang & Li, 2016). Residential segregation means the spatially residential aggregation phenomenon of a specific ethnic or socioeconomic group with a homogeneity of features, often with a consequence of a residential patch across urban spaces (Hao, 2015). Daily activity segregation is considered as the aggregation and separation of minority members in some particular urban public space (Li & Wang, 2017).

Fragmentation, which is a synonym of segregation, literally means "broken pieces" (Deffner & Hoerning, 2011). Urban fragmentation of a minority refers to a phenomenon that a city as a unity transforming into several patches or divided pieces of habitants, due to the fact that different kinds of immigrants from a diversity of ethnicities, languages, income level or cultural background settle aggregated (Alesina & Eliana La Ferrara, 2005). Urban fragmentation also is considered as a process of deconstructing a former urban entirety previously characterized by homogeneity, after absorbing a large number of people from a different ethnicity (Deffner & Hoerning, 2011). Fragmentation might not only increase prejudice and conflict between different groups, which often leads to disruptive political and social instability, but also create poverty, insecurity, inequity and inequality (Sivasundaram & Ma, 2008).

The difference between fragmentation and segregation has been discussed by various scholars. Some researchers maintain that fragmentation is a more visible isolated phenomenon related to morphological, geographical and social structures than segregation (Deffner & Hoerning, 2011). It is argued that habitat fragmentation is a form of habitat segregation (Proctor, McLellan, & Strobeck, 2002). Because of the difference of the two definitions, in this thesis, segregation is hypothesized to be applied for the ethnic issue of Chinese immigrants in Rotterdam.

Integration has been defined as the action that causes to bring people together, particularly different ethnicities who have been kept separated previously, or to cause such a separation to end (Ruiz-Tagle, 2013). The efforts to promote integration have been mainly devoted to ethnic segregation and the decrease of poverty. Integration also refers to the spatial aspect of immigration integration such as housing, settlement choice and daily mobility as well as their impact on opportunity in labour force and sociability (Buhr, 2014).

2.2 Cause and impact of immigrants segregation

Immigrants' segregation is a kind of typical segregation related to ethnicity or race. This section discusses why immigrants' segregation happens in a city and what kind of impacts it can bring about.

2.2.1 Causes of residential and daily activity segregation

Ethnic segregation is considered as the outcome of intricate interactions of multiple causes. Even though residential segregation and daily activity segregation are related to each other, they are two different sub-topics frequently discussed by experts.

For the residential segregation, a variety of individual disadvantages push the ethnic minority members to live in poverty neighbourhoods, where few native citizens settle. Primarily, the affordable rent (price) attract immigrants without income or with low income to settle in the marginalized neighbourhoods with poor service, when arriving to a new country (Garner & Bhattacharyya, 2011). Objectively, unequal

distribution of public service and amenities in cities aggravate this phenomenon (Edensor & Jayne, 2011). Secondly, low education background and poor working skills are the disadvantages which make them hard to find a job in their destination country (Musterd & Ostendorf, 2009). Unemployment lead to poverty in those neighbourhoods. Thirdly, the chain of migration explains that another reason why newcomers are more willing to live in the minority aggregation area with the same origin is that because individuals can receive more helps from the minority people with the same origin when arriving (Skop, Peters, Amaral, Potter, & Fusco, 2006). So the affordable rent in marginalized neighbourhoods, low education background, poor working skills and the chain of migration are the factors directly or indirectly lead to residential segregation.

Institution also matters on the residential segregation. Other scholars argued that the root cause leading to the residential spatial patterns for a city include: organizing of welfare state and housing policy (Musterd & Deurloo, 2002).The difference of welfare state in the access to labour market, the quality of social welfare, the balance of income redistribution system can result in remarkable discrepancy of segregation extend (Desriani, 2011). For example, the phenomenon of social polarization and ethnic segregation in the Scandinavian city of Oslo decline because its developed welfare system offer the immigrants equal right to education, work and health care as the native citizens (Wessel, 2000). Conversely, the racial segregation situation in US cities wasn't improved because the welfare system in some states of Americans was racist (Piven, 2003). Whether the local housing policy tend to integrate the minority or to discriminate the housing allocation for the minority is also another important reason for residential spatial segregation (Desriani, 2011). For example, the Netherlands implement the policy of "mixed neighbourhoods" to try to integrate the ethnic minority into the native Dutch neighbourhoods (Musterd & Ostendorf, 2009)..

Daily activity segregation of ethnic group also exist, although the daily activity is considered as an individual behaviour because people have fewer constraints but more freedom in the daily mobility in urban space, comparing to their place of settling (Ravalet, 2006). Due to the cultural barrels and poor language skill lead to poor communications with the native majority for minority members (Aoki & Santiago, 2015), subjectively, some of the ethnic immigrants intend to go to the concentrated public place of ethnic minority, instead of the natives, to make friends or hang out. Being lack of social networks with native people is another reason for daily activity segregation.

Job segregation or "religion" segregation also happen in some specific space in daily life. There is an objective reality that the job segregation exits in some Americans cities because African Americans with low-educational background only can work in low-skill industries or position (Fairclough, 2004). Some special public spaces in European cities like Jewish synagogue, mosque, Chinese temple, where minorities aggregate to worship but few locals visit, play an important role in the daily life among some ethnic groups (Meftah, 2015).

It is found that the residential segregation influence the daily activity segregation in space, with the principle of proximity (Browning & Soller, 2014). Home is the terminal that daily activities start and end and the citizens settling at the same place are likely to go to the same place nearby to some extent (Wang et al., 2012). For example, Chinatown, little Italy in New York city are not only the place where immigrants settle, but also commercial streets in downtown where daily activity of immigrants happens (Associates, 2004). Because primary schools are located in neighbourhoods, African Americans children attend to black school which few white children attend, in their childhood daily life, which make ethnic segregation inherited from generation to generation (Fairclough, 2004). So the daily activity segregation is an extension of residential segregation.

2.2.2 Impact of residential and daily activity segregation

There are positive effects and negative impacts for special segregation, both for residential segregation or daily activity segregation. Scholars tend to discuss the adverse impacts that spatial segregation may yield more than its advantage in the their research.

The negative impact of residential segregation is that the situation of the immigrants neighbourhoods gets deteriorated (W. van Gent & Musterd, 2016). Because ethnic minority has social and economic disadvantages in their destination countries, the immigrants aggregated areas might develop into poor, overcrowded and deprived areas easily. Unemployment and poverty might create crime, violence and social conflict (Moser, 2004). The chaos and disorders not only effect the immigrants neighbourhoods itself, but also spread around the city (Poets, 2015).

The negative impact of daily activity segregation is that minority members would be disconnected from a series of opportunities to socialize with locals and to jobs, if minority members only go to the segregated public places without the natives (Musterd, 2011). A non-segregated working place might help ethnic minority members get integrated easily because he/she can work and socialize with his native colleagues (van Ham & Tammaru, 2016). Suffering from few information and chances to get employed, it is hard for immigrants to be integrated into the formal labour market, which is considered as the first step to be integrated for immigrants (Konle-Seidl & Bolits, 2016). A formal job not only can offer a relatively high income and improve their working skills, but also can extend their social network in his daily life and enhance their quality of life (Mchugh & Challinor, 2011).

A negative impact for both the residential segregated areas and daily activity segregated areas are that those places may be discriminated by the native on the basis of their characteristics (Cummins, 2016), which is disadvantageous for the minority group. Those segregated areas will have a bad reputation among the locals because they are visible and perceived easily based on the difference of ethnic appearances, cultures and languages. Then, the native are more reluctant to live or visit those immigrants segregated areas. The amenities and public service are developing to distributed more unevenly. Those negative impacts happen like the domino effects, one effect another, which make the segregated areas worse consequently.

Meanwhile, there are also some positive impacts that derive from the aggregation of minority groups and segregation. Indeed, to some extent, the segregated area is an optional place for some minority groups to live, to shop and to socialize (Capers, 2009). An isolation area like an urban village or ghetto offers the possibility for the poor to survive in the city because the rent and living cost is relatively low compared to the rest of the city (Teitz & Chapple, 1999). The isolated area is a buffer area for the newcomers, where life is cheaper (Haque, Khanlou, Montesanti, & Roche, 2010).

A second positive impact is that it is more possible or easier for the municipality to offer specific public service for the minority in the segregation area because they have similar daily activity or alike behaviour. For example, the local government is more likely to build a mosque in a muslin aggregated area for their religious activities (Maussen, 2005). It is convenient for the Chinese immigrants to live in a China town because they can do grocery shopping for Chinese ingredients more easily (Min & Logan, 1991).

2.3 The Dutch experience of immigrants segregation and integration

In the Netherlands, immigrants prefer to settle in four larger cities due to the rich job opportunities, networks of compatriots and specific facilities (Nabielek, 2016). Being feared of the increased ethnic residential segregation, polarization and criminality, the Dutch government launched some immigrants

integration policies including the "mixed neighbourhoods" and "the multidimensional integration" since the end of 20 century, aiming to prevent the segregation developing (Musterd & Deurloo, 2002).

2.3.1 Mixed neighbourhoods

The policy "mixed neighbourhoods", which aimed at changing the physical, social and economic characteristics of problematic segregation enclaves and changing the proportion of ethnic minority, was expected to address the relationship between ethnic residential aggregations and integration (Gijsberts & Dagevos, 2010). The mixed neighbourhoods is a policy of residential integration which promotes immigrants to get access to neighbourhoods with Caucasian majorities and with an equivalent level of amenities and public services (Alba & Nee, 2003). By changing the social welfare strategy and providing social housing, the municipality announced that low-income groups had more alternatives to live in a nice house (Desriani, 2011), which is targeting to help the ethnic minorities and low-income groups. At the urban planning level, a rule had been proposed that large-scale dwelling project have to consist a minimum proportion of units for social housing (Galster, 2007).

There are some obstacles in the process of building the mixed neighbourhoods. First, some white Dutch articulated that they are reluctant to share their neighbourhoods with the minority groups (Bolt, van Kempen, & van Ham, 2008). Researchers found that social mix doesn't mean social cohesion, because indeed, being neighbours for people doesn't signify that they are friends or that they have a lot of interactions (Herweijer, 2009).

Reacting to the mixed neighbourhoods, some minority members are willing to move in a non-segregated area. They found the necessity to leave segregated neighbourhoods, because of the low housing quality, poor nuisance and unsafety (Gijsberts & Dagevos, 2010). A portion of minority parents realized that the lack of native Dutch neighbours is an obstacle for their kids, due to the absence of the local language circumstance (Herweijer, 2009).

The hypothesis behind the mixed neighbourhoods is that "mixed neighbourhoods are good for contact" between migrants and native Dutch. But this hypothesis was doubted by other researchers, because they maintain that it is possible that even living in highly mixed community, specific immigrants still only have interaction within their own group (Musterd & Ostendorf, 2009). With a program to target and improve the 40 most deprived neighbourhoods in the Netherlands, experts found that the mixed neighbourhoods policy improved the living environment for the minority but doesn't address social segregation and that liveability in neighbourhoods and social exclusion in society are not related (W. P. C. Gent, Musterd, & Ostendorf, 2009).

2.3.2 Multidimensional integration

Except the dimension of residential integration, Sociologists in America gave a definition to the multidimensional integration of immigrants that it is a integration for immigrants from three extra major dimensions: acculturation, social integration, and socioeconomic achievement (Alba & Nee, 2003). Alba & Nee maintain that acculturation refers to the process of spreading the native values, local customs and indigenous philosophy to the immigrants and relieving the conflicts of religion, politics and history from immigrants with different backgrounds into the local environments. Social integration is a process to achieve a harmonious circumstance and maintain peaceful social relations by strengthening social networks, improvement of language, and promotion of intermarriage (Hyman, Meinhard, & Shields, 2011). Socioeconomic achievement refers to the participation of labour market and improvement of skill training, which can bring income to support them and their family (Klosters, 2014).

The Dutch multidimensional integration policy consist of three dimension: labour market participation, participation in education, social-cultural integration such as social contacts, language skills and role models (Musterd & Deurloo, 2002). The labour market, school and social contacts are related to daily activity. The Dutch language skills give the newcomers more opportunities to interact with the native Dutch. In the social-economic dimension, the labour market participation offers the immigrants a formal job, legal income and an opportunity to interact with native Dutch (Sobolewska, Galandini, & Lessard-Phillips, 2017). In the culture-economic dimension, participation in education give minorities to a chance to learn the language of Dutch, to learn the Dutch institutions and values and to learn the labour market orientation (Akcomak & ter Weel, 2004), which make it possible for the immigrants to find a better job, to make friends with native Dutch or even marry with native Dutch.

Recent research argued that the social and economic dimensions have the most initiatives for migrant integration and most of the good practice belong to labour market participation (Juzwiak, McGregor, & Siegel, 2014). It is found that education appears to be an essential factor for successful integration and the effects are obvious among the second generation immigrants (Musterd & Ostendorf, 2009).

2.4 Methods to measure segregation

To measure the degree of segregation, this section discussed the methods on residential spatial segregation and daily activity segregation separately. Methods to study the residential spatial segregation are more conventional while methods to study daily activity segregation are more diversified and new.

2.4.1 Methods to measure residential segregation

Researchers maintain that residential segregation is a phenomenon with multiple aspects, which can be summarized into five dimensions of measurement: evenness, exposure, aggregation, centralization, and spatial clustering (Denton & Massey, 1988).

All of dimensions of measurement methods on residential segregation are based on the distribution of population settlement, whose data are from municipality. A city is divided into a number of small units and neighbourhood or a postcode area are seen as a small unite of settlement (Musterd & Deurloo, 2002). Then those data is applied into different kinds of models or calculation.

Denton argued that each dimension has its own definition and calculation methods and they are logically independent from each other.

Evenness is the dimension related to the disparate distribution of social groups among units within a metropolitan area (Iceland, Weinberg, & Steinmetz, 2002). It compares the overrepresented and underrepresented unites of the proportions in the population of the minority (Desriani, 2011). A minority group is considered to be aggregated or isolated if it is unevenly distributed over the city.

Exposure is a dimension related to the extent of potential interaction between minority and majority group members within a metropolitan area (Denton & Massey, 1988). It indicates the likelihood that minority members physically confront or encounter the majority in each neighbourhood in the defined urban area (Oka & Wong, 2014).

Concentration is the relative dimension to measure the amount of physical space or land occupied by a minority group in the urban environment (Denton & Massey, 1988). It is considered a concentrated settlement if a group occupies a restricted proportion of the total urban area in a metropolis. This dimension

helps to interpret the segregation phenomenon racial discrimination limits the disadvantaged group living in a relatively small physical space (Iceland et al., 2002). If a large number of people living in a small scale of place to live, it considered as concentration.

The fourth dimension of segregation is **centralization**, which compares distance of the geometric centre of the areas that minority groups live to the real city centre. Centralization is the proximity extent of the place which a group is spatially located near the downtown of a city (Denton & Massey, 1988).

The fifth dimension of residential segregation is the extent of **spatial clustering**, exhibited by a minority group-that is, the extent to which areal units inhabited by minority members adjoin one another, or cluster, in space.

Among the five dimension, some of them are suitable to be applied to this study while some of them are not.

The dimension of concentration is potentially suitable to be employed in the case study of Rotterdam. Those indices under the dimension of concentration are calculated by the number of population for the minority group dividing the amount of land occupied by them (Denton & Massey, 1988). But the data of land ownership in Rotterdam is not available so that the calculation of concentration can not be adopted in the study.

The dimension of centralization is not suitable to be applied to this study. Centralization is more practical to measure the segregation for the Americans cities like Chicago because the African-Americans or the low-income groups tend to settle in or near downtown areas together, which is witness to be spatially aggregated as well (Hulchanski, 2010). But on the contrary, in the European cities like Paris or Milano, the centre is more likely to be occupied by the rich or the natives while the minority or the poor tend to live in marginal areas of cities (Spencer & Cooper, 2006). In Rotterdam, the native Dutch or wealthy people tend to live in the northern and eastern part of the city while minority immigrants and poor people tend to live in the southern part (Entzinger & Engbersen, 2014). So the dimension of centralization is meaningless for the measurement of immigration segregation.

The dimension of spatial clustering is also not suitable to be applied to this study. The spatial clustering is measured by the small unit and its neighbour units. If a unit has a large number of a specific group immigrants and all of its adjacent units also have a large number of this group immigrants, it is seen as cluster. This method is suitable to analyse the population distribution data by tiny small units. The research on immigrants in Enschede has postcode area data with six digitalized level, which divide the city into hundreds of tiny small unites (Desriani, 2011). But in this research, only postcode area data with four digitalized level is available so it is meaningless and unpractical to measure spatial clustering.

Among the five dimensions, only the evenness and exposure are left to measure the residential spatial patterns of Chinese immigrants in Rotterdam. With GIS platform, those indices under the dimensions of evenness and exposure can identify the geographic locations of statistically obvious geographical aggregation area, cluster area or centralization point (ESRI, 2017). With the dissimilarity index under the dimension of evenness and the interaction index under the exposure which are also popular in previous research, the spatial characteristics of distribution can be drew on maps.

Dissimilarity index under the dimension of evenness is applied to estimate the residential segregation level and measure the dynamics changes in the period 1991-2011 in a case study of London (Harris, 2015). The dissimilarity index was employed to analysis the evolution of economic segregation, social segregation, education segregation and housing quality variables in the city of Lincoln, Nebraska (Aftika, 2014). Similarly, to measure the extent and magnitude of spatial segregation of the poor within specific mega-cities of Peru, the aggregation of different socio-economic groups was mapped with the dimension of cluster (Peters & Skop, 2007).

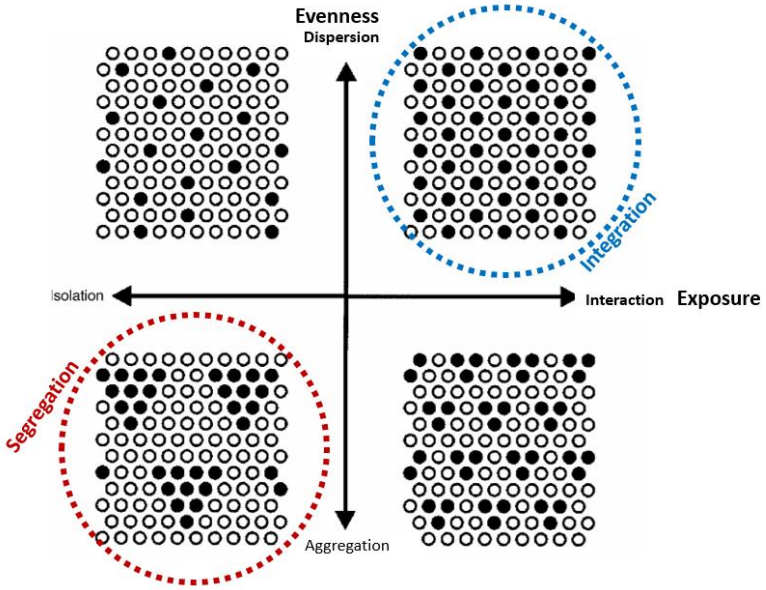

Figure 2-3: Dimensions of exposure and evenness (adapted from Reardon & O'Sullivan(2004))

The interaction index under the dimension of exposure is calculated by the extent that members of one minority group encounter members of majority group in each spatial unit (Denton & Massey, 1988). To evaluate the exposure of different language speakers in neighbourhood level in Montreal, the interaction index was employed to calculate the English speakers exposed in the French speakers in each unit(Farber, Páez, & Morency, 2012).

With a combination measurement (Fig.2-3) of two dimension evenness and exposure, the level of segregation or integration can be draw in a quadrate picture (Reardon & O'Sullivan, 2004). The horizontal axis express the exposure while the vertical axis express the evenness. It is considered as segregation if aggregated at the dimension of evenness meanwhile it is isolated at the dimension of exposure. It is considered as integrated if a group is dispersed at the dimension of evenness meanwhile it is interacted at the dimension of exposure.

2.4.2 Methods to measure daily activity segregation

This section introduce three main methods to measure daily activity segregation, which includes regression modelling, qualitative GIS, GPS or phone tracking analysis

Regression modelling

Regression modelling is a traditional statistical approach to access the relationships among different variables, to establish an equation to express the relation of those variables with parameters and constant (Guerard, 2013). Regression modelling is also applied in the field of spatial patterns analysis or urban segregation exploration.

With census tract data from 1970 through 2000, a regression discontinuity method was used to test for discontinuities of dwelling in the dynamics of neighbourhood racial composition in a British city (Card, Mas, & Rothstein, 2008). Recently, a regression estimator that is designed to detect urban fragmentation by assessing homogeneity or likeness between people and the social circumstances they experience in daily activity spaces was proposed, based on the people's exposure to in their daily usage of urban space (Li & Wang, 2017). In Li and Wang's study, this method was applied in Hong Kong, to explore the various segregation factors and to examine their interactions in a society. Both simple and multi-regression modelling for spatial patterns of daily activity are discussed to take two or more different independent variables into account in their model.

Qualitative GIS

Qualitative GIS approach, which combines the traditional geographic information systems methods with conventional qualitative methods (Cope & Elwood, 2009), is a relatively new method applied in urban planning. There are several popular conventional qualitative methods such as interview, questionnaire and focus group discussions (Bryman, Bell, & Teevan, 2012a). So the common qualitative GIS combined methods include walking interviews, participatory mapping and guided tours.

The qualitative GIS methods have been adopted in recent studies. For instance, the qualitative GIS methods was applied in the study of children's perception on urban environment in the city centre of Enschede, the Netherlands (Alarasi, Martinez, & Amer, 2016). In this study, qualitive methods such as interviews, focused group discussions and guided tours are used to collect data among children. Walking interview is another popular Qualitative GIS approach, which are connected to the interviewee's daily life such as their neighbourhoods and communities, focusing on what happens in these areas and who passes along (Clark & Emmel, 2010).

Another example using the qualitative GIS are Wang & Li 's studies on daily activity in Beijing and Hong Kong. To measure activity space is more complicated than to measure residential location because of the complexity and diversity of individuals' behaviour (Wang et al., 2012). The daily activity start from the place where people live. Home is the most significant node in an individuals' daily life due to that it is considered as a terminal where the majority of activity trips begin or finish for the individual (Wang & Li, 2016). Similarity in settlement might result in homogeneity in exposure in physical circumstance while similarity in residence might have influence in the heterogeneity in activity space for social interaction (Brand, 2009). According to the proximity principle, it is more likely for citizens settled at the same neighbourhood to go to the public place nearby to shop, to study, to work and to socialize (PPS & Metropolitan Planning Council, 2008). The nearby preference places among individuals have a tendency to overlap so they develop into hotspots for a certain group of people. Recently, Wang et al (2012) proposed four dimensions for activity space to measure its segregation:

·**Extensity**: the spreading of an activity space. Extensity means the spatial extent of activity space, which is related to personal spatial mobility in their daily life. It is assumed that the further far distance away from home for daily activity, the rich the extensity of the social life is.

·**Intensity**: the dimension of activity space related to time and frequency. Intensity emphasizes duration of visits to certain places and the number of occurrence within a period of time to visit those places. It is hypothesized that the longer the duration is, the higher the intensity of social life is, or the higher the frequency is, the higher the intensity of social life is.

·**Diversity**: the dimension related to the categories and differences of places and activities involved in an activity space. The higher the diversity is, the richer a person's social life is .

·**Exclusivity**: related to the quality or state of being exclusive for a public activity space. It refers to the exclusion, aggregation or isolation of the individual's daily life directly. Exclusivity is defined by the accessibility of locations where activities are taken place in a person's daily life. For example: eating at a private club has a higher extent of exclusivity than at a school canteen.

GPS or phone tracking analysis

The GPS and phone tracking reveal a number of details of human's activities in the dimension of space and time. GPS tracking analysis on daily activity is a method to understand the daily activity spatial patterns in people's social context through hours or day (Diao, Zhu, Ferreira, & Ratti, 2016).

By a GPS trace data collected from volunteers and simulated trajectories of people from different races, spatiotemporal approach on daily activity is employed in the study of social divisions and activity-space segregation in the two Americans cities of Buffalo and Utica (Palmer, 2013). The GPS trace data offer numerous daily activity details of the sample volunteers correctly, but his outcome was estimated by relatively small samples of people. Similarly, mobile phone traces helped to quantify, visualize, and detect the urban activity of a variety of individuals in a metropolitan area of Boston spatially and temporally (Diao et al., 2016). With GPS trace, the walking interview was used in study on walkability and quality-of-Life of muslin women workers in Dhaka. Different routes to garment from home were walked by the participants, who talked about their perception on security, cleanness and crowdedness (Shumi, Zuidgeest, Martinez, Efroymson, & van Maarseveen, 2015).

The mobile phone traces of a large number of people show the hotpots of the signal in the city, which indicate the aggregated area in different period of a day in a general view. With mobile phone data, an activity-based research on social segregation over the 24 hours a day in the Paris region considered how different social groups move within a city in a day, exploring the place effects on individual behaviour and targeting areas to implement interventions to improve the connection (Roux et al., 2017). From a mobility-based perspective, a study on individuals' exposure was implemented to analyse different linguistic groups in a the bilingual city of Montreal at both local and exotic communities (Farber et al., 2012). In this way, the daily activity in a period of time can be perceived from the GPS or phone tracking.

In a word, to analysis the daily activity spatial patterns, different kinds methods are used to collect data such as mobile phone traces, GPS trace, questionnaire and interview. the analysis is focused in the geographic distribution of the activity, considering time as a dimension.

Among the upper methods, Qualitative GIS is a feasible one for this study because the questionnaire, interview and participatory mapping can be viable data collection method to collect the primary data. People are willing to talk and write, which can offer the information of their daily life and spatial patterns.

GPS or phone tracking analysis and regression modelling are not suitable methods, comparing to qualitative GIS. GPS or phone tracking analysis is a difficult method to implement because it is tough to collect the GPS or phone track data of daily activity. Collecting the GPS or phone track data of daily activity is more possible to infringe privacy so participants might be less willing to cooperate. Regression modelling isn't considered as a potential method for daily activity of a group of people because Individual has his/her preference on daily activity. To build up some relationship among variables for daily activity of people is doubted its real meaning.

2.5 The Chinese immigrants in Rotterdam

Chinese immigrants to the Netherlands, also called Chinese Netherlanders, refer to the members of Chinese ethnic group settling in the Netherlands who came from the Mainland China, Taiwan and Hong Kong, as well as the Chinese descendants from Indonesia, Surinam, Singapore, Dutch Caribbean islands to the Netherlands (Mandin & Gsir, 2015). In this study, the Chinese Netherlanders who settle in Rotterdam are discussed.

2.5.1 The population of Chinese immigrants in Rotterdam

According to Fig. 2-4，the population of Chinese immigrants settling in Rotterdam who came from Hongkong, Mainland China and Taiwan is more than nine thousands in total in 2017. But the population of Chinese immigrants from Indonesia, Singapore, Malaysia, Suriname, Dutch Caribbean islands is unknown because they cannot be distinguished by country of origin from the demographic data .

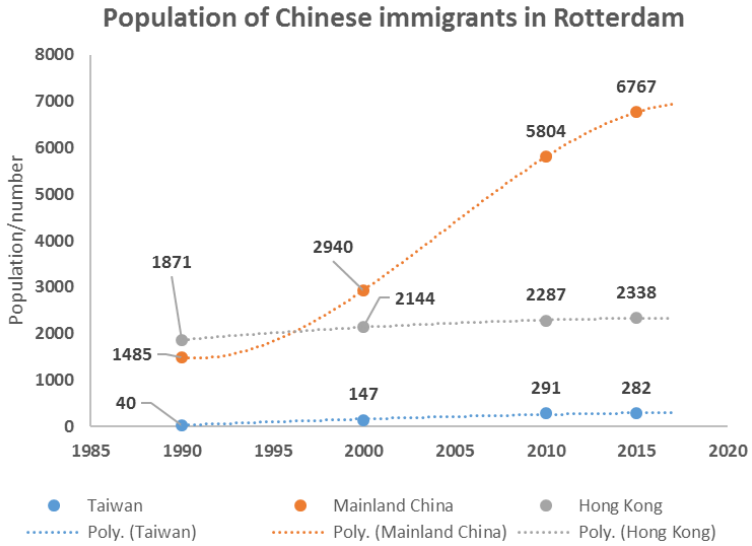

Figure 2-4: Population dynamics of Chinese immigrants in Rotterdam

(Data from: OBI Rotterdam municipality, 2017)

During the last two decades, the Chinese immigrants population in Rotterdam increase dramatically because of the settlement of a large number of newcomers from Mainland China (Fig. 2-4). In this study, the citizens whose origin is China, Taiwan or Hong Kong are assumed to be Chinese immigrants. Second generation immigrants and first generation are included. This study also tries to include those Chinese immigrants or descendants who came to the Netherlands directly from Indonesia, Singapore, Surinam or Netherlands Antilles. Unfortunately, they cannot be included in the discussion of residential segregation, because it is impossible to distinguish them from the ethnic of Indonesian, Singaporean, Surinamese in the statistics data. But for daily activity, they are included because they are accessible in the primary data collection.

2.5.2 The migration history and sub-groups of Chinese immigrants

The Chinese immigrants in the Netherlands is considered as a diversified ethnic minority with a long immigration history (Benton & Pieke, 1998).

The history of Chinese immigrants to Rotterdam can be dated back to the beginning of 20 century(Ma Mung et al., 1992), when the first Chinese sailors arrived at Katendrecht (Vervloesem, 1940), where they

built the old China town afterwards. In the period of 1965-1975, thousands of Chinese newcomers arrived, particularly the Hong Kong people. After the People's republic China's reform and opening up in 1978, a number of mainlander relatives and friends of Chinese Netherlanders found their journey to the Netherlands (Harmsen, 1998). Those people, who are originally from the south-eastern coastal areas of Mainland China like Canton province and Zhejiang province, came to the Netherlands as labour workers or for family reunion. After 2000, a new trend appears that an increasing number of Chinese students came to the Dutch universities to study and that some of them settled down after graduation (Gijsberts et al., 2011). Gijsberts called those new Chinese arriving after 2000 "study and knowledge immigrants" because they have or will have a highly education background or high position job.

Regarding the migration history, the Chinese immigrants also can be classified into three categories: the first generation immigrants(before 2000), study and knowledge immigrants (after 2000) and the second generation immigrants (Frank & Oostrom, 2011).

Primarily, the Chinese immigrants of first generation is a group who came to the Netherlands as labour worker or for family reunion (Frank & Oostrom, 2011). Most of them arrived before 2000. Among the first generation immigrants, languages, Confucianism, lineages are the main factors that keeps the overseas Chinese communities together (Benton & Pieke, 1998).

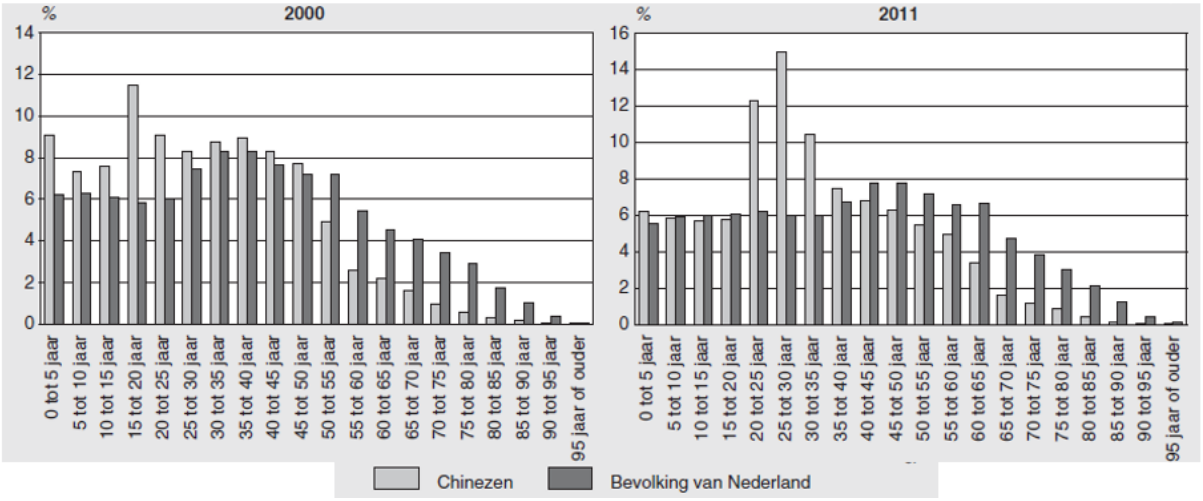

Figure 2-5: Age proportion of Chinese immigrants in the Netherlands in 2000 and 2010

(Frank & Oostrom, 2011)

The first-generation Chinese migrants can be mainly divided into three major sub-branches at the end of 20 century: Cantonese people, Zhejiang people, and Peranakan Chinese (Indonesian Chinese) (Minghuan, 1999). Cantonese people are those Chinese from Hong-Kong and the southern coastal province of Canton (广东Guangdong), whose mother tongue is the language of Cantonese (Beckhusen, Florax, & Poot, 2012). Minghuan maintained that Cantonese is the largest sub-group among Chinese Dutch. It is dominantly influenced by Hong-Kong culture, and most run restaurants or businesses after arrival. The Zhejiang people are the second largest sub-group of Chinese immigrants, most of whom are from Wenzhou (温州) and Qingtian county （青田） in Zhejiang province. Thirdly, the Peranakan Chinese are those Chinese descendants from Dutch East Indies (Indonesia), who identify themselves Chinese but other sub-groups don't accept them as "real Chinese" (Minghuan, 1999).

The second category is the " study and knowledge migrants", who came to the Netherlands to study after 2000 and then stay in the Netherlands to work. Those Chinese students, who came to the Netherlands

to study for a bachelor, master or doctor degree after 2000, are from the whole mainland China. Most of them were born in cities of mainland China and influenced by mainland culture (Gijsberts et al., 2011). After graduation, some of them found a job and settled down in the Netherlands, becoming knowledge immigrants (Overmars & Hendriks-Cinque, 2012). All of them speak Mandarin. There is an obviously ascending trend of young Chinese coming to the Netherlands in the period of 2000-2010, which changes the demographic of the Chinese immigrants dramatically (Fig.2-5). Half of the newcomers are the international Chinese students or knowledge immigrants while the other half are the new labour workers by the immigration corridor from the coastal province such as Canton, Zhejiang and Fujian (Frank & Oostrom, 2011).

The third category is the second generation Chinese migrants, also named Netherlands born Chinese (NBC), who were born and gr up in the Netherlands (Gijsberts et al., 2011). Gijsberts found that the second generation immigrants have strong identity as Dutch even though their ethnicity is Chinese.

2.5.3 Different origins of Chinese immigrants

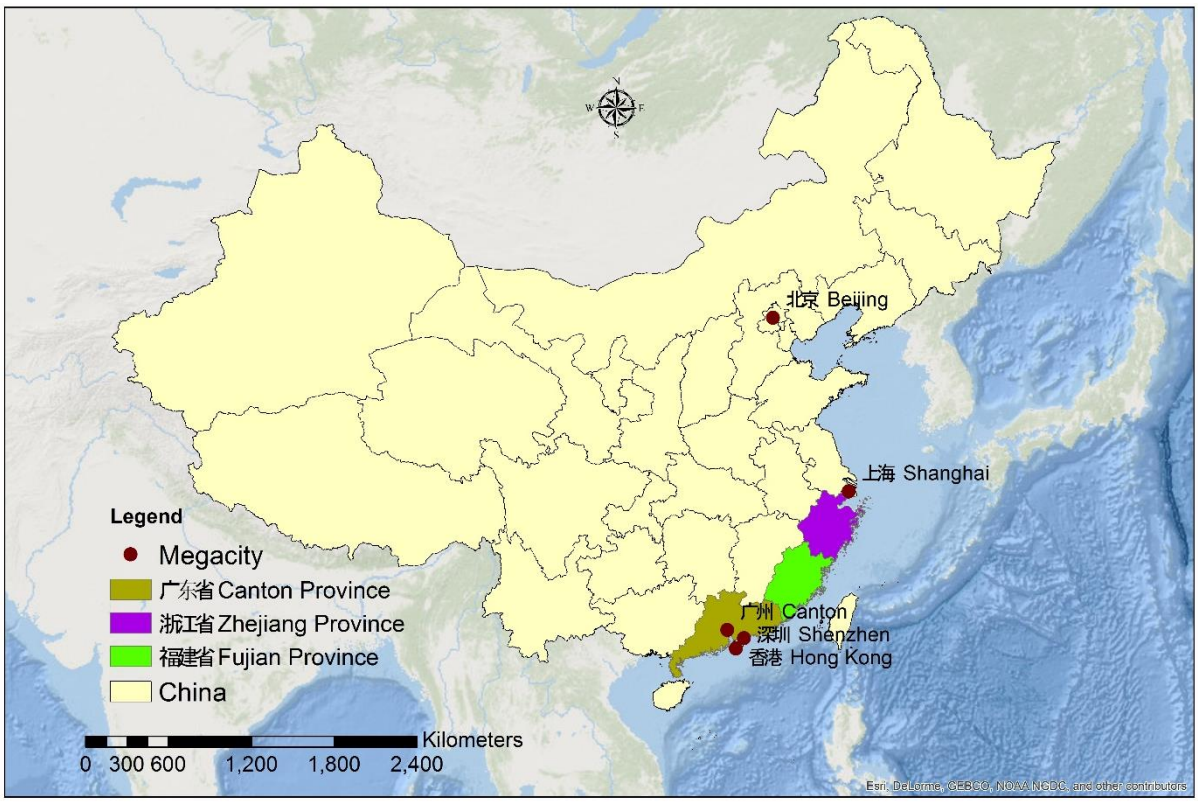

Figure 2-6: Origin of Chinese immigrants (Data from: ESRI, October, 2017)

Even though sharing a similar outlook and common ethnicity, the Chinese immigration in the Netherlands has its different internal branches. Accordingly the discussion in 2.5.2, distinguished them based on their geographical origin and reasons and timeline for migration. In this study, the Chinese immigrants can be further distinguished into five categories based on their origin (Fig. 2-6): Cantonese, Zhejiang people, Fujian people, the other mainland Chinese and other Chinese from the rest of the world. In addition, the second generation were born in the Netherlands but their parents are Cantonese, Zhejiang people, Fujian people.

It is hard for the Chinese immigrants from different origins to build up close friendship. Language barriers exist. For example, a Cantonese makes few friends with a mandarin speaker because a Cantonese-

speaker could only communicate with a Mandarin-speaker through Dutch or English (Alice, Gilmartin, & Loyal, 2008). Cultural difference also make them have less connections. People influenced by Hong Kong culture and people influenced by Mainland China culture always have different values and less connections.(Cheung, 2003)

2.5.4 The social-economic characters of Chinese immigrants

This section explains the social-economic characteristics of Chinese immigrants such as income, employment, education, and the relationship with Dutch.

The economic situation of the Chinese immigrants is getting better than before, which can be reflected in income, housing quality and car ownership (Gijsberts et al., 2011). Still about 20%of the Chinese immigrants in the Netherlands fall into the low income category in 2011 but positively the poverty rate dropped sharply in the past 10 years (Gijsberts et al., 2011). The Chinese immigrants has a high rate of car ownership and usage (Zhang, 2013). The housing quality of the Chinese immigrants is clearly lower than that of the native Dutch, but higher than that of Turkish and Moroccan migrants (Mandin & Gsir, 2015).

The Chinese immigrants get integrated in the Dutch labour market very well. The low unemployment rate is a notable characteristics among the Chinese immigrants (Mandin & Gsir, 2015). Chinese restaurants are the most important employment sector among the first-generation Chinese migrants (Minghuan, 1999). The first generation work hard in their position and it is found that Chinese women work longer hours than men (CBS, 1998). In the labour market, the knowledge immigrants and members of the second generation, in particular, are strongly represented in high-level occupations (Gijsberts et al., 2011). Gijsberts maintained that the second generation immigrants, who have modern and wide horizons, can be seen as a model minority group, especially reflecting at school and labour market.

The Dutch Chinese community is relatively well educated. The second generation immigrants tend to perform excellent at school and be accepted at Higher Education. Meanwhile, the massive arrival of Chinese students dominates the picture (Hong, Pieke, Steehouder, & Veldhuizen, 2017). Even though the study immigrants from China came to the Netherlands for advanced education, they tend to have strong mind on socialism and collectivism because they received compulsory education in Mainland China (Ho, 2006). However, the Dutch language remain a problem for many first-generation Chinese migrants, who have a lower educational background (Minghuan, 1999).

Another characteristics that the Chinese immigrants tend to be silent and obedient, which is influenced by Confucianism (Tianbo & Moreira, 2009). Modesty, obedience and forbearance are the doctrines of Confucianism, being considered as virtue in Chinese traditional culture (Hui-Chen Huang & Gove, 2012). The first generation and the study and knowledge immigrants are more likely to have those kinds of characteristics because they grew up in China. But the second generation immigrants are not influenced by traditional Chinese culture a lot but Dutch culture (Gijsberts et al., 2011).

With regards to the Chinese immigrants' connections with native Dutch, the first generation immigrants is considered a closed community (Minghuan, 1999) but the second generation is not (Gijsberts et al., 2011). Even though the Chinese immigrants consider native Dutch are kind and friendly, the first generation immigrants have few social contacts with native Dutch unless they are involved in international relationship or marriage. Dutch-born Chinese immigrants hang out with native Dutch children since kindergarten and one fifth of them lose the Chinese language (Gijsberts & Dagevos, 2010). Some of the second generation has some problem with their parents at home, because the Netherlands born Chinese talk, think, and behave more like a native Dutch while the first generation immigrants still live like a typical traditional Chinese (Gijsberts et al., 2011). Interestingly, a quarter of Chinese migrants is in mixed relationships, especially women with a Chinese origin marrying with native Dutch man (Gijsberts et al., 2011).

2.6 Summary

Spatial pattern refers to the distribution arrangement of population or objects in space and the geographic relationships among them. The discussion of the spatial pattern for the Chinese immigrants in Rotterdam is used to reflect the degree of segregation. In this study, the segregation is analysed by looking into residential spatial pattern and daily activity spatial pattern.

Methods on measuring residential segregation are divided into five dimensions: evenness, exposure, concentration, centralization, and clustering. A number of models or formulas under those five dimensions can be calculated, based on the statistics data by small units. In this study, evenness and exposure are chosen to be applied to measure the residential segregation of Chinese immigrants in Rotterdam because the other three have data limitations or unsuitable context.

Methods on measuring daily activity segregation are more diversified and relatively new. The method of regression modelling is a spatial analysis based on mathematics calculation with a variety of parameter while the Qualitative GIS is a combination of spatial analysis and sociology methods. The GPS tracking analysis not only can discuss the spatial pattern of GPS trace from a small sample of people in a city, but also can apply into the analysis of the big data in a city.

There is a variety of causes of segregation for ethnic immigrants: low educational background, poor language skills and lack of social networks are amongst the causes. Unemployment and poverty are the direct causes for residential segregation while the organizing of welfare state and housing policy also contribute to residential segregation. Cultural barriers and poor language skills result in daily activity segregation. What's more, the residential segregation is another important cause for daily activity spatial pattern.

Municipalities in the Netherlands have addressed the ethnic segregation and their integration for more than 20 years. Mixed neighbourhoods were proposed to alleviate the spatial segregation of ethnic minorities. The multidimensional integration policy (discussed earlier) tries to help the ethnic immigrants to integrate into the Dutch society by labour market participation, participation in education, and social-cultural integration.

The Chinese immigrants have a long history of immigration to the Netherlands, but the population experienced a dramatic increase in the last two decades. The classification of sub-groups from different origin: Cantonese, Zhejiang people, Fujian people, the other mainland Chinese and other Chinese from out of China, helps to know more about the Chinese immigrants. In addition, the first generation immigrants (as labour workers), second generation (Netherlands born Chinese) and the study and knowledge immigrants also draw a clear picture for the Chinese immigrants. The different sub-groups are hypothesized in this thesis that they might have different spatial patterns.

3. RESEARCH METHODS

This chapter introduces all of the methods to answer the research question of this study. Primarily, the research design is displayed to outline the research process. Then a brief introduction on the study area - Rotterdam- is given. Thirdly, the data collection methods and data analysis methods adopted in this study are discussed in details. Finally, the ethical considerations of this research are discussed.

3.1 Research design

This research (Fig.3-1) was a case study designed to explore the spatial patterns of Chinese immigrants in the Dutch city with the case of Rotterdam. To discuss the details and analyse intensively the spatial patterns of Chinese immigrants in Dutch city, Rotterdam is typical enough to answer the research question to support the research objective.

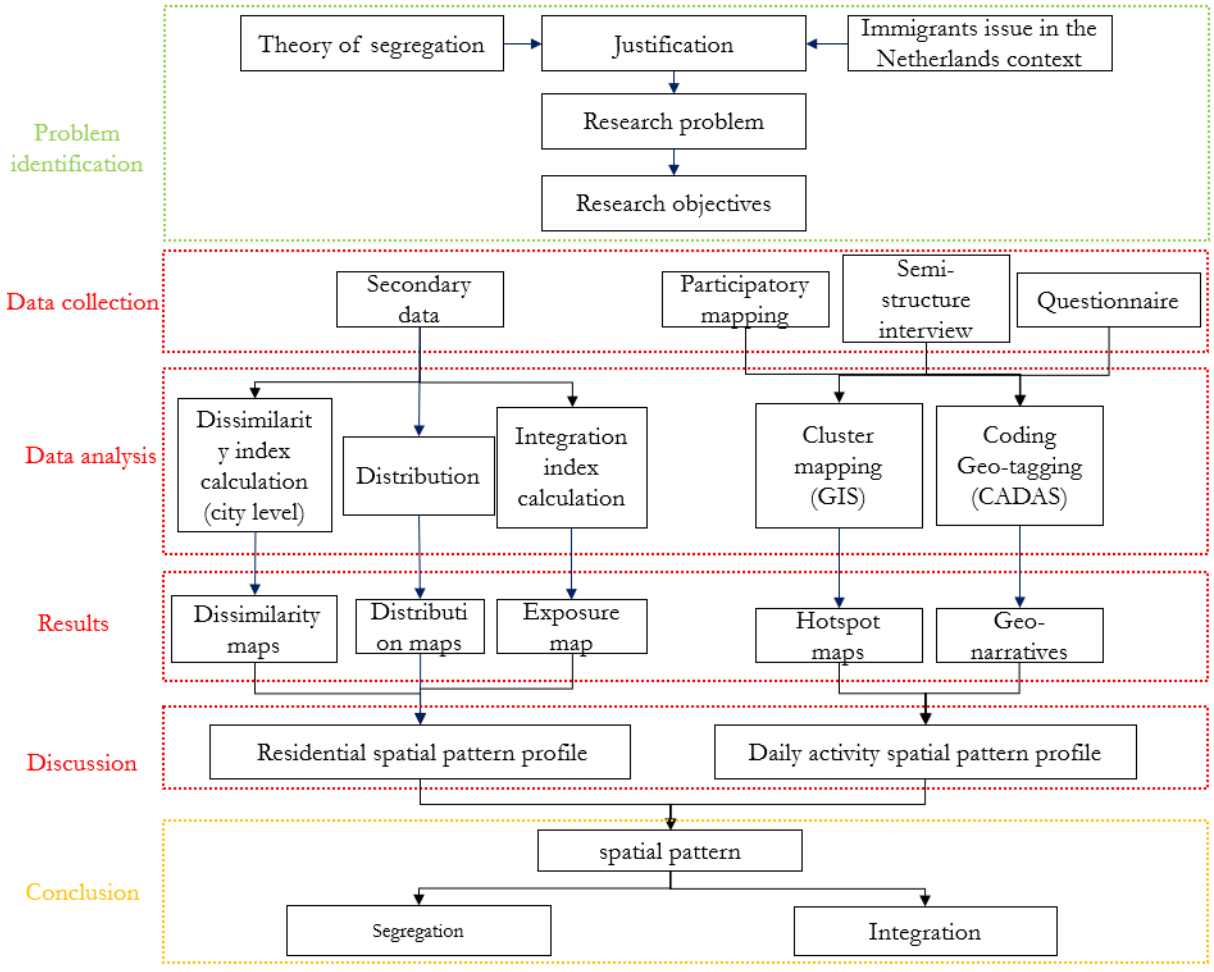

Figure 3-1: Research design

The phase of problem identification talked about why the author are interested in the spatial patterns of Chinese immigrants in the Dutch major cities. The concepts of the spatial patterns and segregation, the Dutch immigrants issue and policy and the Chinese immigrants in the Dutch context also were discussed. To solve the research problem, a research objective, which was to map the spatial patterns of Chinese immigrants in a major Dutch city for investigating its degree of segregation, was proposed. The second phase was data collection, which included primary data collection and secondary data collection. The third phase was data analyses with several kinds of approaches such as qualitative, quantitative and spatial analysis

methods. The phase of discussion mainly answered the questions under sub-objective 2 and sub-objective 3. It included the interpretation of maps and explanation of figures. The final phase was the conclusion, to summarize the finding and answer the research problem.

3.2 Study area

Rotterdam is a Dutch city in the province of south Holland, within the region of Rhine–Meuse–Scheldt river delta at the North Sea. With 633,471 habitants (CBS, 2017), the city of Rotterdam cover an area of 319km². It is composed of fourteen sub-municipal areas (Fig. 3-2): Centrum, Charlois, Delfshaven, Feijenoord, Hillegersberg-Schiebroek, Pernis, Hoek van Holland, Hoogvliet, IJsselmonde, Kralingen-Crooswijk, Rozenburg, Noord, Overschie and Prins Alexander.

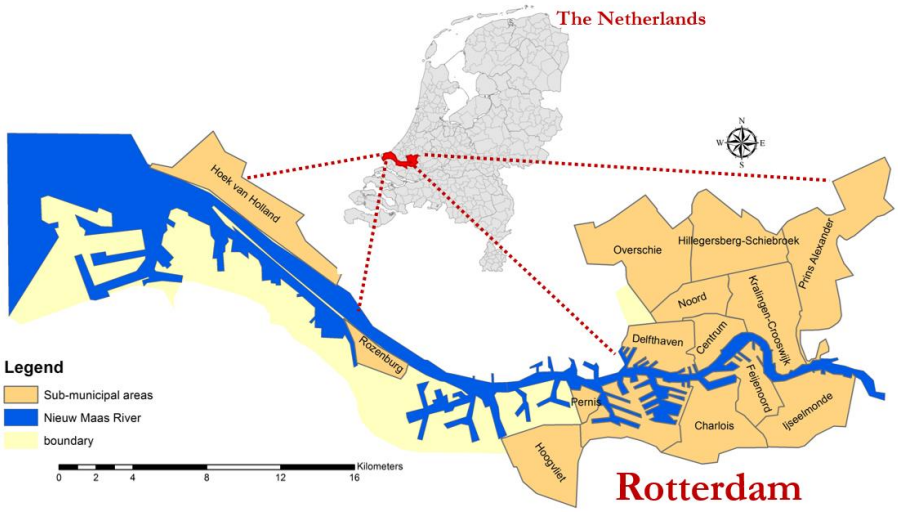

Figure 3-2: The location and sub-municipal areas of Rotterdam

(Data from: OBI, Rotterdam municipality)

Rotterdam is the second largest city after Amsterdam and an economic hub in the Netherlands. It has a flourishing logistics industry, petrochemical industries and prosperous international business, being famous for its Euro port (City of Rotterdam Regional Steering Committee, 2009). By metro, train and highway, Rotterdam is connected well with the cities nearby like Den Haag, Gouda, Dordrecht and Delft(Velinova, 2016). The city also has a network of railroads, waterways and roads to the neighbour countries earning a reputation of being the "gate way of Europe". A diversity of industries brings a number of job occupations, which attract immigration (Van den Bosch, Hollen, Volberda, & Baaij, 2011).

The city of Rotterdam has an long immigration history thanks to its success of the seaport and logistics industry (Melorose et al., 2007). Foreign labour recruitment of Dutch companies had started in the southern European countries since 1950s because of the large demand of labour workers (Juzwiak et al., 2014)s. The wave of recruitment expands to Greece, former Yugoslavia, Turkey and Morocco after 1960s. Meanwhile, immigrants from Hong Kong, Antilles, Surname, and Indonesia also arrived at this period. The second immigrants wave appeared in the last decade of 20 century because of labour shortages, especially the demand for high-tech elites (Platonova & Urso, 2010).

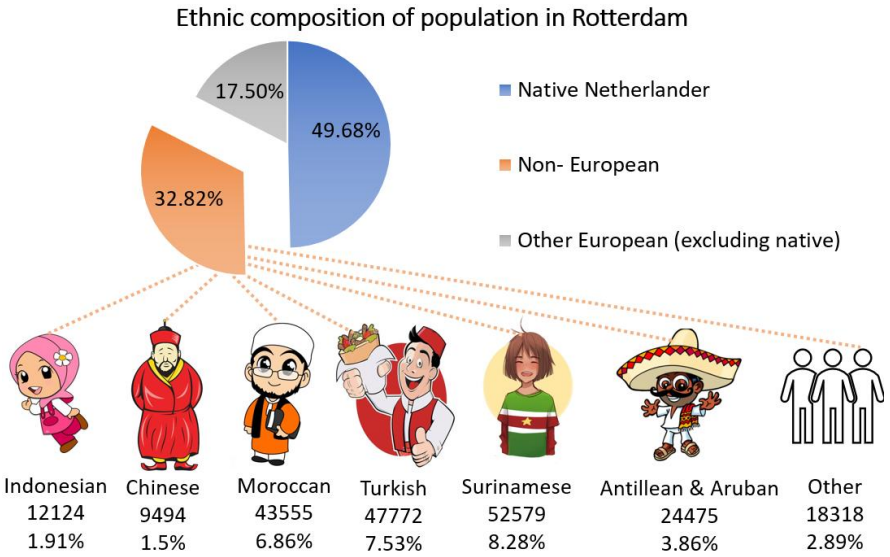

Figure 3-3: Ethnic composition of population in Rotterdam (Data from: CBS, 2016)

Rotterdam has developed into an immigrant city with settlers from all over the world. About half of the city's residents in Rotterdam were born out of the Netherlands or have at least one foreign-born parent (Entzinger & Engbersen, 2014). The demographic data (Fig.3-3) shows that more than 17% of the inhabitants are from other European countries while some 33% of the citizens are from Asia, Africa, Oceania and the Americas. In the non-European population, Surinamese immigrants is the biggest minority group, accounting 8.28% population of the city, Turkish is the second biggest, 7.53% and Moroccan is the third biggest, 6.86%.

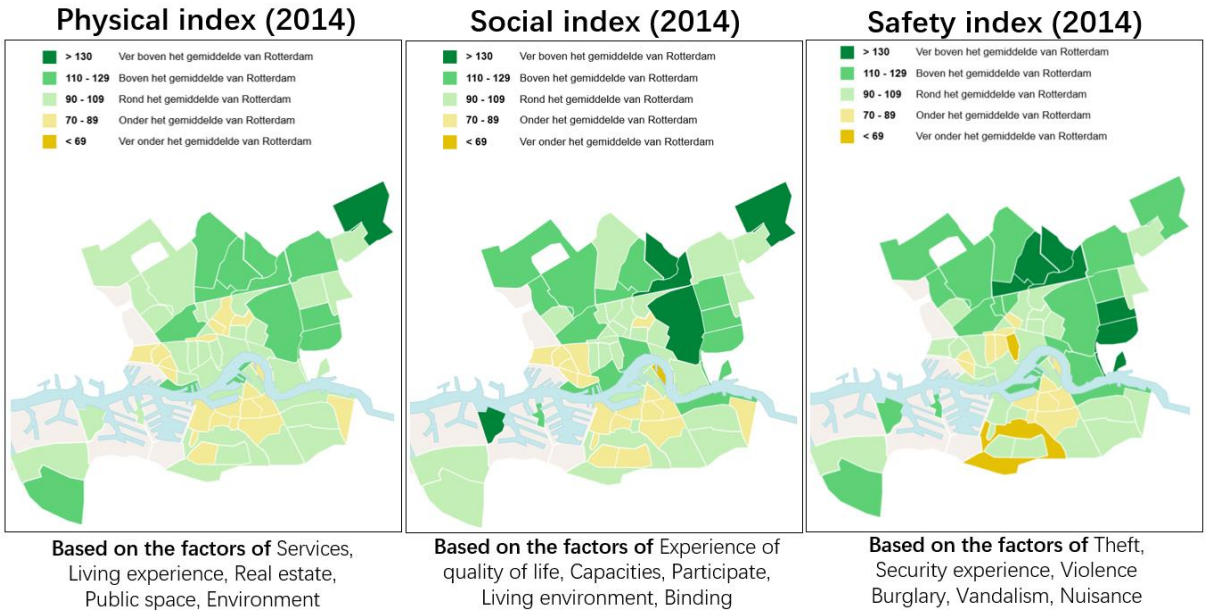

Figure 3-4: The physical, social, safety profile of Rotterdam by postcode 4 area

(Gemeente Rotterdam, 2016)

A large number of immigrants also creates a larger challenge for Rotterdam. Language barriers, cultural differences and unfamiliarity with the law system are some of prevailing problems immigrants are facing (Beckhusen et al., 2012). It is found that minority groups such as Surinamese, Turkish, and Moroccan have more tendency to settle close to each other, in poor areas, and have few chances to escape from low-quality neighbourhoods, when compared to the indigenous Netherlander (Bolt & van Kempen, 2003). The city of

Rotterdam is highly segregated because of the concentration of large immigrants (Musterd, 2011). Indeed, the municipal government has started addressing the segregation issue of immigrants since 1980s (City of Rotterdam Regional Steering Committee, 2009). However, the outcomes are not obvious. The native Dutch still tend to live in the northern and eastern parts of the city where the physical amenities, social circumstances are better and as well as it is more safe (Fig. 3-4). On the contrary, newcomers still tend to settle in the west and south of the city (Entzinger & Engbersen, 2014). Otherwise, newcomers from non-industrial countries have disadvantage in educational background and labour market than the locals, which force them to settle in poverty neighbourhoods (City of Rotterdam Regional Steering Committee, 2009).

3.3 Data collection and compilation

This section introduced the data required for this study, primary data collection and secondary data collection.

3.3.1 Data required

In the research, primary data and secondary data were required to analyse the spatial patterns. Primary data for analysing daily activity pattern included participatory mapping, questionnaire and interview (Tab.3-1). Secondary data consisted of administrative map with postcode and demographic data.

Table 3-1: Data required

Type	Format	Acquisition date	Source
Primary data			
Participatory maps	Hand-out sheet	September 21th--November 6th, 2017	Participatory mapping
Individual daily activity data	Voice record and transcription		Interview
Questionnaire for individual daily activity	Hand-out sheet		Questionnaire
Secondary data			
Postcode map with postcode	Vector (shp)	September, 2017	ESRI
Demographic characteristic data of Chinese immigrants in Rotterdam	Excel sheet	September, 2017	Onderzoek en Business Intelligence (OBI), Municipality of Rotterdam

3.3.2 Primary data collection

The primary data was used to support the analysis on daily activity pattern. To investigate the daily activity pattern of the Chinese immigrants in the Netherlands, the second half of this case study was implemented as an empirical study.

The part of daily activity spatial patterns was an empirical study, whose data collection was based on **sampling**. Because of the limited time and resources, it is impossible to ask questions for all of the members from the Chinese immigrants in Rotterdam, whose population is more than nine thousands. The sampling is a process of selecting a few sample from a big group to become basis to estimate or predict the prevalence of undiscovered information or situation, which can save time and resources but with some compromise of accuracy in the finding (Kumar, 2005). To manage this problem, selecting several representatives as samples to make an estimate can be a solution (Bryman, Bell, & Teevan, 2012b).

The quota sampling strategy was used to select the Chinese immigrants. Quota sampling was a method of selection with controls, ensuring that specified numbers are obtained from each specified sub-group of

the population (Elder, 2009). On one hand, because of the absence of a sampling frame, random sampling is not available. On the other hand, Quota sampling is easy for researcher to get access to the Chinese immigrants (Kumar, 2005). Some obvious characteristics make it convenient to collect data with quota sampling among the Chinese immigrants. This was preferred instead of a volunteer sampling or snowball sampling whose samples might not be representative of all of the elements in the population (Bryman et al., 2012a).

To know the sub-groups could help to achieve the maximum precision and avoid bias in the selection of sampling. Inside the sub-group, each individual was chosen completely by chance. If one was sampling from a list, the information on the list mattered. Based on the hypothesis, two categories of Chinese immigrant sub-groups were concerned for the sampling: by origin and by generation (Fig. 3-5).

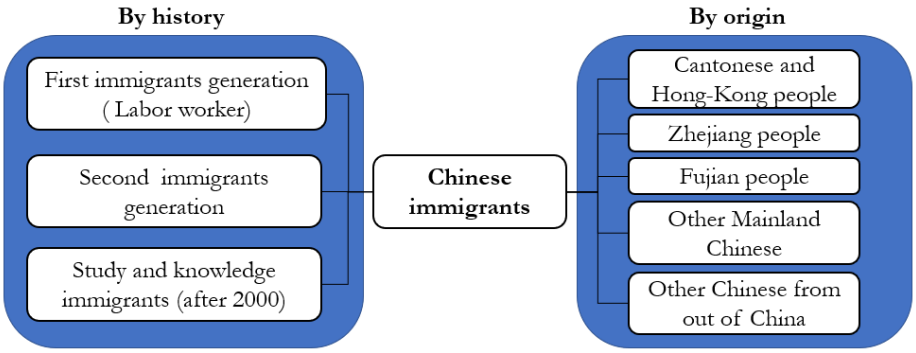

Figure 3-5: Composition of Chinese immigrants

Due to the facts that the sub-groups of Chinese immigrants have different origins and that they speak different languages, the primary data collection was implemented in the any possible languages such as Cantonese, Mandarin Chinese and English. The conversation to first generation immigrants was in Cantonese mostly while the conversation to study and knowledge immigrants was in mandarin. But the conversation to the second generation immigrants was more diverse, in Cantonese, mandarin and English. The interviews were recorded on a voice recorder and then transcribed and interpreted manually.

The primary data collection was conducted in Rotterdam. The majority of the participants were found in the new China town (West Kruisekade), the old China town (Katendrecht), Chinese Christian Church, Chinese older entertainment centre, Erasmus University, Wijkpark and Hoogstraat and other places in the city, due to the fact that these were leisure or working places for Chinese immigrants who might have time and willingness to talk. To levitate bias resulting from interviewees, demographic information of the participants had been collected and clarified into different categories. Members of Chinese immigrants who were older than 16 years were invited to participate into the primary data collection as sample unit. For the sample size, 63 participants were met in six weeks of fieldwork and 58 of them are valid.

Table 3-2: Steps of primary data collection

	Method	Content	Time consumed
Step 1	Questionnaire	Individual information	3 min
Step 2	Participatory mapping	Daily activity	1~2 min
Step 3	Semi-structure interview	Daily activity and opinion	2~20 min

The method used in primary data collection was a semi-structure interview with a participatory mapping and questionnaire. All of participants were invited to follow the three steps: filling in a questionnaire first, then drawing a paper map and participating in a semi-structure interview (Tab.3-2). To capture overall information of individuals, it was the same group of people that took part in the primary

data collection with three different methods. The primary data consisted of two parts: the individual information data and daily activity spatial data of the Chinese immigrants in Rotterdam. With these three methods, the primary data collection were conducted by the author in the city of Rotterdam.

Questionnaire

Questionnaire is a popular method to collect data utilized in sociology, asking a list of structured questions (Bryman et al., 2012b). An advantage for questionnaire is convenient to standardize the process of measurement for all of the answers. Questionnaire was used to ask volunteers questions about the residential, individual daily activity and socioeconomic characteristics for the Chinese immigrants. Participants were given detailed guides on how to fill in the questionnaire. The answers of the questions were summarized for the preparation to analyse the results. The individual information data included gender, age, origin, nationality, educational background, job occupation, household size, period living in the Netherlands, period living in Rotterdam.

Participatory mapping

Participatory mapping is a data collection method to explore the knowledge and concerns of local peoples in a neighbourhoods or a city by drawing map or location (Warner, 2015). Based on the approach, it is possible to collect individual preference on places or perception of the environment. It is also applied in the sociology survey among a specific group of people, especially children, ethnic minority and the poor people (Alarasi et al., 2016).

Applying the participatory mapping into study the daily spatial patterns of Chinese immigrants in Rotterdam, allowed the map drawer to demonstrate their favourite places on the map. The locals, who have a different perspective on their familiar environment against the researcher, based on their daily activity (Bentley, Cramer, Hamilton, & Basapur, 2012). With the approach of participatory mapping, the researcher can collect and agglomerate all of these local knowledges among a large number of inhabitants, to create a high-resolution composite map that serves to provide a greater level of knowledge (Warner, 2015).

Paper maps were prepared for participants to be drawn on. The data collected through participatory mapping included the home locations, working place (school), and leisure place of individual. Home was where daily activity starts. Working places were where people spend a large amount of time doing work or study activities. The activities in leisure time were more diverse such as shopping, doing sport, socializing, entertainment and private affair, so the leisure places were more diverse.

Semi-structured interview

Interview, which was a popular survey approach to get access to respondents' behaviour, activity and attitude (Bryman et al., 2012b), was implemented in this research to collect the data of the daily activity for Chinese immigrant in Rotterdam. To minimize the difference between interviewees and receive more valuable information which was not forecasted (Bryman et al., 2012b), semi-structured interview was chosen instead of structured interview. On one hand, semi-structured interview made it easier to standardize the process of measurement for the interview, on the other hand, questions were not highly structured so that it gave more freedom for interviewees to offer more detailed (Mathers, Fox, & Hunn, 2010).

To understand the integration of Chinese immigrants into the Dutch society, a semi-structured interview approach was selected to explore the opinions (Barriball & While, 1994).The main topics of the semi-structured interviews are about the place where they live, they work and they go in their leisure time.

Further questions about their career, family, social network and opinion on their life in the Netherlands were asked.

In the semi-structured interview, questions about personal daily activity type, daily activity frequency, perception on neighbourhoods and other daily life experience were asked.

3.3.3 Secondary data

The secondary data was comprised of the demographic data of Chinese immigrants in Rotterdam at postcode level 4, which served for the analysis of the residential spatial patterns. Administrative map with postcode, the Chinese immigrants settlement information in each postcode area are needed.

The settlement information in each 4 digital postcode area in Rotterdam was provided by the municipality of Rotterdam. The settlement information included the population of first generation Chinese immigrants, the population of second generation Chinese immigrants, the population of native Dutch and the total population in each postcode area in the year of 1990, 2000, 2010 and 2015. The postcode map of Rotterdam, which was the based map for analysing, was extracted from the ESRI map.

3.4 Data analysis methods

There was a difference of data analysis methods between the residential spatial patterns and the daily activity spatial patterns. Methods to analyse the residential spatial patterns were completely quantitate methods while methods to analyse the daily spatial patterns are mixed methods of qualitative and quantitative.

3.4.1 Residential spatial patterns

Population distribution, evenness and exposure of the Chinese immigrants were calculated to display the spatial patterns of Chinese immigrants. To examine the change of spatial patterns in the period of 1990-2015, a dynamics analysis was applied into the study with the statistics data in the year of 1990, 2000, 2010 and 2015.

·Visualization of population distribution

Visualizing the population distribution of Chinese immigrants in Rotterdam was the first step for the analysis of residential spatial patterns before other calculation. Based on the postcode number, the statistics data and the postcode were connected in the attribute table in the platform of the ArcGIS. It helped to know the geographic distribution characteristics of the Chinese immigrants.

·Evenness

Evenness refers to the distribution of two social groups among areal units in a city (Oka & Wong, 2014). A minority group was considered to be segregated in a city if members from this minority group settled unevenly across neighbourhoods.

The dissimilarity index is a popular measurement for residential evenness, which refers to the unequal distribution of minority groups across areal units of an urban area (Iceland et al., 2002). Conceptually speaking, this index represented the proportion of minority members that would have to change their area of residence to achieve an even distribution (Jakubs, 1977). A popular formula for the dissimilarity index is:

$$D = \sum_{i=1}^{n} [t_i|p_i - P|/2TP(1-P)] \quad \text{(Denton \& Massey, 1988)}$$

where ti and pi are the total population and minority proportion of area unit i, and T and P are the population size and minority proportion of the whole city, which is subdivided into n areal units.

·Exposure

Residential exposure means the extent of possible contact for minority group to interact with the majority group within geographic areas of a city (Denton & Massey, 1988). It indicates the act of subjecting minority member to the majority influencing experience.

The interaction index is a measurement for exposure. It concerned the degree to which a minority physically confronts the majority members by sharing a common dwelling unit (Ray, 1999). The extent of a minority exposure to the majority was defined as the likelihood of sharing the same dwelling unit. It can be considered as the minority-weighted average of each spatial unit's majority proportion (Denton & Massey, 1988). For each residential unit, the unit had lower possibility for minority to interact with the majority if it contributes more to interaction index. In this study, minority was Chinese immigrants while majority is the native Dutch.

The following formula measures the extent to which members of minority group X are exposed to members of majority group Y, and it is usually called the interaction index. It is the minority-weighted average of each spatial unit's majority proportion.

$$_xP^*_y = \sum_{i=1}^{n} [x_i/X][y_i/t_i] \quad \text{(Denton \& Massey, 1988)}$$

where xi, yi, and ti are the numbers of X members, Y members, and the total population of unit i, respectively, and X represents the number of X members city-wide.

·Method to sort out the study and knowledge immigrants from the first generation immigrants

In the secondary data, all of the Chinese immigrants born in China or Hong Kong were seen as the first generation immigrants. Indeed, the first generation immigrants included: 1.the labour workers; 2.family reunion immigrants; 3. Students and knowledge immigrants. The fact is that the student and knowledge immigrants, who has advanced educated background or high income, have a different life style from the labour workers in the first generation (Gijsberts et al., 2011). So it is deducted that the student and knowledge immigrants might have a different residential spatial patterns from the labour workers in the first generation. Then, it is necessary to sort out the study and knowledge immigrants from the first generation immigrants.

The study and knowledge immigrants mainly came after the year 2000 while almost all of the Chinese immigrants arrived before 2000 were the labour workers or their family members (Gijsberts et al., 2011). The coming trend of labour worked or family reunion declined but still about half of the immigrants arrived in the Netherlands by the migration chain in 2000-2010 (Frank & Oostrom, 2011). Dutch universities received an increasing number of international students from Mainland China to study since 2000 (Frank & Oostrom, 2011). The most outstanding figure was the Erasmus University in Rotterdam with 774 Chinese students, which increase 26% in the period of 2006 -2011 (Overmars & Hendriks-Cinque, 2012). About 20 % percent of the international Chinese students stayed in the Netherlands to work after generation (Hong et al., 2017). But the percentage was flexible, depending on the economic trend (Huberts, 2016).

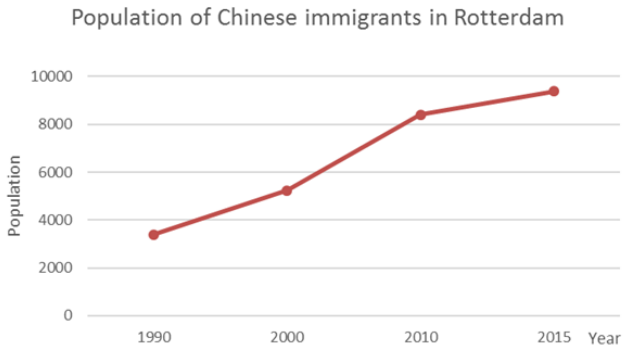

Figure 3-6: Population of Chinese immigrants in Rotterdam

(Data from: OBI Rotterdam municipality)

According to the line chart (Fig. 3-6), there is a finding that there is a relation in the slope of the linear segment (Y= K*X + b). The slope in 2000-2010 equals the sum of slope in 1990-2000 and slope in 2010-2015:

$$K_{2000\text{-}2010} = K_{1990\text{-}2000} + K_{2010\text{-}2015}$$ *(K is the slope of the line)*

To sort out the population of study and knowledge immigrants from the total population of the first generation immigrants roughly, it was assumed that the population of all after-2010 immigrants are study and knowledge immigrants, based on the upper discussion. This assumption was build up when the Chinese immigrants don't move out of the postcode area in the period of 2000 - 2015. So the number of the study and knowledge immigrants in each postcode area in the year of 2015 equals the sum of the increment in 2010-2015 and $K_{2010\text{-}2015}$ / $K_{2000\text{-}2010}$ of increment in 2000-2010, which comes the following:

$$P_{\text{study \& knowledge } 2015} = (P_{1st\ g\ 2010} - P_{1st\ g\ 2000}) * (K_{2010\text{-}2015} / K_{2000\text{-}2010}) + P_{1st\ g\ 2015} - P_{1st\ g\ 2010}$$

$P_{1st\ g}$ is the First generation population; $P_{\text{study \& knowledge}}$ is Population of study and knowledge immigrants

So the population of labour workers and their family in 2015 equals the total 1st generation population in 2015 minus the population of study and knowledge immigrants, which comes the following:

$$P_{\text{labour works \& family2015}} = P_{1st\ g\ 2015} - P_{\text{study \& knowledge 2015}}$$

3.4.2 Daily activity spatial patterns

Qualitative GIS method was a mixed-method approach, which combined typical geographic information systems methods with qualitative methods (Cope & Elwood, 2009). The mixed method of qualitative GIS was applied to analyse primary data of daily activity spatial patterns.

Firstly, quantitative primary data collected were used to input in a database. Individual information like gender, age, origin, nationality, educational background, job occupation, household size, period living in the Netherlands, period living in Rotterdam was digitized into excel table. To make those paper maps drawn by the participants during the participatory mapping possible for spatial analysis, they must be inputted into a spatial database. A distinct mapping ID related to individual information like shopping preference or favourite socializing location offered to each participant (Alarasi et al., 2016). Then, identified spaces in the paper maps were digitized and a database including included a variety of attributes like point ID, participant ID and favourite spots, was built up in the platform of ArcGIS. The application of a GIS database enabled the creation of a variety of mapping outputs.

Four dimensions: extensity, exposure, intensity and diversity (Tab.3-3), which were adopted from Wang & Li's research, were used to measure the Chinese immigrants daily activity in Rotterdam. The dimension of exposure has the same function as exclusivity, but it measures the level of the a group of people exposing to other ethnic group, from the opposite side of exclusivity. Based on the individual information, the participants from different origin, different generation and different educational background was clarified. Different sub-groups of the Chinese immigrants by generation for daily activity were analysed.

Table 3-3： Daily activity index

Dimension	**Index**
Extensity	Distance
Exposure	The level exposed to other ethnic groups
Intensity	Frequency of visiting
Diversity	Number of types

Secondly, the interviews record and the transcription were inputted into a Computer-Assisted Qualitative Data Analysis (CAQDAS) software. Key words coding, labelling and clarifying were done, based on the subjects developed from the key concepts in framework (Cope & Elwood, 2009). Street maps of the city were enclosed into CAQDAS to make it possible for geo-tagging of the codes and tagged by these to related narrative words from the interviewees. The pictures taken were also geo-tagged in the map and clustered into a diversity of classes according to the content deducted from the interview's statements. Finally, conducted by the concepts in framework, these statement were coded together with the words (Alarasi et al., 2016).

3.5 Ethical considerations

The topic of ethnicity in a city is a sensitive issue throughout the research, from data collection to outcome interpretation for the immigrants and ethnic issue. The external ethics and internal ethics should be concerned during the research (Crampton, 1995).

The external ethics of the immigrants' spatial patterns includes commodification and surveillance. Talking about the data commodification, on one hand, it is convenient for researcher to get or buy the secondary data from the data producer; on the other hand, some of the data should be accessible to the public while other data cannot be sold because they are confidential. In this research, there is no commodification of the demographic data, which is used to analyse the residential spatial patterns, because it is provided by the Rotterdam municipality. Regarding surveillance, the infringements of privacy is also considered in this research, because the spatial data consists of a large amount of individual information on their residence and daily activity (Crampton, 1995). What's more, the research might discover some bias or some conflicts between ethnic groups or even within an ethnic group, but the research itself should be politically neutral (Lake, 1993).

The copyright of the data and the data matching are concerned for the internal ethnic issue. Quoting other's data should be stated its origin in the report to show respect for the authority and copyright. The accuracy of the data should be pursued in the research and fake data should not be used.

So it is crucial to follow the ethnic code and standards of practice to manage the study of spatial patterns of Chinese immigrants in Rotterdam.

4. RESULTS AND INTEPRETATION

This chapter focus on the results of analysis on the spatial patterns of Chinese immigrants. Primarily, I discuss the dynamic residential spatial patterns of Chinese immigrants in the period of 1990~2015, residential spatial patterns of different sub-groups, factors influencing residential spatial patterns. Secondly, I discuss the empirical results of daily activity spatial patterns of Chinese immigrants and continue to interpret the daily activity spatial patterns by sub-groups in more details.

4.1 The dynamic residential spatial patterns of Chinese immigrants

As an independent ethnic group, the population distribution of Chinese immigrants is visualized to show where Chinese immigrants live. The dynamic residential spatial patterns of Chinese immigrants is discussed crossing 25 years in this section. Then, concerning the spatial patterns, the dissimilarity index and the integration index of Chinese immigrants are calculated to measure its residential segregation degree.

4.1.1 Population distribution

The administrative area of Rotterdam includes the Europe port area and the city. In the following picture (Fig 4-1), the blue part is the port area while the red part is the city.

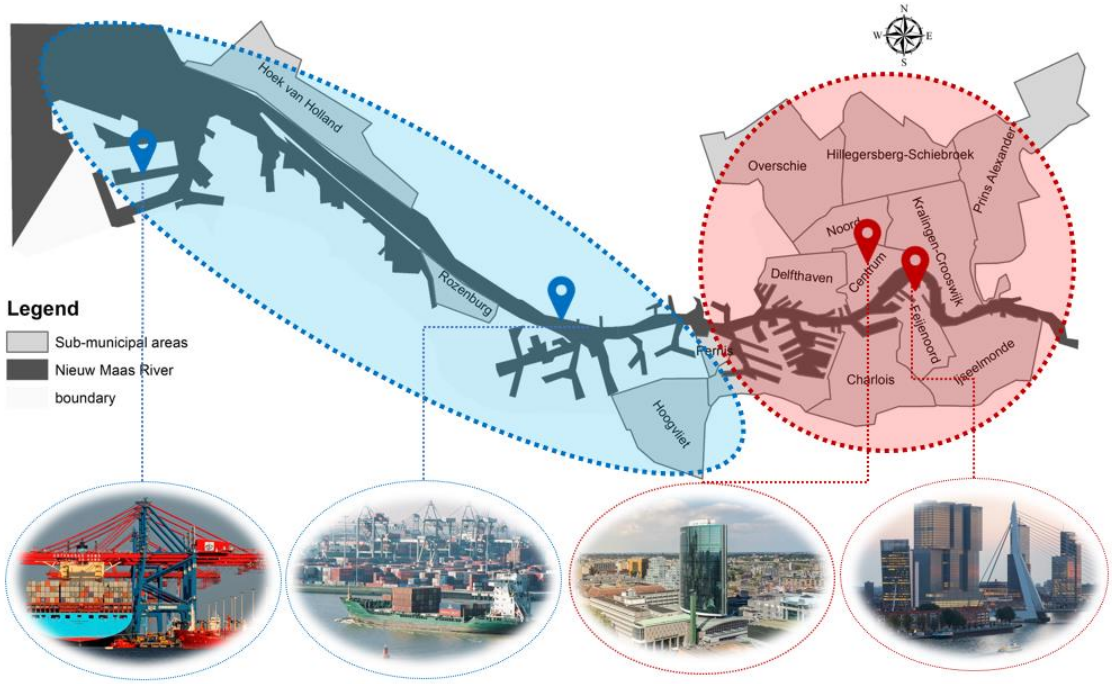

Figure 4-1: The port area and the city of Rotterdam

(Data from: OBI Rotterdam municipality)

The following maps are the population distribution of Chinese immigrants in Rotterdam in the years of 1990, 2000, 2010 and 2015. Those maps show the total settlement population of Chinese immigrant in each four-level postcode area. The different size of point illustrates the different quantity of residents. The bigger the point is, the more Chinese immigrants settling there are.

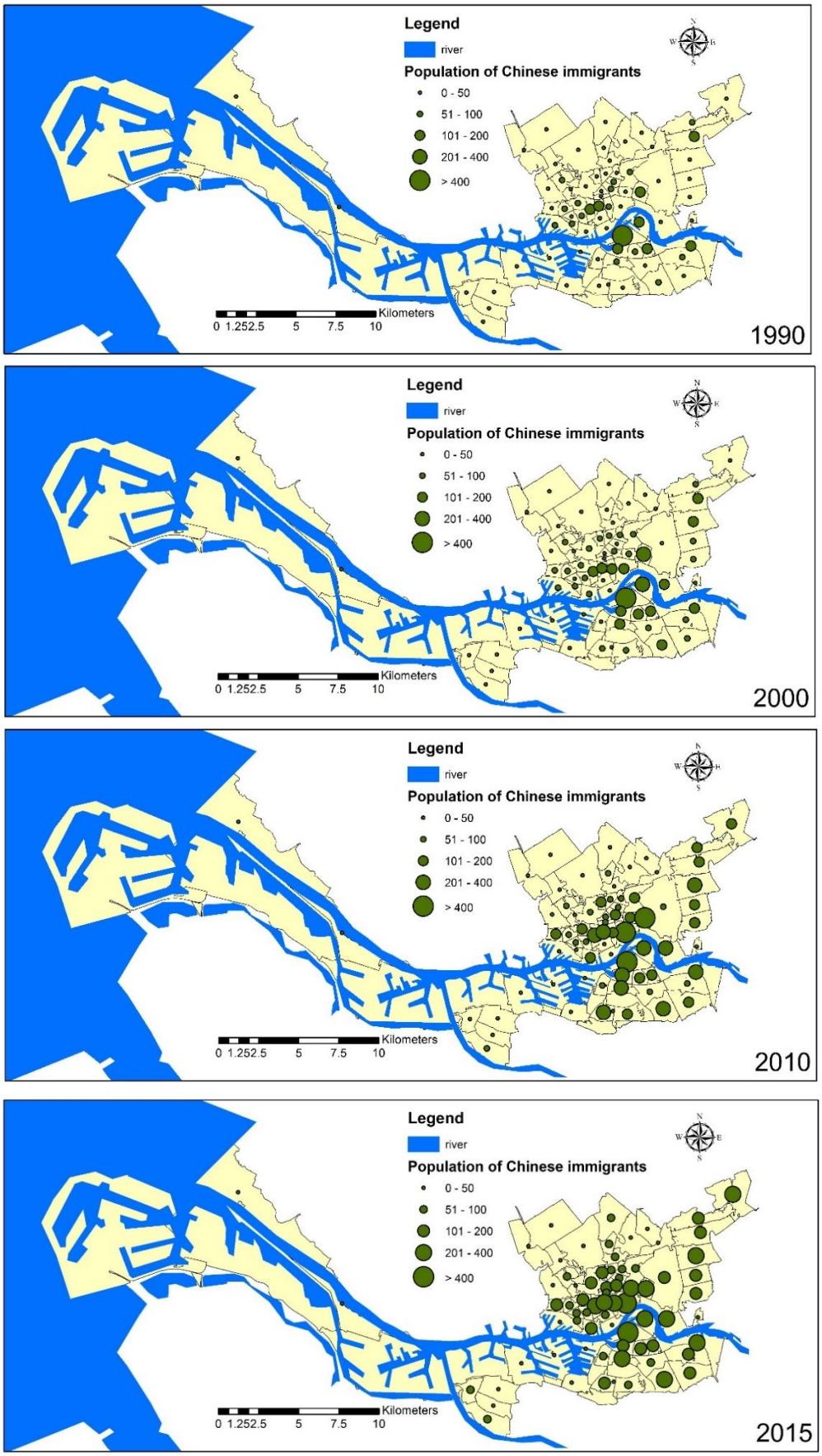

Figure 4-2: Settlement distribution of Chinese immigrants (Data from: OBI Rotterdam)

In the year of 1990 (Fig. 4-2), only one postcode area (postcode: 3072) has more than 400 residents of Chinese immigrants (Indeed, There are about 650, accounting for one fifth of the Chinese population). It is located in the southern bank of the river. Meanwhile, all the remaining postcode areas have less than 200 people with a Chinese origin. Most of the postcode areas have less than 50 Chinese immigrants.

In the year of 2000 (Fig. 4-2), still only one postcode area (postcode: 3072) has more than 400 residents of Chinese immigrants. Then, this area is like a core area of the Chinese immigrants' life and more Chinese immigrants settle in the areas near to this core area in 2000 than in 1990. Two postcode areas with more than 200 but less than 400 Chinese immigrants appear near the core.

In the period of 2000-2010, there was a huge change in the spatial pattern among the Chinese immigrants. It is witnessed (Fig. 4-2) that the Chinese immigrants are more likely to settle in the areas northern to the Nieuw Maas River in 2010, instead of the areas southern to the river. Obviously, the amount of the Chinese immigrants population in 2010 is more than that in 2000 in the city. There are two extra postcode areas with more than 400 Chinese habitants. This trend continue to 2015.

In 2010, one of the new populous core postcode areas is in the centrum of city (Fig.4-2), where the city hall, international companies, commercial streets like Blaak and Beurs locate. Another Chinese immigrants populous postcode area is next to the centrum. Indeed, those areas are the most popular areas among citizens and tourists. There are about 550 Chinese immigrants inhabiting in the centrum.

There is an obvious trend that the settlement of Chinese immigrants is getting more and more dispersive. The coming trend of massive newcomers is one of the reasons to explain the huge difference of residential spatial pattern between the two decades. It is deduced for another reason that those Chinese immigrants who are wealthy enough to afford to buy an expensive dwelling, are more willing to move to the northern and the eastern side of the city, instead of living in the southern part of the city.

4.1.2 Evenness. Dissimilarity index

The dissimilarity index is a popular measurement for residential evenness, which refers to the unequal distribution of minority groups across areal units of an urban area. The dissimilarity index for a city varies from 0 to 1. Not only taking the Chinese minority proportion into account, it also considers the total population in each neighbourhood in the index. The city is more segregated when the value of the index is higher. Conversely, it is less segregated if the index is close to 0. For each unit of the city, the unit is more aggregated if it contributes more to the index.

In 1990 (Fig. 4-3), the Chinese immigrants distributed unevenly in the city and the dissimilarity index of the whole city is 0.31128. The darkest postcode area is the one where the old China town "Katendrecht" locates (Fig. 4-4). It contributes most for the index. The two postcode areas along the southern bank of the Nieuw Maas River also have a relatively high aggregation of the Chinese immigrants. Generally speaking, the southern part of city is more aggregated than the remaining parts.

Being located in the southern bank of the New Maas River, the darkest area (postcode: 3072) in 1990 consists of two neighbourhoods: Katendrecht (Fig. 4-4) and Afrikaanderwijk. Afrikaanderwijk is mainly settled by a large number of Turkish, Moroccans, Surinamese and Antilleans immigrants and it also gets infamous for its disorder and high crime rate (Meinen, 2014). Katendrecht was a cheap neighbourhood with labour workers' dormitory, which had been the well-known China town in Rotterdam since the beginning of 20 century (Vervloesem, 1940). The similarity of those two neighbourhoods is that the majority of habitants are immigrants and that few native Dutch live there (Entzinger & Engbersen, 2014). Because the

Katendrecht China town is located in this postcode area, the postcode area has a high population of Chinese habitants.

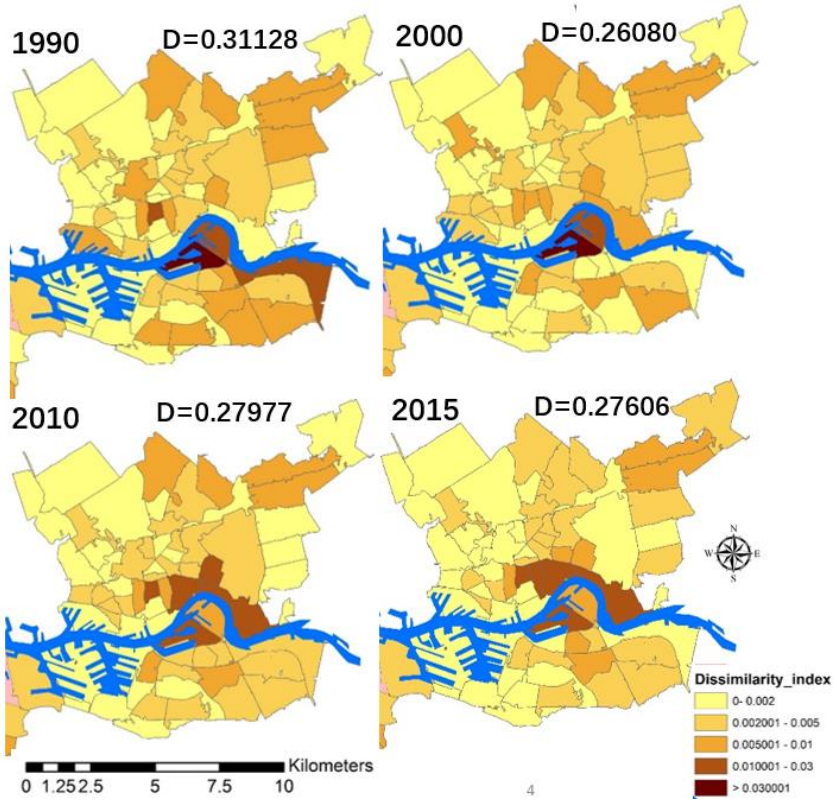

Figure 4-3: Dissimilarity index of Chinese immigrant in Rotterdam

Katendrecht (the old China town) started from the international trade and logistics industry with the Asian countries in 1911 (Steenhuis, 2012). Gradually, the peninsula of Katendrecht (Fig. 4-4) grew into a sailor community with Chinese restaurants and tea houses, where not only Chinese entrepreneurs did good business but also the native Dutch ran business (Vervloesem, 1940). Katendrecht was considered as a segregated ethnic enclave full of prostitutes, pimps, drug trafficker and gambler in second half of 20 century (Maccreanor & DKV, 2014). Then more and more Chinese settled in the Katendrecht and the peak number of Chinese immigrants settling in Katendrecht used to be about 1500 in the 1970s (Steenhuis, 2012). This neighbourhood is aggregated by Chinese immigrants almost for a century. In 1990, still more than six hundreds of Chinese immigrants in Rotterdam dominantly settled in the poor neighbourhood of Katendrecht. But Chinese immigrants are moving out of Katendrecht gradually, so Katendrecht has become the old China town.

In the year of 2000 (Fig. 4-3), the dissimilarity index of the Chinese immigrants in the whole city is 0.26080, lower than 10 years ago. The darkest postcode area (postcode: 3072) is still the one where Katendrecht is located. In 2000, the postcode areas in the southern bank of the Nieuw Maas River also have a lower aggregation of the Chinese immigrants than those in the northern part.

In the year of 2010 (Fig. 4-3), the dissimilarity index of the Chinese immigrants in the whole city increased a bit, comparing to ten years ago. The postcode areas along the northern bank of the Nieuw Maas River developed into the new aggregation areas for Chinese immigrants. Chinese immigrants aggregated in the neighbourhoods in Kralingen-Crooswijk, Delfshaven and Centrum. In 2010, the Chinese immigrants are not highly aggregated in a small area any more, but they live less aggregated in a wider area. The darkest postcode area where Katendrecht locates is getting less darker than 10 years ago. The peninsula of

Katendrecht is experiencing gentrification in the 21 century. A project of tourist interest place has been launched by the local government and the storehouses have been redesigned into café or galleries by architects since the beginning of the 21 century (Deffner & Hoerning, 2011).

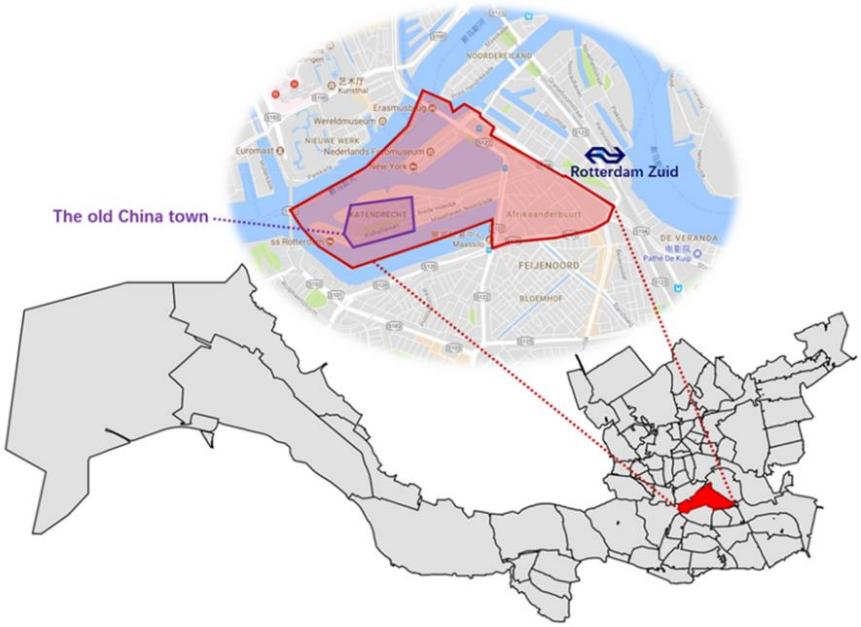

Figure 4-4: The most populous and the Katendrecht

(Data from: OBI Rotterdam municipality and Google Map)

In the year of 2015 (Fig. 4-3), the dissimilarity index of the Chinese immigrants in the whole city is 0.27606. It decreased a bit, comparing to five years ago. The postcode areas along the northern bank of the Nieuw Maas River, the centrum and the Katendrecht maintain aggregation areas for Chinese immigrants.

Looking at the period of 1990 -2015 (Fig. 4-5), the dissimilarity index decreased generally, but with fluctuation. The spatial patterns becoming more even generally. The dissimilarity index of Chinese immigrants in Rotterdam dropped dramatically from 0.31128 to 0.26080 during first decade. Then, it increased slightly in the second decade and it decreased again in 2010 – 2015.

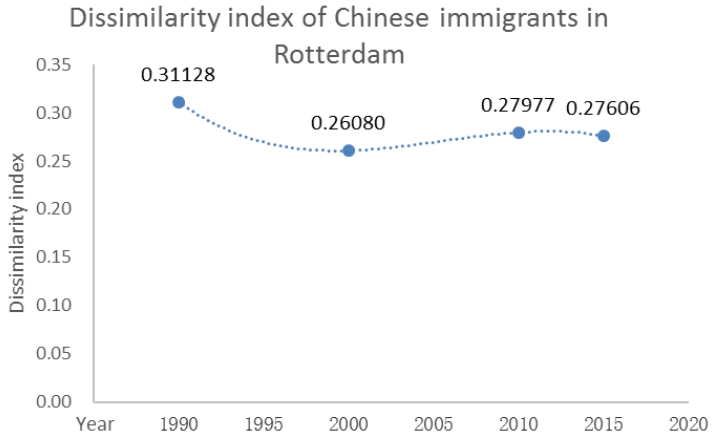

Figure 4-5: Dissimilarity index of Chinese immigrants in Rotterdam

A direct reason that could explain why the spatial patterns of Chinese immigrants are getting less aggregated is the improvement of their income. The Chinese immigrants are more easily adapted to the

labour market (Mandin & Gsir, 2015), which gives them more opportunities to obtain a relatively high income. Low-income immigrants cannot afford to move out of the low quality housing stock in Rotterdam (Entzinger & Engbersen, 2014). Once immigrants have higher income, they tend to move in among the natives in the city of Rotterdam, instead of aggregating in an ethnic enclave (Beckhusen et al., 2012).

For the period of 2000-2010, when the dissimilarity index increases, it can be analysed by the coming trend of massive new Chinese immigrants. When new comers arrive, some of them live in their relatives or friends house, because they can get help from their friends and relatives (Skop et al., 2006).The chain migration can explain the sudden aggregation phenomenon in 2000 - 2010 (Mandin & Gsir, 2015). Once they get through the buffer period to get used to the new society or they can live independently, they move out of the community where Chinese immigrants aggregate. That is why the dissimilarity index decreased again during 2010-2015.

4.1.3 Interaction index of Chinese immigrants and native Dutch

Residential exposure means the extent of possible contact or potential interaction between minority and majority group within geographic areas of a city (Denton & Massey, 1988). The interaction index concerns about the degree to which a minority and the majority members physically confront each other by the virtue of sharing a common residential area (Denton & Massey, 1988). In this case, the minority is the Chinese immigrants while the majority is the Dutch.

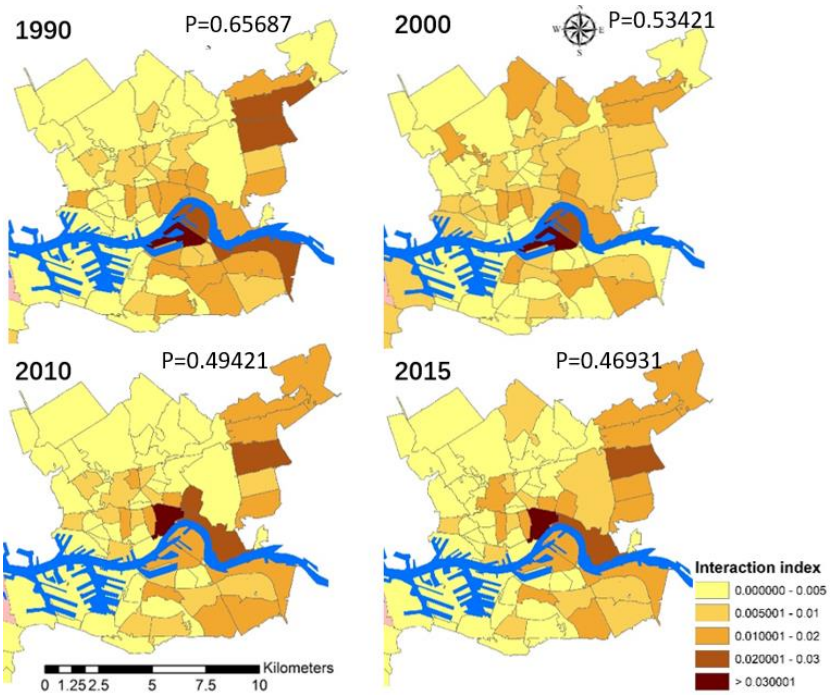

Figure 4-6: Interaction index maps (Chinese immigrants and native Dutch)

In 1990 (Fig. 4-6), the interaction index of the whole city is 0.65687. The darkest postcode areas is the one where Katendrecht locates. There is a higher Chinese immigrants proportion and a relatively high native Dutch proportion living in it. So there is a higher possibility for interaction between the Chinese immigrants and the native Dutch. For the lighter yellow areas, there are less possibilities for the minority to interact with the native Dutch because there are less Chinese immigrants.

In 2000 (Fig. 4-6), the interaction index of the whole city got lower than ten years ago. It demonstrates that generally speaking, it has less potential for the minority to interact with the majority (native Dutch). The darkest postcode area is still the one where Katendrecht locates.

In 2010 (Fig. 4-6), the interaction index of the whole city continually got lower than that in 2000. It demonstrates that generally speaking, it has lower potential for the minority to interact with the majority than before. Several northern areas have dark colour, which indicates that the minority has more opportunities to confront to native Dutch because more and more Chinese move into those postcode area where native Dutch settle. The postcode area where Katendrecht locates in, was not the darkest postcode area any more. It became a less darker postcode area than before, because the native Dutch move out. However, the postcode area in the centrum where Beurs locates in, had become the darkest area. In the centrum (Fig. 4-7), Chinese immigrants still has the highest possibility to interact with the native Dutch, because there are a number of Chinese and native Dutch living there. In the year of 2015 (Fig. 4-6), the spatial patterns of exposure for the Chinese immigrants has a similarity with the year of 2010.

Figure 4-7: The most interacted area in 2010 and the new China town

According to the line chart (Fig. 4-8), the interaction index has a declining trend among the 25 years. It shows that on the city level, the Chinese immigrants have less and less opportunities to interact with the native Dutch crossing the period of 1990-2015. When the interaction decreases, the segregation degree tend to increase. So the situation that Chinese minority faces is becoming worse.

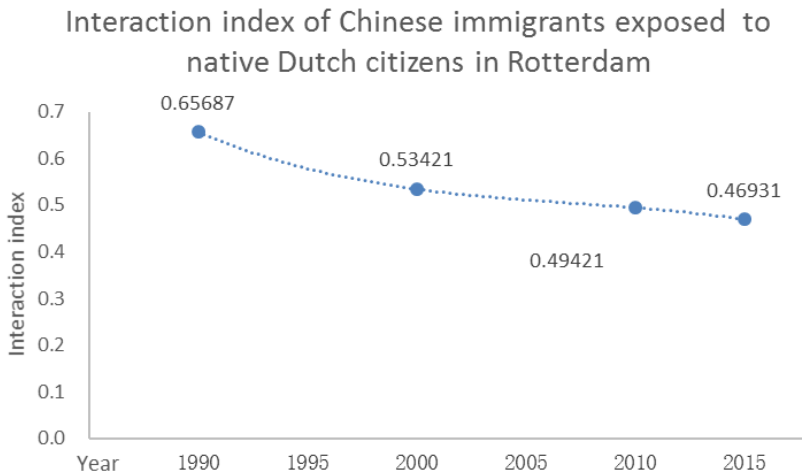

Figure 4-8: Interaction index (Chinese immigrants and native Dutch)
(Data from: OBI Rotterdam municipality and Google Map)

The reason behinds this phenomenon is that "native Dutch flight", which means large-scale of the native Dutch group moved out the ethnically mixed city of Rotterdam after 1990 (Fig. 4-9). A decreasing number of native Dutch living in Rotterdam cause the interaction index between the Chinese immigrants and native Dutch to decrease. In 1990, about 3/4 of the citizen population in Rotterdam are native Dutch while 1/4 are immigrants. But in 2015, approximately only half of the citizen population in Rotterdam are native Dutch and the other half are immigrants.

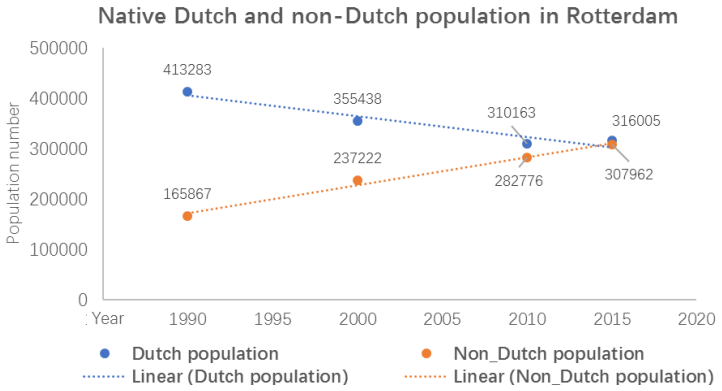

Figure 4-9: Native Dutch and immigrants population in Rotterdam

4.1.4 Interaction index of Chinese immigrants and non-Dutch

Because the immigrants (Non-native Dutch) in Rotterdam have increased to half of the population, it is necessary to consider the non-native Dutch as the majority group (Non- native Dutch), which includes other non-Dutch EU citizens, Moroccan, Turkish, Surinamese, Indonesian and so on. The same formula was applied to calculate the interaction index between the Chinese immigrants and the non-native Dutch group.

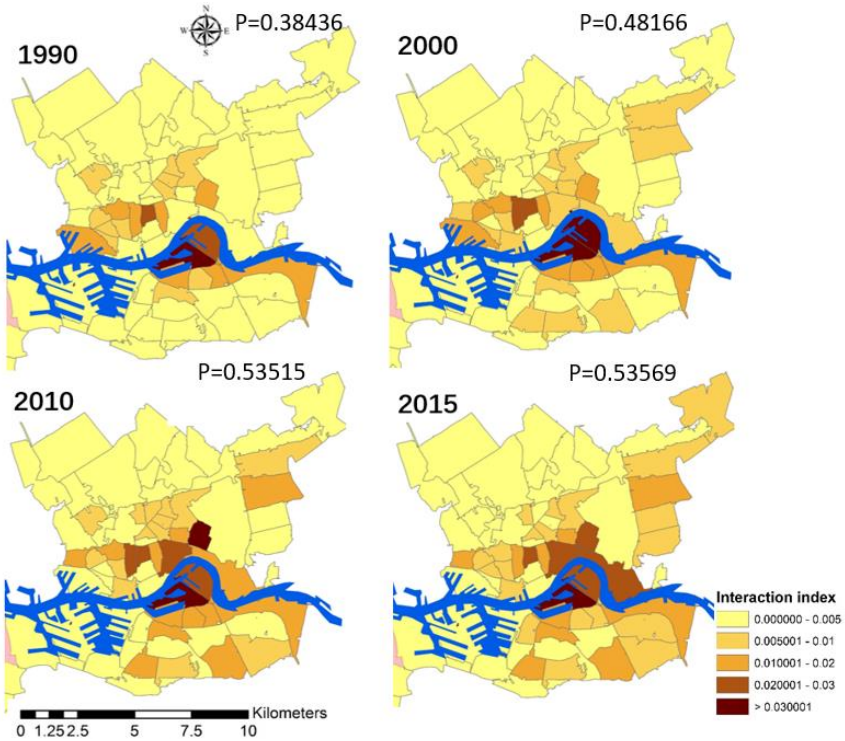

Figure 4-10: Interaction index maps (Chinese immigrants and non-native Dutch)

In 1990 (Fig. 4-10), the interaction index between the Chinese immigrants and the non-native Dutch group is generally low. The darkest postcode area is the one where Katendrecht locates. There is a higher

Chinese immigrants proportion and a higher non-native Dutch proportion living in it. So there are more possibilities for interaction between the Chinese immigrants and the non-native Dutch. For the lighter yellow areas, there are less possibilities for the minority to interact with the non-native Dutch because there are few Chinese immigrants or few non-native Dutch.

In 2000 (Fig. 4-10), the area where Katendrecht locates was still the darkest postcode area. But the darkest area spread to the one next to it. It demonstrates that there are more opportunities for Chinese to interact with the non-native Dutch.

In 2010 (Fig. 4-10), the postcode areas north to the river are getting more and more dark than before. More and more Chinese immigrants and non-native Dutch move to the northern part of the river. One reason is that the "native Dutch flight", more vacant rooms in the northern part of the river are available for the Chinese immigrants and non-native Dutch. Another reason is that both the Chinese immigrants and non-native Dutch are getting wealthier they can afford to live in a more expensive neighbourhood.

In 2015 (Fig. 4-10), the trend that the postcode areas northern to the river is much darker. But the one where Katendrecht locates was still the darkest postcode area because there always a number of Chinese immigrants and non-native Dutch.

According to the line chart (Fig. 4-11), the interaction index between Chinese immigrants and non-native Dutch has a growing trend among the 25 years. It shows that on the city level, the Chinese immigrants have relatively more opportunities to interact with the non-native Dutch crossing the period of 1990-2015. With a condition considering the non-native Dutch as majority, when the interaction increases, the segregation degree decreases. So the situation that Chinese minority faces is becoming better.

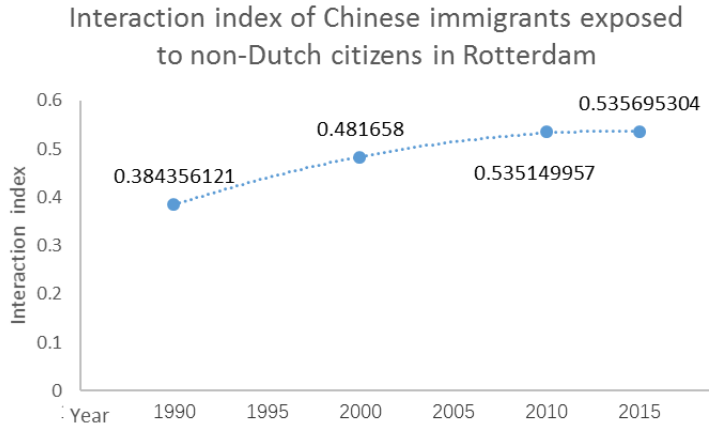

Figure 4-11: Interaction index (Chinese immigrants and non-native Dutch)

4.2 The residential spatial patterns of different sub-groups

To understand the spatial patterns of the Chinese immigrants in Rotterdam in more details, following the previous research, I divide this minority group into three categories based on their migration history and their common characteristics: the first generation immigrants, the second immigrants and the study and knowledge immigrants (Frank & Oostrom, 2011).

4.2.1 Distribution of different sub-groups in 2015

In the map (Fig. 4-12) of the first generation, there is a most populous area as a core. This core area, which is on the southern bank of the Nieuw Maas River, consists of the post area where the old China town named "Katendrecht" is located in, and the one next to it (postcode: 3071). Those two most aggregated areas where first generation Chinese immigrants settled, are the initial areas where Chinese immigrants

settled when they arrived in the beginning of 20 century. The 3071 postcode area includes the island in the Nieuw Maas River named "Noordereiland", where there are old neighbourhoods with a series of containers and port activities. The Kop van Zuid in 3071 postcode area is famous for its modern skyscrapers, historic factories. It is not far away from the Katendrecht old China town. Some of the old immigrants still live there. In the neighbour areas of the biggest core area are less aggregated than the core area. An exception is that a third most populous area is located in the district of Kralingen-Crooswijk with a high housing price. It shows that the wealthy first generation live in this area. In addition, the north-eastern of the city is another popular area among the first generation Chinese immigrants.

In the map of the second generation immigrant distribution (Fig. 4-12), there are two separate most populous areas as two cores. One is the 3072 postcode area where the old China town named "Katendrecht" locates while the other (postcode: 3011) is the one in the centrum. According to the housing price map (Fig. 22), the centrum is one of the most expensive areas to live. The most populous postcode area in the centrum shows that some of the second generation Chinese immigrants aggregate to live in the most expensive part of the city, which reflects that some of them are well-off. Previous research found that the second generation Chinese immigrants tend to have a higher educational background and a higher income than the first generation (Gijsberts et al., 2011). For the Katendrecht, one explanation is that the kids or teenagers second generation Chinese immigrants still live with their parents. It is possible that some of the second generation adults still live in the old China town. It is a limitation that there is no age information about the Chinese immigrants in the data. The life in 3072 and 3011 postcode areas is completely different. With nice apartments, convenient public transports, shopping streets and markets, living in the centrum (3011) is more handy than in the 3072 postcode area. In addition, it is obvious that the north-eastern part of the city is also popular among the second generation.

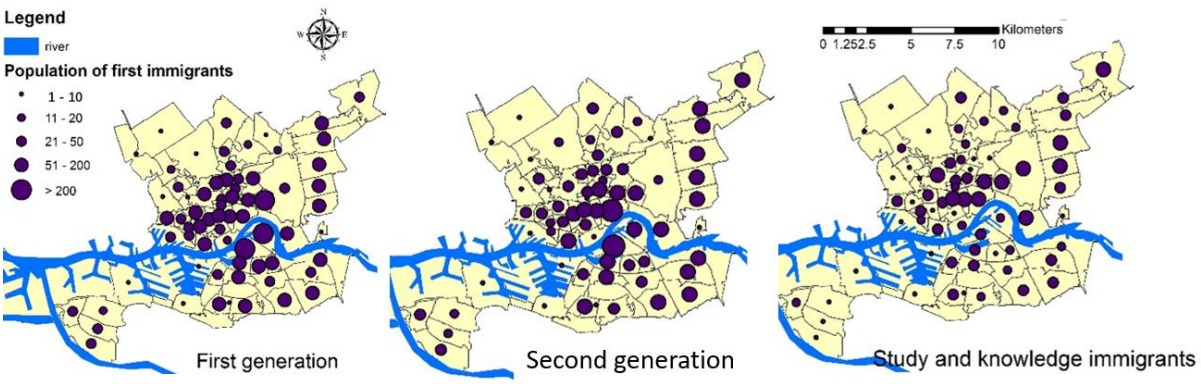

Figure 4-12: Population distribution of sub-groups from Chinese immigrants (2015)

(Data from: OBI Rotterdam municipality)

In the map of the study and knowledge immigrants distribution (Fig. 4-12), there are no any highly aggregated areas. But there are a bunch of brown postcode areas in the map, which are adjacent to each other. It means that the population of the study and knowledge immigrants are less aggregated than the first generation immigrants and the second immigrants. But they are just dispersive in a specific defined big area. None of them are in the southern part of the Nieuw Maas River but all of brown postcodes are located in the north, which covers the centrum, district of Prins Alexander, Krallingen Crooswijk and part of Delfthaven. The fact that two thirds of the aggregated area for the study and knowledge cover the area with the highest housing price (Fig. 4-13), indicates this sub-group can afford to buy or rent a house or an apartment in the most expensive area of Rotterdam. It reflects they tend to have a higher income. In the centrum, there are CBD, China town and shopping streets, bar streets and public services, where it is handy

for the Chinese immigrants to work, to live and to entertain (Fig.3-4) . The University of Erasmus, business school are located in the Krallingen Crooswijk, where study immigrants used to live when they were students and maintain their social network. Prins Alexander is a liveable neighbourhood with its own commercial and traffic hub named "Alexandrum" in the Northeast of Rotterdam.

Based on the interviews, some respondents from Chinese knowledge immigrants reflected the trend that knowledge immigrants tend to live close to the centrum or the neighbourhoods with high housing price. The distance to work is one of the factors that knowledge immigrants emphasise. They work in the centrum so that they choose to live close to the centrum. Some immigrants maintained that they are more willing to live in those neighbourhoods where there are more native Dutch residents living in.

In a word, comparing the population distribution maps of different categories by generation in 2015, I found that they have different spatial patterns among different categories. Both of the first generation immigrants and the second generation immigrants have one or two notable aggregated core. The wealthy Chinese immigrants aggregate in the wealthy core in the centrum while the immigrants with moderate income still gather in the cheap core in the southern part of the city. There are also some similarities in the spatial patterns between the first generation immigrants and the second generation immigrants that the area along the Nieuw Maas River and the district Prins Alexander are popular among both of them. The reason to explain the similarity might be that the second generation minor live with parents in a household.

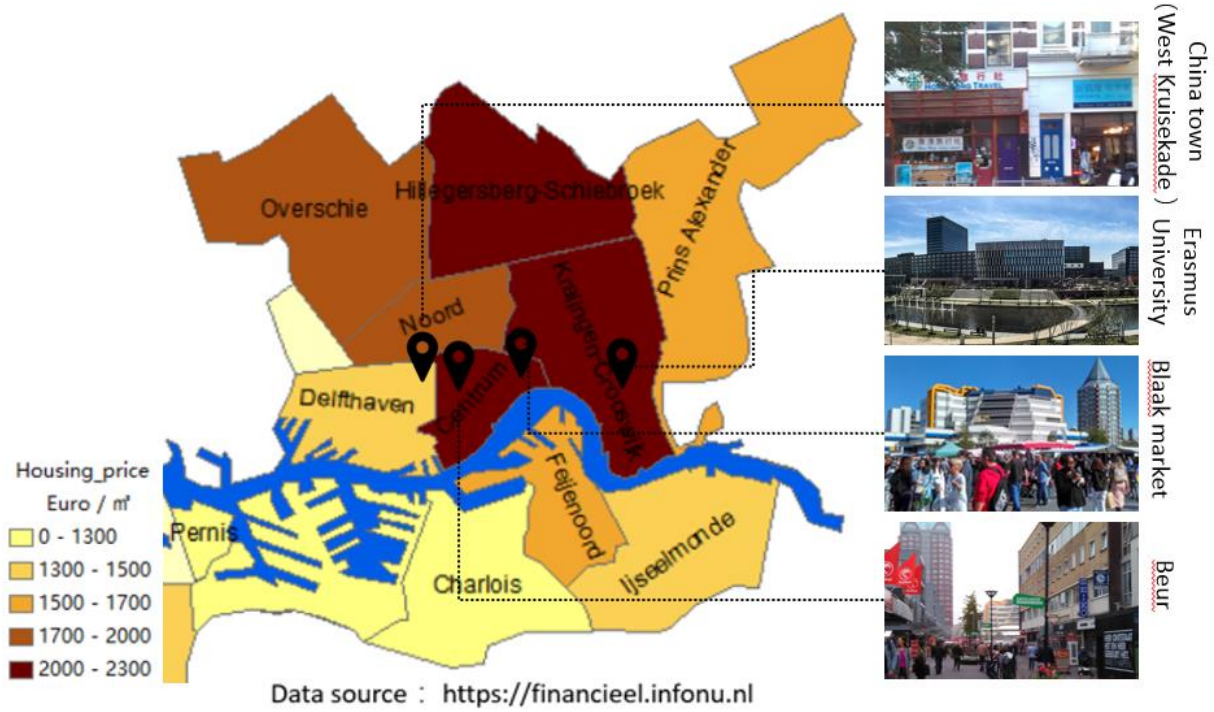

Figure 4-13: Distribution of housing price (2014) and Popular public space

High education background and high income make the study and knowledge immigrants have another completely different spatial patterns. They settle in the more expensive area near the Erasmus university and the centrum due to the fact that those places are closer to school or work office where they build their social network. The majority of them don't feel attached to local Chinese community, because they have a different origin from the Cantonese, Zhejiang people and Fujian people.

4.2.2 Dimensions of different sub-groups

Similar dimensions such as exposure and evenness had been used to measure the residential spatial pattern for different sub-groups of Chinese immigrants.

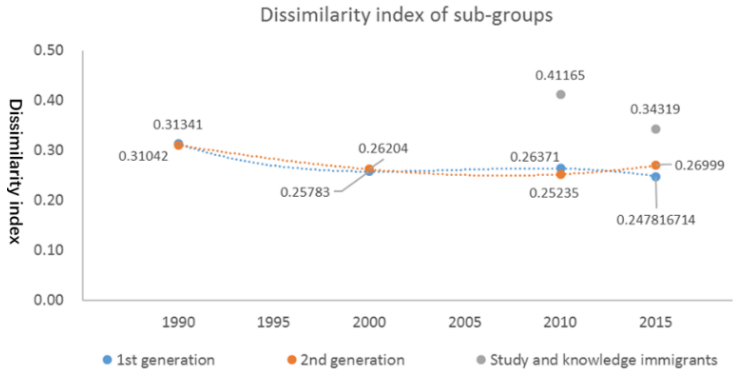

Figure 4-14: Dissimilarity index od sub-groups

For evenness, the dissimilarity index of 1st and 2nd generation had similar trend in 1990-2000 (Fig.4-14). During that time, most of the 2nd generation immigrants were children or teenagers so they cohabitate with their parents. But the 1st generation was distributed more dispersedly than the 2nd generation in 2015.The study and knowledge immigrants had high Dissimilarity index (0.41156 in 2010 and 0.34319 in 2015), which showed that they were much more aggregated than other sub-groups.

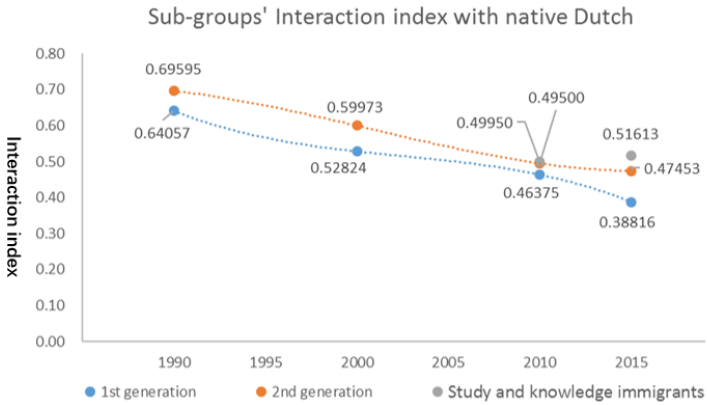

Figure 4-15: Sub-groups' interaction index with native Dutch

For the dimension of exposure, the interaction index to native Dutch of 1st and 2nd generation had a similar decreasing trend in 1990-2015 (Fig.4-15), but the 1st generation's interaction to native Dutch dropped more than 2nd generation. This is due to the "native Dutch flight" in the period. On the contrary, the interaction index to native Dutch of study and knowledge immigrants increased.

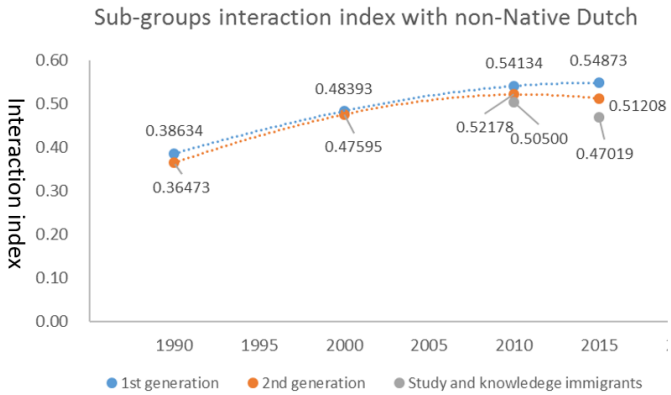

Figure 4-16: Sub-groups' interaction index with non-native Dutch

For the dimension of exposure, the interaction index to non-native Dutch of 1st and 2nd generation had a similar increasing trend in 1990-2015 (Fig.4-16), but the 1st generation's interaction to native Dutch increased more than 2nd generation. This is due to the non-native Dutch increased in the period. On the contrary, the interaction index to non-native Dutch of study and knowledge immigrants decreased.

4.3 Factors influencing residential spatial patterns

There are several factors effecting the residential spatial patterns of Chinese immigrants. there are some general factors effecting the residential spatial patterns. The previous section showed different sub-groups has its own spatial patterns, which might be influence by different factors.

4.3.1 General factors

Generally speaking, the sense of safety and security and cultural atmosphere are important factors to select a place to settle, which affect the residential spatial patterns of Chinese immigrants. The sense of safety and security in the southern part of Rotterdam is not as good as the northern part and some neighbourhoods in the southern part have developed into minorities enclave (Entzinger & Engbersen, 2014). Some neighbourhoods in Rotterdam are full of Islamic culture (Jansen, Gemici, & Wouden, 2010), where Chinese immigrants are reluctant to live because there is a habit difference in eating habits between them.

***Interviewee 12**: I have been living in the Netherlands, studying and working, for seven years in total. I work in Rotterdam now. I live with my partner near the Zuid station. My partner is a white Dutch. It is a bad choice to live there and we've decided to move out of that place soon. The south is very low-quality and full of poor people. It is chaotic and dangerous. I saw a gun battle near my apartment during the day in the past year. I feel unsafe. If I continue to live there, I really do not know when I would die, probably tomorrow. Another reason is that I do not like the Islamic atmosphere there. It is not like the Netherlands. The market is even not selling pork.*

***Interviewee 21**: Seven years ago, I came to the Netherlands from Fujian to work as a chef in a Chinese restaurant. I live in Alexander, just ten minutes by car to Centrum. The environment in Alexander is relatively safe and in order, much better than the south. There are more native Dutch living there. Large companies, universities are located in Alexander and there is a huge park nearby. The neighbourhood is peaceful and people are friendly. Some Chinese immigrants also choose to settle in Alexander.*

4.3.2 Factors on the first generation immigrants

For the first generation immigrants, behind the dispersed spatial pattern, there are a lot of reasons like intermarriage, restaurants managing operation or increase of income. Some Chinese, especially Chinese women, got married to a native Dutch so they follow their spouse to live in native Dutch neighbourhoods.

***Interviewee 8:** I arrived in the Netherlands in 1977 from Fujian province. I live in Rijnhaven since then, in the old China town in the southern bank of the river. Most of the Chinese immigrants had moved out of the old China town once they get richer. Only one Chinese supermarket left over there so I go to the new China town to shop and meet my friends.*

***Interviewee 24:** When I was young, I experienced the Cultural Revolution in China in 1970s. Then, I came back to Canton to work as a teacher. I came to the Netherlands in 1989 after divorce against ex-husband. I started running small business over here. I later met a Dutch guy in the Rotterdam and married with him later. I lived in Schiedam with him now. there are more native Dutch living there. I am never regret that I decided to come to the Netherlands.*

Chinese restaurants running strategies make restaurants distribute less concentratedly to reduce self-competition so that they can make more profits (Zhang, 2013). In the distribution map of Chinese restaurants (Fig. 4-17), we can see the Chinese restaurants are not only concentrated in the China town or

centrum but aggregated in a wider area beyond the centrum. The relatively wide-spreading distribution of Chinese restaurants might bring relatively wide-spreading distribution of the restaurants staff. The increase of income offers the Chinese immigrants opportunities to choose a better neighbourhood with better public service instead of the old China town to live in.

Interviewee 2: *I came to the Netherlands in 1995 from Zhejiang province. I owned a big Chinese restaurant in the southern part of Rotterdam. I can earn more money by moving the restaurant into neighbourhood than in the China town. The aggregation of Chinese restaurants lead to self-competition between Chinese so we tend to run it spread around.*

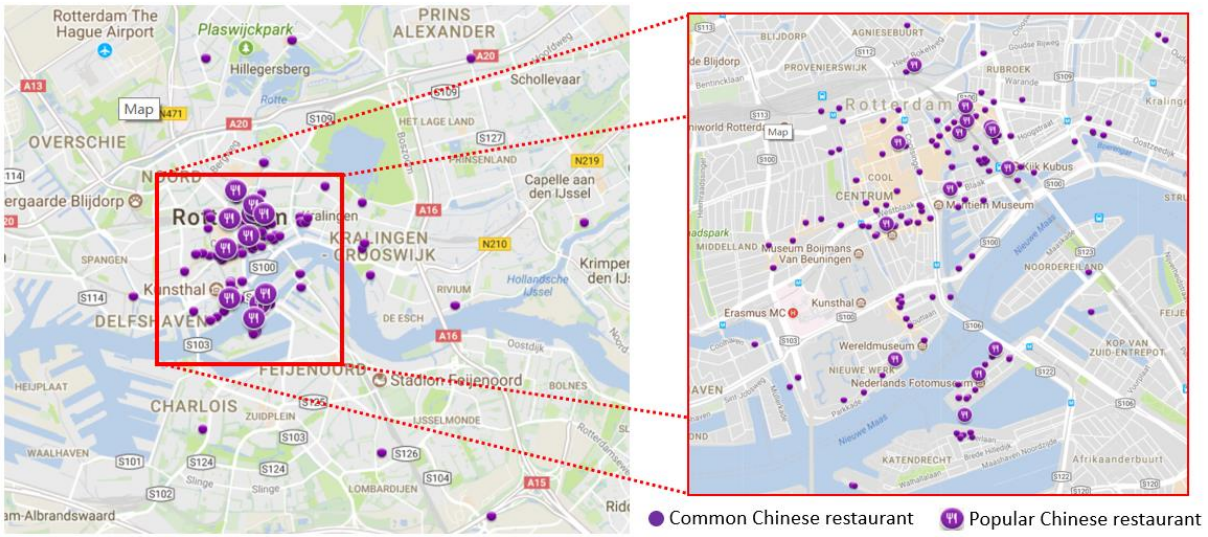

Figure 4-17: Distribution map of Chinese restaurants in Rotterdam (Data from: Tripadvisor)

But still some of the first generation immigrants live aggregately, especially in Katendracht. For those people, the social network and educational backgrounds matters. They have low educational backgrounds and some of the first generation Chinese immigrants can't speak Dutch to build up friendships with native Dutch and need others' help. It is difficult for this group of people to live independently because of these language barriers and cultural differences. Their life totally depends on the China town and the Chinese community. Thus those people have to live aggregately.

Interviewee 1: *I came to the Netherlands from Hong Kong in 1979…I just graduated from primary school and my survival skill is cooking. I used to run a restaurant in the China town with my husband. We ran a restaurant downstairs, we live upstairs. I cannot speak Dutch so I work in the kitchen. My circle is the China town in Rotterdam and Den Haag. All of my friends are Chinese.*

Interviewee 4: *I came to the Netherlands in 1976…I only attended to school for several years when I was a kid. During that age in China, girls were not allowed to go to school. My apartment is at the other end of the West Kruiskade street, being closed from the new China town. I like to live in that place where there are more Chinese immigrants. All of my friends here are Chinese. I can't communicate with my family doctor because my Dutch is so poor, I don't know how to explain my pain or those complicated names of medicine. I just can talk in basic Dutch when I go shopping.*

4.3.3 Factors on the second generation immigrants

The life styles of the second generation are more close to native Dutch. They live alone after growing up. They consider comfort or convenience as the main factors instead of social network of Chinese friends.

Choosing a neighbourhood where native Dutch also live is another factor. Still a lot of second generation are kids, juveniles or economically dependent on their parents so they live with their parents.

Interviewee 17: *I was born in the Netherlands and my life style is totally westernized. I bought an apartment in centrum and I live alone. Even though it is a bit expensive but I think it is worthy. Life here is convenient. It is closed to all kinds of public services.*

Interviewee 53: *I live in Blijdorp, behind the centraal station. My mother and my stepfather chose to live there and I followed them to live there when I was kid. My mother remarried with a native Dutch guy and I speak Dutch at home. But they have moved out so I am the only one who live there now. In my neighbourhoods, there are more native Dutch than immigrants. Honestly, it is more safe to live in a neighbourhood where native Dutch aggregated*

Interviewee 41: *I am 19 years old and I was born in Rotterdam. I still live in my parents' apartment.*

4.3.4 Factors on study and knowledge immigrants

For the knowledge immigrants, the convenience to work and education for kids are important factors that affect the residential spatial pattern. A living place with convenient transport or road network is essential for knowledge immigrants to commute to work. Young parents with advanced educational background hope their kids will have a better education, which makes them tend to live in native Dutch neighbourhoods with a high housing price.

Interviewee 18: *I came to the Netherlands from Canton in 2012. I work as an accountant over here. My apartment is near the train station. The Rotterdam Centraal station is like a transport hub, which make it convenient to live here. My office is near the stadium station in the southern part of the city. I commute to work from the centraal station every day by subway or tram.*

Interviewee 28: *I worked as an architect. But I live in the street behind the Centraal station. It is not far from my company. Life is easy and cosy. As an architect, I often overwork for designing, so it is convenient to go home at night.*

Interviewee 52: *I am an engineer and I live in a neighbourhoods where more native Dutch live because it is more in order. They are the mainstream culture here and I can hear their thoughts and opinions. I also like my kids playing with the native Dutch children. I like living in a neighbourhood where the housing prices rise remarkably because the poor can't move in. Only about 10% of foreign population are living in my neighbourhood.*

In addition, the Chinese students tend to live in campus or near campus. Therefore, their residential spatial pattern has a concentration pattern near campus. Distance to school is the key factor influencing their residential spatial pattern because schools are the centre of the life of the student. The price of the rent is also a factor because most students do not have an income. In addition, whether the living condition meets the standard to apply for rental allowance or subsidy is another factor influencing their residential spatial pattern.

Interviewee 58: *I am a student from Erasmus and I live in studio building in Williamsplein. Living there, I get some rental allowance from government. It is 15 minutes by bike for me to go to school from home. I have to go to school almost every day.*

Interviewee 51: *The place that I go most frequently is the library at school. I live in De Esch, the final stop of the tram No. 24. I chose to live there because it is not far away from school and that the rent is cheaper. I spend 15 minutes cycling from home to school every morning. I go to my friends' house to party often. All of us live closed to each other.*

4.4 Daily activity spatial patterns of Chinese immigrants

4.4.1 Demographics of participants

All of the 58 are those Chinese immigrants who live, study or work in Rotterdam or in the satellite cities of Rotterdam like Schiedam, Delft. This point insured that most of daily activities of the participants occur in Rotterdam.

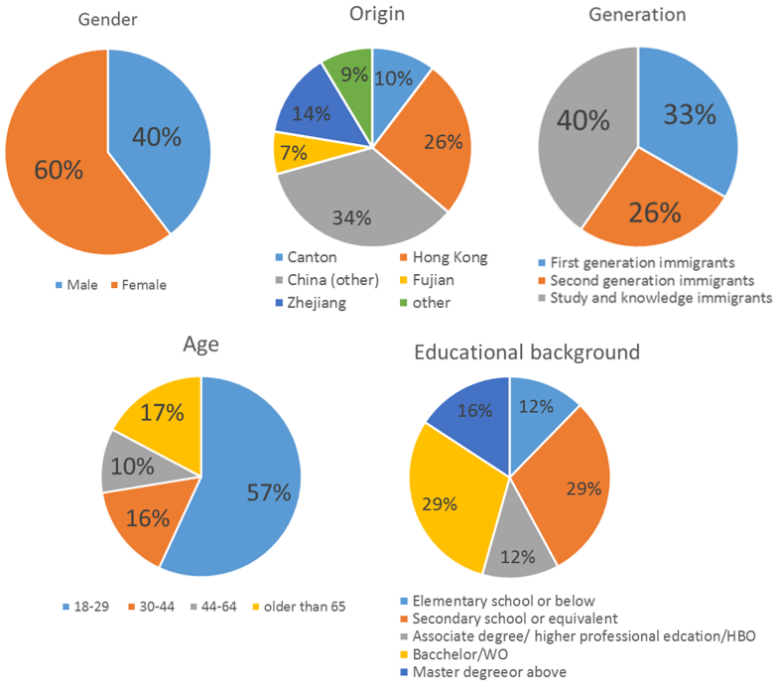

Figure 4-18: Demographic structure of participants

To make sure that the representatives for all kinds of categories have been covered for the quota sampling, the proportion of the samples (Fig. 4-18) had been checked. Among them, 60% of the participants are female while 40% are male, because the female Chinese immigrants are more than male Chinese immigrants in the Netherlands (Frank & Oostrom, 2011). Among them, 33% of them are the first-generation immigrants, 26% are the second-generation immigrants and 40% are study and knowledge immigrants. For their origin, 26% are from Hong Kong while 10% are from Canton province. Interviewers from Hong Kong and Canton are Cantonese people, accounting for 36% of them. 9% are from Fujian province and 14% from Zhejiang province. The immigrants from the other part of Mainland China account for 34% of the total participants. 9% of the Chinese immigrants or descents were from other countries such as Surinam, Indonesia, Singapore, Dutch Antilles islands, but still most of them has the origin of Canton.

For the age proportion, the people in their 18 to 29 years old accounts for more than half of the participants because most of the study and knowledge immigrants are in their twenties. The number of study and knowledge immigrants still were increasing after 2010 to make this sub-group larger (Hong et al., 2017). The educational background of Chinese immigrants shows that 16% of the population already have a

bachelor degree and 29% have a master degree or above. But most of the Chinese students haven't got a degree from a Dutch university.

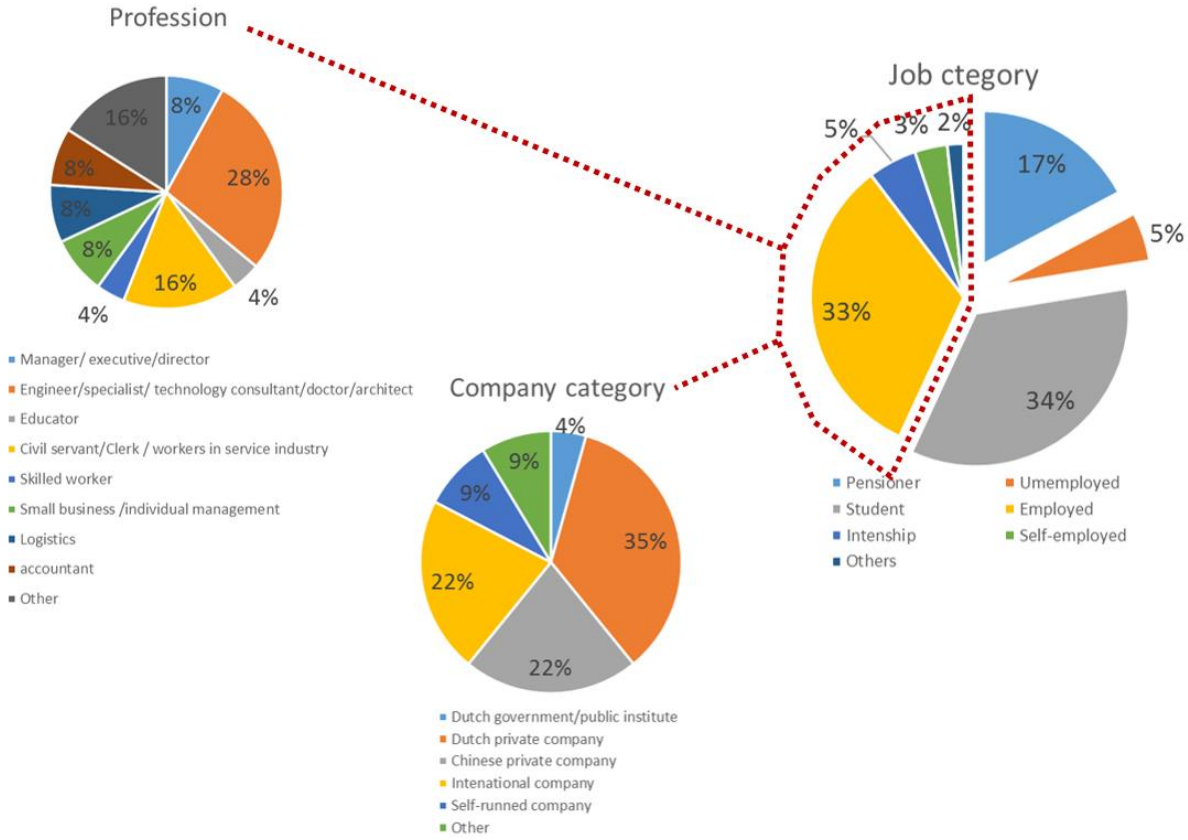

Figure 4-19: Comparison of population structure

For the job categories (Fig. 4-19), 34% of the total participants are students studying in university currently while 46% of them are working. 17% of them are retired and 5% of them are not employed. The profession of the participants are diverse but high-tech position and service industry still are dominant. 28% of people who are employed work as engineer/specialist/technology consultant/doctor/architect, which are considered as the group with high income. 8% of them are manager/executive/director. 16% of the participants work as civil servant/clerk/workers in service industry because some of them work as chef in Chinese restaurants. For the company category, 35% of the participants work in Dutch private companies and 22% of them work in international companies. Those people are considered to have more opportunity to be exposed to Dutch circumstances or international circumstances. 22% of the participants work in Chinese private companies, which are considered in this study to be more closed and have fewer opportunities to interact with native Dutch or other ethnic groups.

4.4.2 Popular places for Chinese immigrants

Generally speaking, Chinese immigrants who participated in the semi-structured interviews are aggregated in the Beurs (Hoogstraat), the Blaak, the new China town (West Kruisekade) and the Erasmus University in their daily life (Fig. 4-20). The centrum is the place where shopping streets (Beurs), open markets (Blaak) locates. It is available and accessible for everyone. Different kinds of entertainment places like movie theatres, restaurants, cafés and clubs also cluster in the centrum, where all kinds of people visit and spend their money. According to the map, there are many Chinese immigrants studying in Erasmus University and Hogeschool, including the studying immigrants and the second generation immigrants.

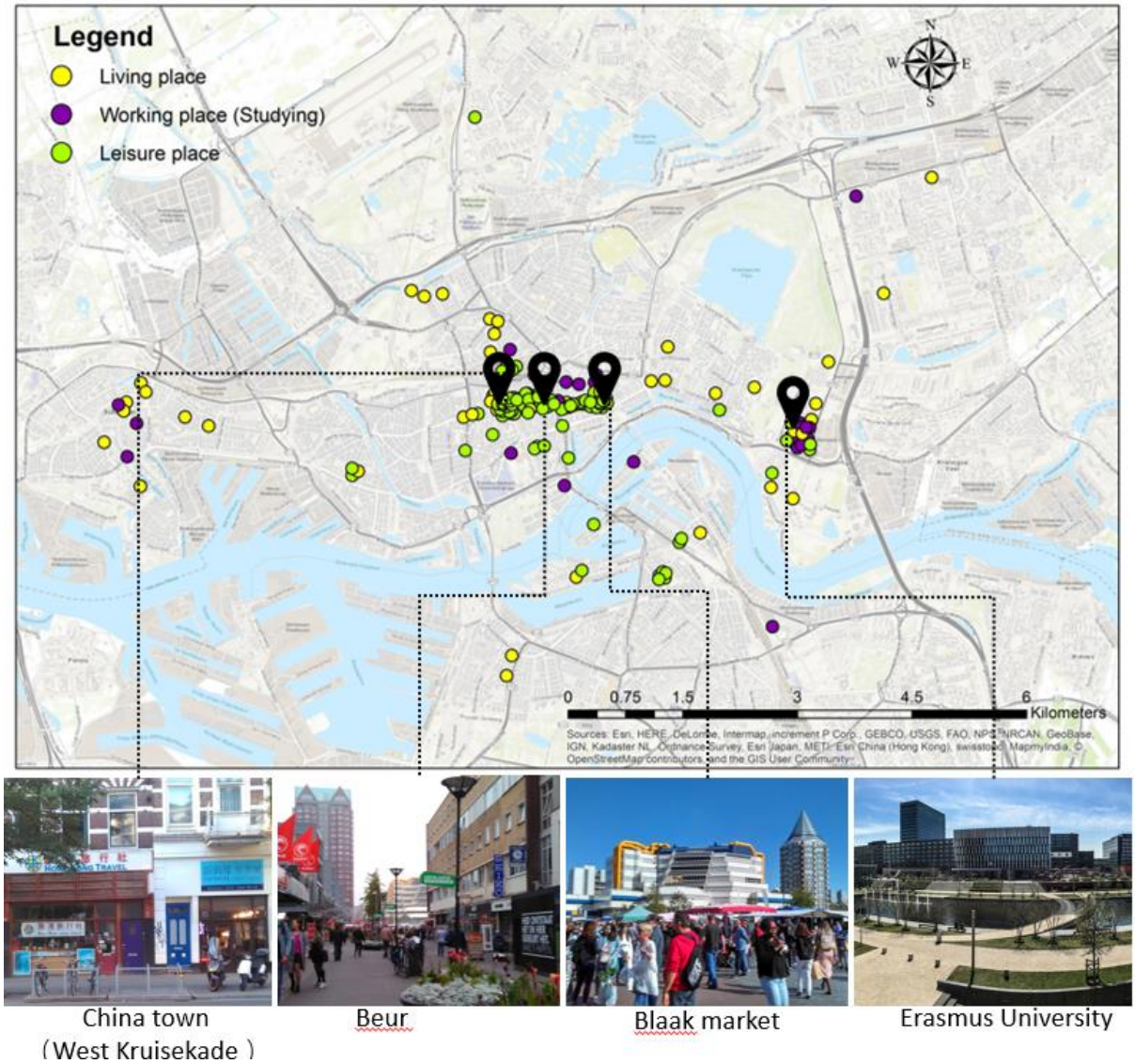

Figure 4-20: Popular places map of Chinese immigrants aggregated

Regarding to the dimension of exposure, preferred places of daily activities can be divided into three categories: isolated, medium and interacted. Among the popular places that interviewees mentioned and drew, the centrum (including Hoogstraat, Blaak market) and university are considered to be the places with high exposure to native Dutch and other ethnicities because there are more native Dutch shopping, hanging out, working or studying over there. The China town for Chinese is considered to be medium level of exposure (not isolated but less interaction) because there are more Chinese in China town than people with any other ethnicities. A place is seen as isolated place if it is only available and accessible for Chinese immigrants. For the dimension of intensity, the frequency of visiting those preferred places of daily activities have been divided into three categories: seldom (less than 3 times a month), medium and frequently (more than 8 times a month).

4.5 Daily activity spatial patterns by sub-groups

To know more about the spatial patterns of the Chinese immigrants, the daily activity spatial patterns for first generation immigrants, second generation immigrants, and study and knowledge immigrants are discussed separately.

4.5.1 First generation immigrants

The daily activity spatial patterns of first generation immigrants is simple (Fig. 4-21). As expected, their working places and the leisure places are aggregated in the China town. Another popular place is the Blaak open market, which is open on Saturday and Tuesday, twice a week. Indeed, the living place of the first generation immigrants are more spread-around than the working places and the leisure places.

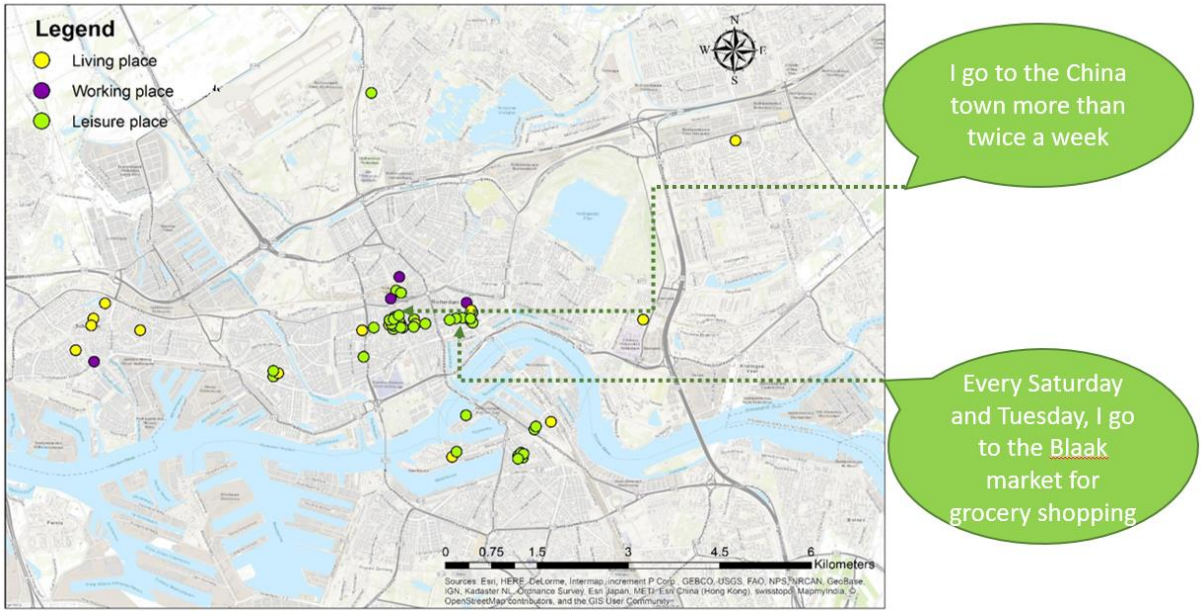

Figure 4-21: Daily activity spatial patterns of first generation immigrants

Most of the first generation immigrants who arrived in the Netherlands before 1990 are getting to 60 years old and some of them are already retired. Those people are the group who were seen as "restaurants Chinese" (Minghuan, 1999). They get together to do some entertainment activities in their retired or pre-retired daily life. The Chinese older activity centre, the Chinese church and other Chinese associations are the most popular places where they sing, dance and play games. Some of them travel across half of the city to go to those places to meet friends because they live in different neighbourhoods across the city. Some of them live out of the city but they still come to those place to hang out with their friends. The Chinese older activity centre, the Chinese church and other Chinese associations, where people speak Cantonese or Mandarin, are only accessible and available for Chinese immigrants. For intensity, elder first generation immigrants go to the Chinese older activity centre, the Chinese church and other Chinese associations two times a week or more often.

Interviewee 1: *I am retired. I live near the China town. I go to the open market (Blaak) to shop every Saturday and Tuesday. I go there to buy fresh food and vegetable. I like Chinese food and I cook. When I am free, I play mah-jong game at the Chinese elderly activity centre every Wednesday. I usually play the game there for the whole afternoon and then I go home to cook in the evening. There is singing and dancing activities at the Chinese elderly activity centre on Thursday. We also learn how to speak Mandarin or Dutch, how to use computer and smart phone over there.*

Some of the first generation immigrants have adapted to the Dutch society very well while others could not. Those who are integrated into the Dutch society are willing to help those in disadvantage. They set up the association to guide the old immigrants in disadvantage to have a happy retired life, to learn Dutch language and learn to use a cell phone and a computer.

Interviewee 22: *I came to the Netherlands from Hong Kong in 1974, I attended to HBO after arrival. I work in a primary school in an administrative position now. My Dutch is better than my English now. Every Tuesday and Friday afternoon I come to the Chinatown elderly activity centre, because I am one of the organisers. Some old people do not understand English, nor Dutch. They have lived here for a few decades, but some of them still do not speak Dutch. We are volunteers to organize activities. I know Dutch, to help them and make their retired life better. I also make a lot of Chinese friends here.*

Interviewee 10: *I came to the Netherlands from Singapore in 1968 but moved to Rotterdam in 1981……I am almost retired now. I live in the most northern part of the city, near Rotterdam Airport. I am a volunteer in the Chinese Elderly Activity centre. I spend 25 minutes cycling to China town from home. I come to Chinatown twice a week, Tuesday, Wednesday. I have a lot of friends there. We sing, dance and playing chess over there. I like the open markets in Blaak and Maashaven, I cycle there to do grocery shopping several time a week.*

The life of young labour workers is not as tough as the old immigrants' were. Most of them also work in restaurant like the old first generation immigrants. They independent and self-reliant. They also can speak some Dutch. However, they still feel lonely and in a monotonous life because of few Dutch friends.

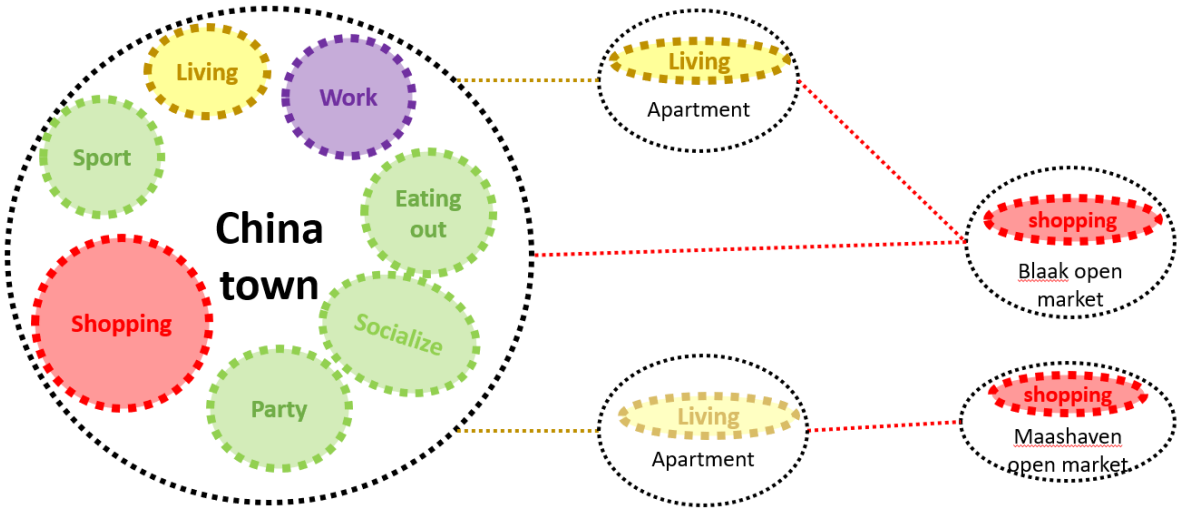

Figure 4-22: Spatial structure of first generation immigrants

Interviewee 37: *I am 32 years old and I came here in 2011 as a labour worker. Now I work as a chef in a Chinese restaurant. I live in Schiedam, but the restaurant is in the centrum of Rotterdam. It takes only several minutes by train to Centraal station from Schiedam centrum. I think that life in Netherlands is boring and monotonous. My Dutch is so-so, enough for daily communication, but I have few Dutch friends. I have few recreational activities. I usually go home to watch TV, play computer after work, I chat with my wife and make some snacks or cake to eat at home.*

Those Chinese older activity centre, the Chinese church, Chinese associations also have positive and negative effect. On one hand, they play an important role in their daily life. Old immigrants make friends and they learn from and help each other in the association. They hang out with Chinese friends with the same ethnicity, language and cultural background. On the other hand, those associations are only available for Chinese, because everyone speaks mandarin, Cantonese or other Chinese dialects. Those association are seen as isolated places which hinder interaction with native Dutch (Minghuan, 1999). If those old first generation immigrants could not learn Dutch over the past 30 or 40 years, they don't expect themselves to learn it in their retired age.

Apart from the China town, the open markets are another popular place among the first generation immigrants. They go shopping in the open market because Chinese like fresh fruits, vegetable and meat.

Another reason is that the commodities in the Blaak open market and Maashaven open market are cheaper than in supermarkets. Those open markets are frequently-visited places with high exposure to other ethnicities.

Thus, I can briefly conclude that the daily activity of first generation Chinese immigrants gravitates around the China town, which is the core of their daily life (Fig. 4-22). Most of the first generation don't live in the China town but they do travel to the China town to have their daily activities. They hang out with their Chinese friends in the China town frequently, with low exposure to other ethnicities.

4.5.2 Second generation immigrants

A similar trend of the second-generation immigrants to the first generation immigrants exits (Fig. 4-23). People also live spread-round but their leisure activities are aggregated in the shopping street, market hall and the China town. The life of the second-generation immigrants is more varied in terms of leisure activities than the first generation.

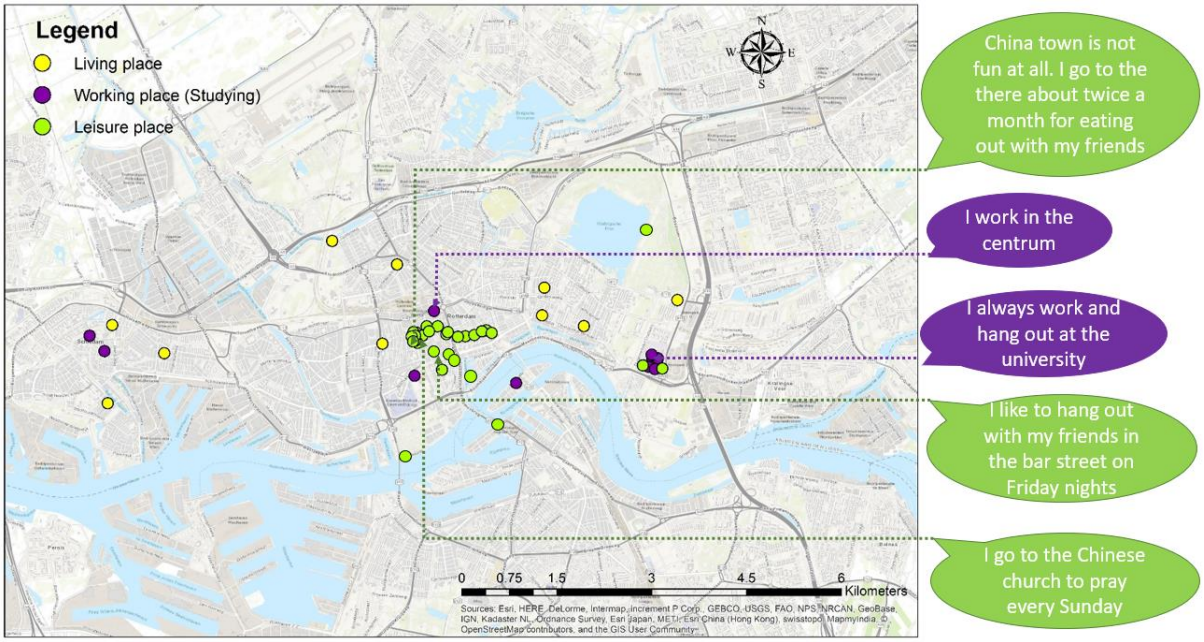

Figure 4-23: Daily activity Spatial patterns of second generation immigrants

Some of the second-generation immigrants still keep some Chinese life habit while others do not. A notable Chinese life habit that those second-generation immigrants still keep is that they like Chinese food, which make them go back to the China town to eat. Another notable phenomenon is that most of them still can speak some Chinese languages, even though without a native accent.

Interviewee 35: *I was born here (the Netherlands),I graduated from college two year ago and I work as a teacher in a primary school. I speak Cantonese, but I cannot read any Chinese characters…….I like to go to Blaak, Beurs for shopping hanging out with my friends during weekends. I go to Chinatown to eat, but when I finished eating, I leave. I do not really like Chinatown. Chinatown is not fun at all.*

Interviewee 42: *I am 21 years old. Every Sunday I come to the Chinese church where the father speaks Cantonese and mandarin. This is the only place in the city where I can practice my Chinese language and make friends with Chinese people. I have a lot of native Dutch friends and talk in Dutch often. I am a Chinese descendant grew up in the Netherlands so I need to learn more about the Chinese culture and language. After the missal, I also buy some Chinese food or ingredients in*

the China town and bring them home to my parents. Even though I was born here (Rotterdam), I still think the Chinese food tastes better than the Dutch food because my parents cooked Chinese food for me when I was a kid.

Interviewee 17: *I was born in the Netherlands and my life style is totally westernized. I grew up in a native Dutch circumstance so I have a lot of native Dutch friends but few Chinese. I like eating bread and spaghetti instead of rice or noodle. I don't go to China town but my parents do. I have a lot of Dutch friends. I am a freelancer. I like to hang out in bars in the Witte de withstraat on Friday night.*

Interviewee 40: *I followed my parents to come to the Netherlands in 1980 when I was 6 years old……Now I own a restaurant in Schiedam centrum. I also live in Schiedam. I drive to the Chinese church in Rotterdam to pray every Sunday morning. Jesus have changed me a lot. I used to gamble, drink, smoke and behave like a lost man. Now I have gave up those bad habits. I like to come to the Rotterdam China town to meet my friends but there are always traffic jam in the rush commuting hours.*

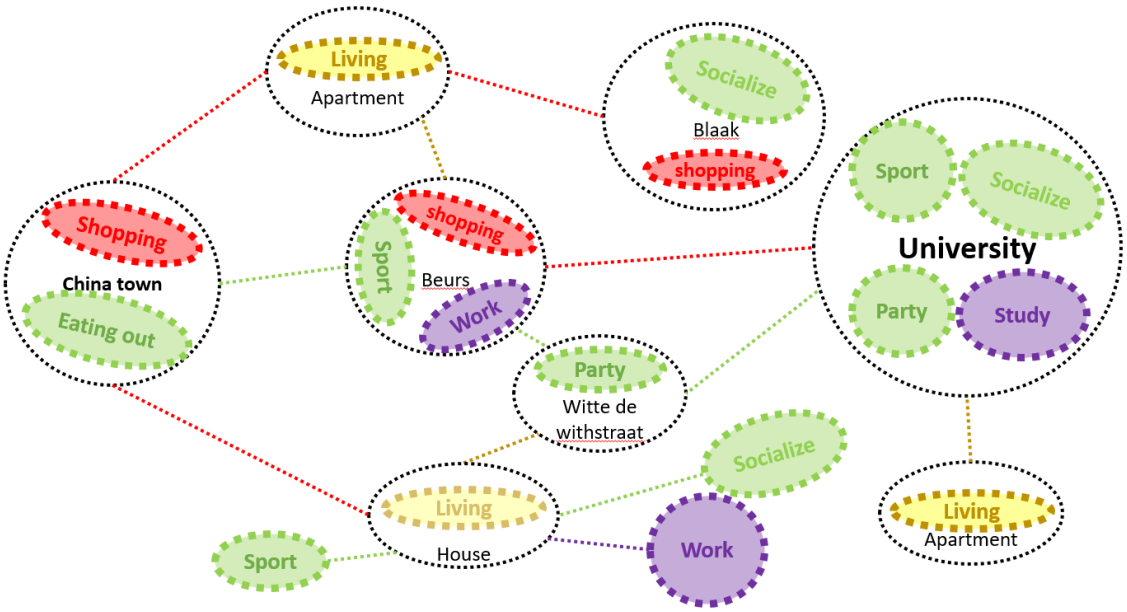

Figure 4-24: Spatial structure of second generation immigrants

The spatial structure of the second generation immigrants is more complex (Fig. 4-24). Those second generation immigrants mainly work in the centrum and their leisure activities are also aggregated in the centrum. Those second-generation immigrants who are still students attach their life to the university. Indeed, the second generation argued that they like to hang out often with their Dutch friends or international friends. So the second generation immigrants tend to have high exposure to native Dutch and other ethnicities frequently. Those second-generation immigrants who go to the China town are looking for Chinese food to eat or shopping with their parents. But the intensity to china town is much lower than the first generation. Meanwhile, by the fig.4-24, the 2nd generation have higher diversity than 1st generation.

4.5.3 The Chinese students

The Chinese students and the Chinese knowledge immigrants under the category of study and knowledge immigrants can be divided because their life style are different. The spatial pattern of students is always aggregated at schools while the knowledge immigrants are more attached to their jobs or spouses.

Among the participants, it is found that the spatial patterns of international students from China are similar and simple (Fig. 4-25). First, the Chinese students have a common place to study like Erasmus University, Hoogschool Rotterdam, Rotterdam University of applied science and TU Delft. Most of them work in the library or classroom during weekdays. Second, they live in a dorm on campus, or share a studio

or apartment with roommates near school. They come to the Netherlands to study alone, without any family members, so they are more willing to live close to school to save commuting time. Their entertainment activities, sports or party are also on campus or nearby with friends or classmates.

Interviewee 62: *I live in a dorm with private kitchen in campus. It is convenient to attend to my class because I have lectures or seminars almost every day. It is not bad to live on campus. There are gym and sport centre on campus so that I can do exercise often. I also go to bars nearby with my friends.*

But Chinese students more or less tend to go to China town for grocery shopping and restaurants several times a month because they grew up in China and get used to the Chinese food. The dietary and the need for Chinese food is the main reason which leads to the Chinese students visit the China town, hunting for food or ingredients. Mostly Chinese students prefer to go shopping with their Chinese friends or alone because their friends with different cultural backgrounds don't have the similar preference on Chinese food. So the shopping activity for Chinese ingredients or eating for Chinese food in the china town is considered as an less interacted activity.

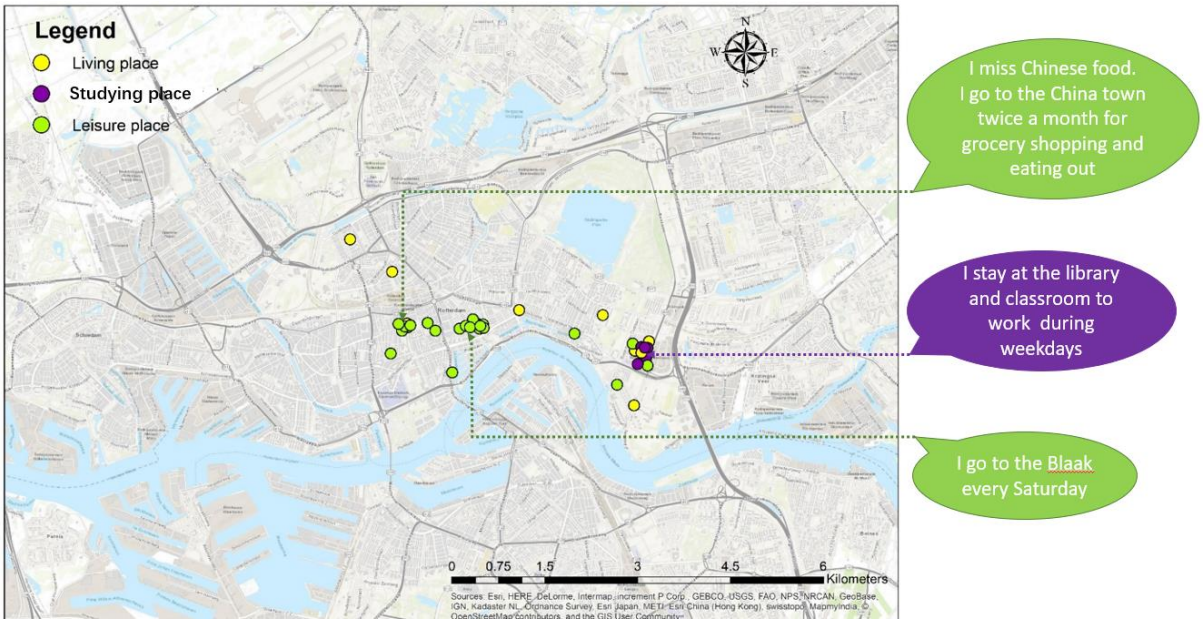

Figure 4-25: Daily activity spatial patterns of Chinese students

Interviewee 58*: Comparing to Dutch food, I prefer Chinese food. so I cook Chinese food every day even though it takes a lot of time. Every weekend, I go to China town for grocery shopping. The Chinese supermarket named "the oriental" is my favourite one. I also go to Chinatown with my Chinese friends to eat for about once a week. I don't go there with my Dutch friends because we have different tastes. The Sichuan food restaurant named "spicy temptation" has the authentic Sichuan flavour so I like it very much. I used to study in Chongqing city when I was an undergraduate student, which make me addicted to the spicy Sichuan food.*

Interviewee 48*: I have a Chinese stomach. I am not used to the Western food. Especially, the Dutch food has no flavour. Eating in the school canteen is expensive, so the cruel reality forces me to cook for myself. I go to the China town to buy ingredients for Chinese food twice a month. The China town is far away from Erasmus campus and there is nothing interesting but the Chinese supermarkets. for me.*

The spatial pattern of the international students is simple and can be summarized that the university is the core for their daily activities (Fig. 4-26), with an extension for shopping in China town and Beurs.

Chinese students are more willing to interact with Chinese instead of Dutch students or international students at school, even though they are exposed to the Dutch or international circumstances.

The Chinese students has a high exposure to native Dutch and other ethnicities frequently because universities is a small international society with students from all over the world. Studying, living or entertaining at school is supposed to be an high interactions to Dutch students or international students from different countries. But most of the Chinese students stick inside the Chinese group instead of being involved in the Dutch-integrated or international daily activities. Integrated daily activity at school doesn't take place frequently because of language barriers and cultural differences. Others have a stereotype that the Chinese students are isolated.

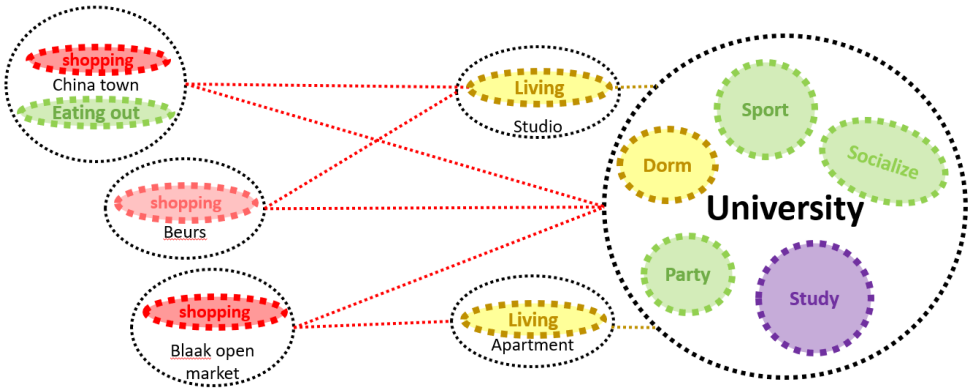

Figure 4-26: Spatial structure of Chinese students

Interviewee 62: *I have few friends in Erasmus and the only several friends I have over here are Chinese. The days in the Netherlands are boring. I am not happy to study and live here. I even thought about whether I should drop out to go home or not, but I did not go back finally. Here, I can't hang out with Dutch or other foreign friends because of language barriers and cultural differences. I have discussions with those Dutch or international students in seminar or group work because I have to do that for my study. But I don't enjoy the discussion because it is hard for us to come to an agreement. I am not good at communicating or socializing with them.*

Interviewee 60: *I was born and grew up in Utrecht so I am a Chinese Netherlander. I share an apartment near Erasmus with my Dutch friends, white Dutch. Since I came to the university, I found that those students from China are very isolated. Their oral English are poor and always stick to their small circle. I have a lot of international friends and Dutch friends in Erasmus, but few Chinese.*

4.5.4 Knowledge immigrants

The spatial patterns of knowledge immigrants from China is more pluralistic than that of the Chinese students (Fig. 4-27). There is no core area for the spatial patterns of knowledge immigrants. Everyone has its own independent settlement area, his own job and his preference place for leisure. But as for the extent, the daily activity spatial patterns for them has a small scale. Speaking of exposure, all of the places for their daily activities are aggregated in the centrum or near the centrum, which is seen to have a high interaction opportunities with other ethnic groups. For the intensity, it is highly frequent because they work in the centrum and they live close to their jobs, they hang out nearby.

Interviewee 12: *The place I work is near the centraal station. My colleagues are from more than 50 countries and I enjoy the international atmosphere in the company very well. The China town is closed to the centraal station, but it is not fun. But I don't like to go to the China town unless some of my Chinese friends visit me to have dinner in the China town.*

Interviewee 27: *I graduated from TU Delft and work as an architect in Dutch company in the centrum now. I live closed to the centrum. My colleagues are people around the world with different ethnic background. Mostly, I hang out with my Dutch friends or international friends for party or activity events. We like going to the bar street named Witte de With straat on Friday night. I eat with my Chinese friends during the weekend because of we have the common taste. I choose to settle down and work in Netherlands because I like Dutch and the Dutch culture.*

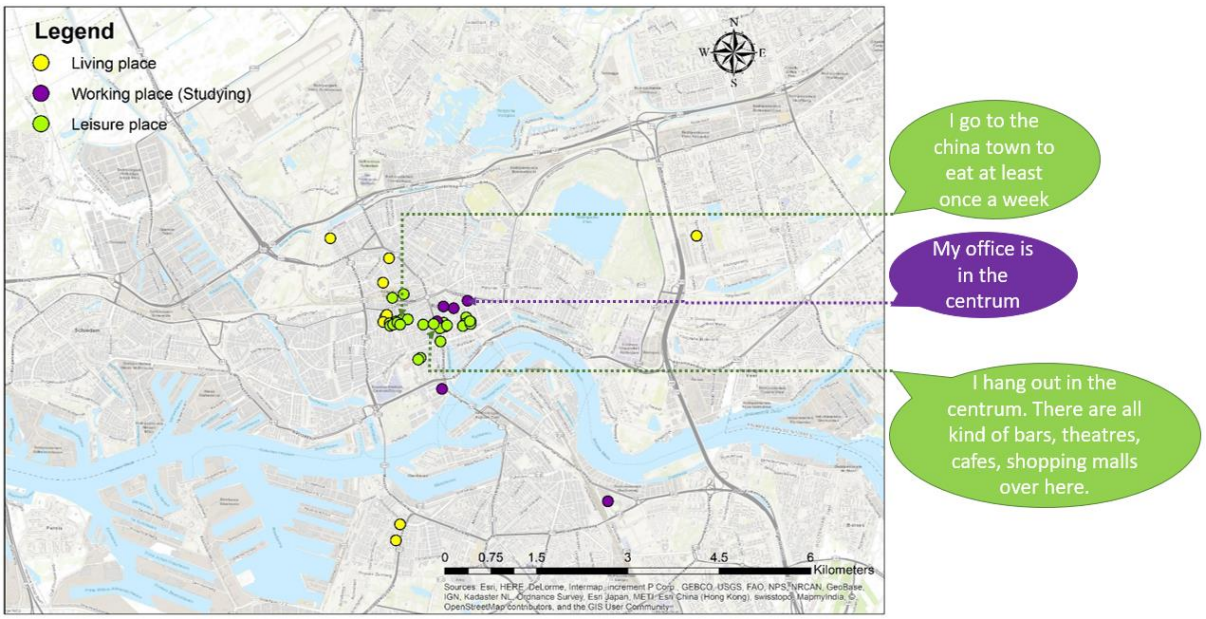

Figure 4-27: Daily activity spatial patterns of knowledge immigrants

The spatial patterns of the knowledge immigrants has a small scale with diversity (Fig. 4-28). All kind of activities are closed to each other. Even the centrum is a small scale place but with a high exposure to native Dutch or other ethnicities. Most of knowledge immigrants has a number of Dutch colleagues or international colleagues in offices, because they work in Dutch companies or international companies. They also hang out with a lot of friends in the city centre with different ethnicities.

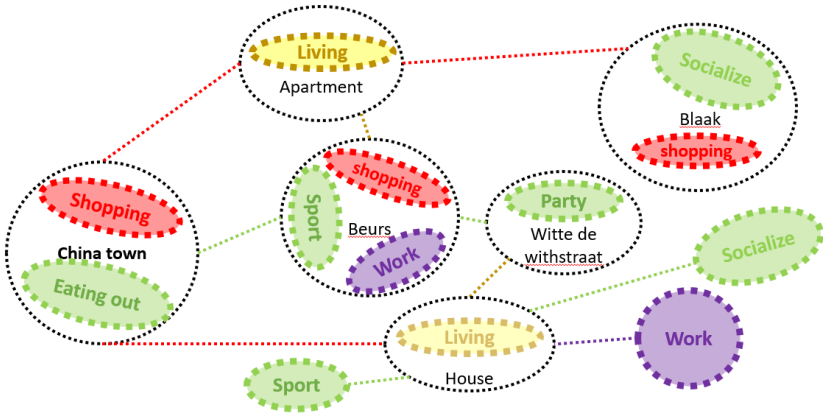

Figure 4-28: Spatial structure of knowledge immigrants

5. DISCUSSIONS

This chapter discusses the spatial pattern of Chinese immigrants, by addressing the sub-objectives on residential spatial pattern and daily activity spatial pattern: to discuss the residential spatial patterns of Chinese immigrants in Rotterdam and to discuss the daily activity spatial patterns of Chinese immigrants in Rotterdam.

5.1 On residential spatial patterns

This section discuss the characterises of residential pattern of Chinese immigrants and characterises by distinguishing three sub-groups: first generation immigrants, second generation immigrants and the study and knowledge immigrants.

5.1.1 More integration into non-Dutch community in Rotterdam

Using the method that Reardon & O'Sullivan (2004) used in their study, I combined the dimensions of evenness and exposure on the quadrate (Cartesian coordinate system) to visualize the dynamic changes of residential spatial pattern of Chinese immigrants in Rotterdam in the period of 1990-2015, in relation to the native Dutch and to other minority groups.

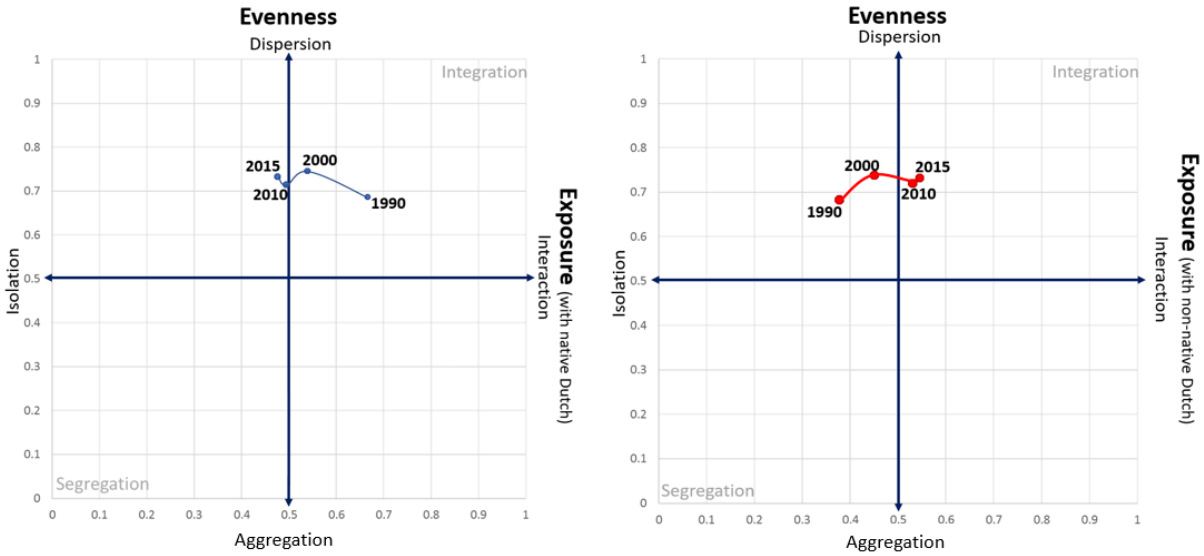

Figure 5-1: Quadrates with combination of two residential dimensions

It is not clear whether the spatial pattern is getting more integrated or more segregated in the period of 1990-2015 because of the contradicted developing trend on the two quadrates. According to figure 5-1, the left quadrate, whose exposure is with native Dutch, shows that the residential spatial pattern of Chinese immigrants develop into more isolation but more dispersion in the period of 1990-2015. But meanwhile, the right quadrate, whose exposure is with non-native Dutch, the residential spatial pattern of Chinese immigrants develop into more interaction but more dispersion, which is seen as more integration in relation to other non-native Dutch inhabitants.

The phenomenon of "native Dutch flight" makes it difficult to judge whether it is more spatially segregated or more integrated with the quadrate of Reardon & O'Sullivan (2004), because of the unclear dimension of exposure. When native Dutch moved out of the city, massive numbers of immigrants arrived and settled in the city, so the majority of ethnic group had switched from native Dutch to non-native Dutch. In 2015 the native Dutch and non-native Dutch accounted for half of the population each. So for the

dimension of exposure, Chinese immigrants have fewer opportunities to interact with the native Dutch but increasingly more opportunities to interact with the non-native Dutch during these 25 years.

Generally speaking, The Chinese immigrants in Rotterdam is distributed more dispersive and they are exposed more to the non-native Dutch community than to the native Dutch. Through the visualization of the population distribution (found in 4.1.1) and the measurement of evenness (found in 4.1.2), it is found that the Chinese immigrants were developing to be distributed more evenly around the city in the period of 1990-2015. Since there are less native Dutch but much more non-native Dutch, which includes Moroccan, Surinamese, Turkish, Indonesian, Dutch Caribbean and other European immigrants, in 2015 than 1990 in the city, the Chinese immigrants are exposed more to non-native Dutch.

So I concluded that the residential spatial pattern of Chinese immigrants in Rotterdam experienced a development into being more integrated with the non-native Dutch community than with the native Dutch community in the period of 1990-2015.

5.1.2 Dispersed residential patterns & mixed neighbourhoods by 1st and 2nd generations

When applying the quadrates of evenness and exposure to the different sub-groups (Fig.5-2), I found that the residential spatial patterns of first generation immigrants and the second generation immigrants have similar general trends in the 1990-2015. Both have a more dispersive residential pattern in 2015 than in 1990. Meanwhile, living in mixed neighbourhoods, both have less exposure to native Dutch but more exposure to non-native Dutch, for the reasons described earlier.

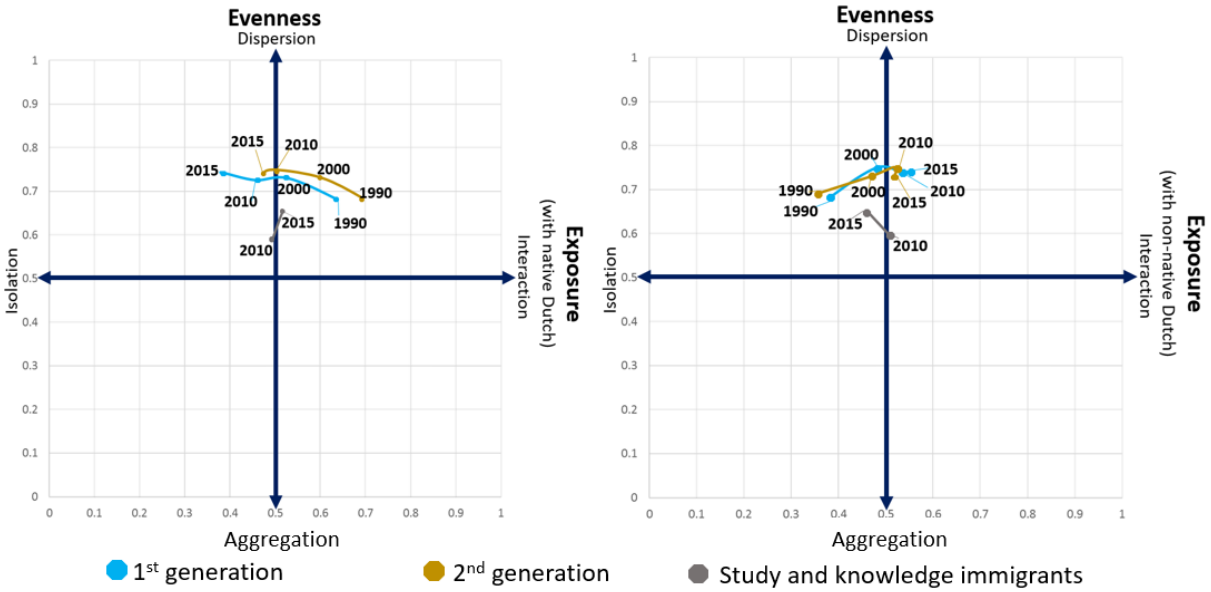

Figure 5-2: Quadrates of two residential dimensions with sub-groups

Surprisingly, the disperse residential patterns amongst first generation immigrants have contradicted the hypothesis that first generation immigrants might have a segregated spatial patterns. The first generation immigrants developed to be distributed more evenly around the city in the period of 1990-2015, which is found in 4.2.2. Besides, from the exposure dimension (Fig.5-2), the first generation immigrants tend to live in mixed neighbourhoods where there are more non-native Dutch but less native Dutch in 2015. Behind this unexpected finding, there are several reasons: endeavour of the Chinese immigrants, the help of the "mixed neighbourhoods" policy from the Dutch government, and the dispersive strategy of managing restaurants. The first generation of the Chinese immigrants strive to work and get out of the plight of living in a segregated area. The Dutch "mixed neighbourhoods" policy, which was launched by the Dutch government at the end of the 20 century to solve the issue of ethnic residential segregations (Gijsberts &

Dagevos, 2010), some Chinese immigrants with low income have moved out of the segregated area of the Katendrecht. The municipality government allocated those low income groups in social housing in some neighbourhoods with few people with the same ethnicity around the city (Alba & Nee, 2003). The strategy of managing restaurants also promotes the first generation immigrants to move around. Aggregation of Chinese restaurants brings self-competition, which push the "restaurants Chinese" to move their restaurant into neighbourhoods with few Chinese restaurants to make more profits. The relocation of restaurants brought the relocation of dwellings.

The residential spatial pattern of the second generation immigrants had verified that hypothesis that second generation immigrants might have a integrated residential spatial patterns. According to the quadrates (Fig.5-2), the second generation immigrants have slightly more exposure to native Dutch and less exposure to non-native Dutch than first generation immigrants. Especially, the second generation immigrants still had more willingness to share neighbourhoods with native Dutch in 2015 than in 2010, even though the population of native Dutch decreased in Rotterdam in that five years. In a word, comparing to the spatial pattern of first generation, the second generation immigrants are slightly more integrated into the native Dutch community.

Both of first generation immigrants and the second generation immigrants have dispersive residential patterns and live in mixed neighbourhoods where there are more non-native Dutch. But the second generation are slightly more integrated into the native Dutch community in residential pattern. To some extent, the similar trend among 1st generation and 2nd generation can be explained by the dependent 2nd generation kids and teenagers.

5.1.3 Study and knowledge immigrants aggregate in north

The aggregated residential patterns amongst study and knowledge immigrants also have contradicted the hypothesis that they might have more dispersed spatial patterns. According to the Fig.5-2, the study and knowledge immigrants are highly aggregated and they have more exposure to the native Dutch even though the native Dutch decreased in 2010-2015.

Indeed, as I discussed in 4.2.1, the study and knowledge immigrants tent to settle in the northern part of Rotterdam, where there more native Dutch live. The northern part of Rotterdam is the prosperous urban area where wealthier people settle.

It is not a surprise that the Chinese students settle in the north, in an aggregated pattern, because universities are located in the north-eastern part of the city. Responding to this aggregation, these students also reside preferably within close proximity to the university and other students (Overmars & Hendriks-Cinque, 2012). The university campus can be seen as a mixed community with native Dutch and international students settling temporarily.

The knowledge immigrants tent to live in the centrum or near the centrum. A number of international companies and offices locate near the centrum. The knowledge immigrants reside preferably within close proximity to their job. Another reason is that life near the centrum is more convenient for all kind of amenities and public services than in other area.

5.1.4 Escaping from poverty neighbourhoods & Decreasing concentration

The residential spatial pattern of Chinese immigrants had experience a change in the period of 1990-2015, which could be seen as process of escaping away from poverty neighbourhoods. Their spatial pattern are getting relatively more even and less concentration.

Chinese immigrants used to live in concentrated neighbourhood. As I found in 4.1.2, in the 1990, more than one fifth of Chinese immigrants population in Rotterdam dominantly settled in the poor

neighbourhood of Katendrecht, as neighbour of the African segregated enclave "Afrikaanderbuurt". According to the urban segregation study (Musterd, 2011), Katendrecht is considered as segregated neighbourhood, being concentred, separated and poor. Arriving as labour workers or for family reunion (Minghuan, 1999), the first generation immigrants dominantly run Chinese restaurants. They have lower educational backgrounds and few social networks with native Dutch (Gijsberts et al., 2011), which are the common individual disadvantages that cause residential segregation.

As their income increases, the Chinese immigrants have moved out the old China town gradually and settled somewhere else in the city, which decreases concentration and segregation in ethnics enclaves. The Chinese immigrants tended to settle in the those neighbourhoods with better conditions, where more native Dutch and wealthier people inhabited (Entzinger & Engbersen, 2014). As I found in 4.3, another reason to move out of the segregated neighbourhoods is that Chinese parents look for better education for their kids. With a higher housing price, those neighbourhoods in the north offer superb public services and amenities (fig. 3-4). As I found in 4.1.2, several neighbourhoods in Kralingen-Crooswijk, Delfshaven and Centrum became new preferred residential areas for Chinese immigrants in 2015. In addition, the Katendrecht is still one of the preferred residential areas of Chinese immigrants in 2015, but it is much less concentrated.

The period of 1990-2015 had seen the prominent changes of residential spatial patterns. Even though residential aggregation still existed, they are less aggregated in a wider area. It is a positive phenomenon that they moved out of the poverty neighbourhood to others, which decreases concentration and segregation in ethnics enclaves in 2015.

5.2 On daily activity spatial patterns

This section discuss the characterises of daily activity spatial patterns of Chinese immigrants and characterises by distinguishing three sub-groups: first generation immigrants, second generation immigrants and the study and knowledge immigrants.

5.2.1 Exposure, intensity and diversity for daily activities

Two dimensions of exposure (vertical axis) and intensity (horizontal axis) for daily activity are combined in Figure. 5-3 while the diversity can be seen on the quantity of different spot. On the vertical axis, the popular places that interviewees mentioned and drew have been listed and ranked into three categories: isolated, medium and interacted.

With the figure.5-3, I found that the first generation immigrants have high frequency amongst the isolated places in their daily life, as well as high frequency amongst the medium exposure places. The Chinese church, Chinese elderly activity centre and other Chinese associations where 1st generation visit frequently have the lowest exposure to other ethnicities (isolated) because people from other ethnicities are exclusive in those place. High intensity amongst the isolated places is seen as segregation.

On the contrary, the second generation and knowledge immigrants have high frequency in those highly interacted places like Dutch/international companies and centrum. The Chinese students and the second generation have high frequency in universities. The centrum (including Hoogstraat, Blaak market), universities and Dutch/international companies are the places with high exposure to other ethnicities because there are more native Dutch shopping, hanging out, working or studying over there. It reveals that they are frequently exposed to native Dutch and other ethnic groups in their daily life. Highly frequent exposure in native Dutch and other ethnic groups in daily spatial pattern is considered as integration, so the second generation and study and knowledge immigrants are more integrated in the native Dutch sand

international society in their daily life. In addition, it is witnessed from figure 5-3 that the first generation, second generation and knowledge immigrants have wide range diversity but the Chinese students has fewer preferred places in daily activity.

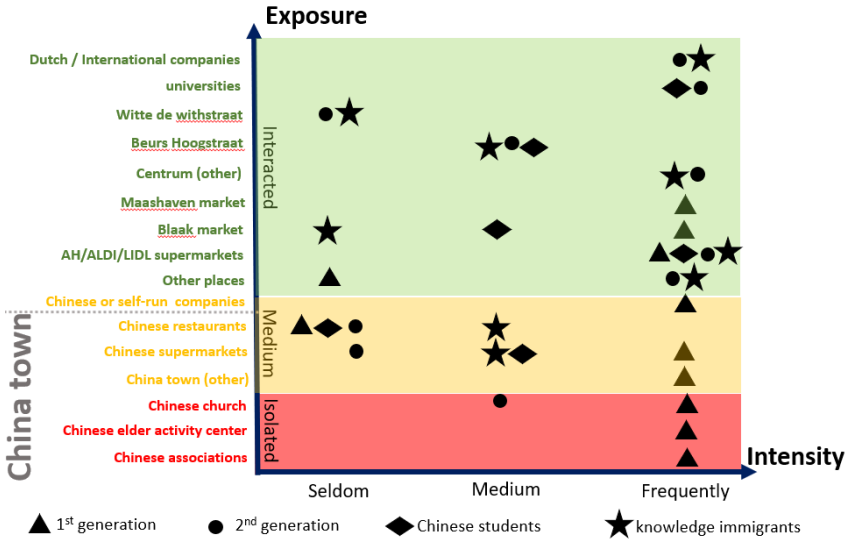

Figure 5-3: Two dimensions of daily activity with sub-groups

I missed the dimension of extensity in the upper discussion from the Li & Wang's four dimension, because I found the daily activities of Chinese immigrants aggregate in several places near the centrum or universities. The distance from home to centrum cannot be interpreted for spatial segregation in this case but the places where they visit can show more clues for spatial segregation.

5.2.2 China town for youths: grocery shopping and eating out

For the second generation immigrants, Chinese students and knowledge immigrants, the China town is a commercial street for grocery shopping and eating out. Those young Chinese immigrants visit China town not as frequently as the first generation immigrants do.

The preference on Chinese food can explain why youths with Chinese origin like to go to the China town. In the interviewers' perspective, there is nothing interesting but a series of Chinese restaurants and Chinese grocery stores in the China town. Among the survey, most of the Chinese youths go to the China town for grocery shopping twice a month or once a week and eating out sometimes (Fig. 5-3). That is a popular street that Chinese immigrants spend their money and have meal with friends. However, all of them confirmed that the China town is not fun at all. And they always spend less than half an hour shopping in the China town. That individual's eating habit is decided by the food in his childhood leads to most of the youths with Chinese origin have preference for Chinese food. Their preference on Chinese food attracts them to the China town to shop Chinese ingredient and visit Chinese restaurants.

Chinese restaurants and Chinese supermarkets in the China town can be considered as aggregated place with the same ethnicity but not isolated places, because they are still open to people with all kind of ethnicities. Not only Chinese go to Chinese restaurants and Chinese supermarkets, but also native Dutch and immigrants from other ethnicities go there for shopping and eating out.

5.2.3 Positive phenomenon for 1st generation: daily activity segregation in China town

Even though the first generation immigrants have a dispersed residential spatial pattern, their daily activity aggregates in some specific places or associations in the new China town, as we see in Fig. 5-3. But it is a positive phenomenon for the elder immigrants because they can help each other.

The Chinese social network attracts the first generation immigrants back to the China town to socialize and to entertain. The first generation immigrants not only go shopping, eating and praying in the China town, but also have different kinds of entertainment activities in the China town such singing, dancing and playing games. They even learn Dutch, learn how to use a cell phone and use computer over there. Those places or associations like the Chinese Christian church, the Chinese elder entertainment centre in the China town, where they meet their Chinese friends, are the popular places for daily activities amongst the old first generation immigrants. To participate in the activities or meet friends, the elder immigrants commute to the China town several times a week and some of them even spend more than an hour traveling to the China town from home. The activity places or associations are only available for the members from the ethnicity of Chinese, so they can be seen as kind of segregated places according to the urban segregation study (Kempen & Ozuekren, 1998).

This actually constitutes a dilemma. These first generation immigrants get together to have self-supporting and self-sufficient daily activities. The first generation immigrants who arrived before 1990 are at least 50 years old and some of them are retired already. Cultural barrels and poor language skill make it hard for them to make friends or socialize with the native Dutch (Gijsberts et al., 2011). Those factors are the causes of daily activity segregation for the first generation Chinese immigrants (Aoki & Santiago, 2015). This first generation immigrants was an isolated group even when they were young, so they have got used to the situation of lack of contacts with native Dutch. Most of them were those "restaurant Chinese" (Minghuan, 1999). They believe that it is tough to live individually. They know the Chinese community will help them to survive in a (still) new country and also for entertainment/social purposes. Some of them have become the most disadvantaged within this group because they are old, unhealthy and they can't work anymore. Some Chinese volunteers with higher educational background and better language skills organise activities for the old first generation immigrants.

Indeed, these Chinese activity centre and other associations are isolated activity places, being separated from other ethnicities. Even though there is a segregated pattern on the daily activity of Chinese immigrants, the Chinese immigrants have a happy entertainment life after being retired. I still consider those specific activity places or associations without any native Dutch as a positive daily activity place. Without those specific places or associations, the elder first generation immigrants might have fewer help and less happiness in their retired life.

5.2.4 Different patterns between 2nd generation and Chinese students

Even though the Chinese students and the second generation immigrants preferred to aggregate those highly integrated places where there are more native Dutch, the second generation immigrants still have more diversity in terms of daily activity patterns than the Chinese students (Fig. 5-3). The daily activity spatial pattern of the Chinese students is only aggregated around their university frequently, with some extension to the China town or shopping streets in the centrum. Different daily activity spatial patterns exists because, apart from ethnicity, the second generation immigrants and Chinese students have very little in common and little connection.

The direct reason behind this phenomenon is the language barriers and cultural differences that the Chinese students have. The second generation immigrants talk Dutch as a native speaker and they are fluent in English (Gijsberts et al., 2011), so they can be involved in the native Dutch circle very well, like a duck in water without any language barriers or cultural differences. In their daily life, they tend to and make friends and socialize with native Dutch. But the Chinese students have relatively poor language skills in English or Dutch, being shy to socialize with native Dutch or international students from other countries. Secondly, the Chinese students, who are more influenced by Confucianism and Chinese traditions than the second generation immigrants, are quiet and "unacclimated" in the Netherlands. In addition, short staying in the

Netherlands makes it hard for the Chinese students to be adapted in the Dutch society. For example, students for a master degree only have one or two years exposure in Dutch community, which is not long enough to conquer language barriers or cultural differences.

2nd generation and Chinese students have notable differences of origins, values and identities, which lead to little connection. Most of the second generation immigrants have a origin from Canton, Hong Kong or Zhejiang while most of Chinese students are not from popular-immigration provinces but other parts of the Mainland China. The 2nd generation immigrants are Cantonese or Wenzhou dialect speakers, who could only communicate with Mandarin-speakers (the Chinese students) through English or Dutch (Alice et al., 2008). Chinese students are influenced by Mainland China culture (Hong et al., 2017), having identity as an authentic Chinese. But the Netherlands born Chinese talk, think, and behave more like a native Dutch so that they tend to have strong identity as Dutch (Gijsberts et al., 2011). As in the interview, Netherlands born Chinese consider the Chinese students are isolated and stick to their narrow Chinese circle. So the little connection between them is another reason for the different spatial pattern.

5.2.5 Knowledge immigrants are more integrated than Chinese students

The daily activity pattern of knowledge immigrants is more integrated than the Chinese students (Fig. 5-3), from the dimensions of exposure, intensity and diversity. Long staying in the Netherlands makes it possible for the knowledge students to reduce language barriers or cultural differences that Chinese students have. Having developing to a knowledge immigrants from students, they have longer-time exposure to native Dutch so that they can build up more connections or friendship with native Dutch. Partnership and intermarriage with native Dutch promote more integrations.

6. CONCLUSION AND RECONMENDATIONS

6.1 Conclusion

With the case of Rotterdam, this thesis explored research problem that the lack of understanding on the spatial patterns of Chinese immigrants in the Dutch context. The main research objectives was to analyse the spatial patterns of Chinese immigrants in Rotterdam for investigating how segregated the Chinese immigrants are.

The residential spatial patterns was an quantitative study analysed with demographic data in 4 digitalized postcode units. With the platform of ArcGIS, maps were drew to show the difference and changes. In the period of 1990-2015, the residential spatial patterns of Chinese immigrants had experience a notable improvement from the state of residential segregation in a poverty neighbourhood into neighbourhoods, which decreases concentration and segregation in ethnics enclaves. They are more integrated into the non-native Dutch communities because of the "native Dutch flight". Until 2015, 1st and 2nd generations immigrants have a disperse residential pattern across the city while Chinese students and the knowledge immigrants tent to aggregate in the relatively rich neighbourhoods where native Dutch live.

The exploration on daily activity spatial patterns of Chinese immigrants found that the first generation Chinese immigrants have daily activity segregation in China town, where the elder immigrants can help each other. Both of 2nd generation and Chinese students have a high exposure to native Dutch. Daily activity spatial pattern of 2nd generation are totally integrated into the native Dutch community while the Chinese students are not as integrated as 2nd generation, because of language barriers, cultural differences and so on. The knowledge immigrants are more integrated in daily activity pattern than the Chinese students, for longer staying in the Netherlands. It is found that the China town is an aggregation area for grocery shopping and eating out among the youths with Chinese origin.

I have adopted the concept of segregation as a theoretical framework to guide my data collection and analysis. However, I would like to argue here that segregation is not entirely suitable to use to describe residential and daily activity patterns of the Chinese immigrants in the Dutch context because they are relatively integrated in some perspectives.

The first generation immigrants have a dispersive residential spatial pattern and more exposure to native Dutch life. However, being neighbours with native Dutch doesn't mean being friends and the mixed neighbourhoods doesn't change their social network and daily activity life. Their daily activity spatial pattern is still relatively segregated because their social network is still within the Chinese community.

The spatial patterns of the second generation immigrants of Chinese immigrants showed that they have been spatially well-integrated. They tend to have a dispersive residential spatial pattern and more exposure to native Dutch. And they interact with native Dutch in their daily life.

The study and knowledge immigrants don't perform as good well as the second generation immigrants in spatial patterns. The study and knowledge immigrants aggregated in/closed to the places where they work or study but they are exposed more to native Dutch, depending on schools or offices. But some of them tend to be isolated in daily life, being not active to be build up social network with natives and they tend to aggregate also in their daily activity.

6.2 Further research

I proposed that further research on the spatial pattern of Chinese immigrants in the metropolitan area of Den Haag-Rotterdam. This metropolitan area is seen as a prosperous urban area encompassing the cities

of Rotterdam and Den Haag as well as 21 other small municipalities nearby (Velinova, 2016), with a large number of Chinese immigrants settling in. This area are well-connected by public transport and their economic activities are well-combined so that there are numerous "intercity" daily activities amongst the Chinese immigrants.

6.3 Recommendations

Targeting different situations among different sub-groups, various recommendation was proposed to the Chinese immigrants. For the first generation immigrants of Chinese immigrants, more helps to meet their needs in retired life are recommended be offered, instead of integration policy to promote more social cohesion with native Dutch. For instance, some financial and policy supports should be offered for entertainment in their retired life. No recommendation is offered for the second generation immigrants themselves. Integration policy is recommended to be applied for study and knowledge immigrants, who have largely potential to get more integrated in the Dutch society. Looking at the bright side, the 2nd generation, Chinese students and the knowledge immigrants will be the dominant people for the Chinese immigrants in the future. As the growth up of the second generation immigrants gradually and the increasing arrival of study and knowledge immigrants, this highly-educated sub-groups of Chinese immigrants will totally change the profile of the Chinese immigrants.

6.4 Contributions

Primarily, this thesis enlarged the knowledge of Chinese immigrants in the Dutch context. It unveiled more details of the Chinese immigration life and discovered the spatial pattern of the Chinese immigrants.
Secondly, this thesis contributed to the urban segregation research. It offer an example to combining residential spatial pattern and daily activity spatial pattern to discuss urban segregation.

6.5 Limitations

Several limitations on data and methods exist in this study. In this section, limitations on data and methods was discussed separately.

Limitation on data

There was a limitation on the demographic data of Chinese immigrants in Rotterdam at 4 digital postcode level, which is a large area including a few neighbourhoods. Therefore, the results and interpretation can reveal some obvious clues but they are still a bit rough on the residential spatial pattern. If this demographic data was at 5 digital postcode or 6 digital postcode, more details can be seen. So it was pity that only demographic data of Chinese immigrants in Rotterdam at 4 digital postcode is available.

Limitation on outcome

There was a limitation on the out coming of the study and knowledge immigrants sorting out from the first generation immigrant in the statistics data because the outcome of clarification is not a 100% correct. The method was invented by the author, based on the knowledge on Chinese immigrants from previous research and knowledge on China.

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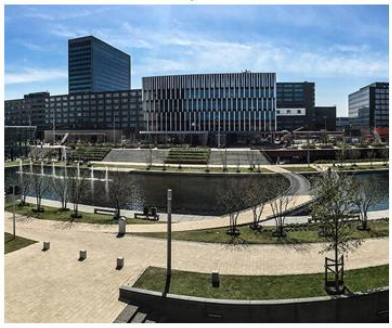
Annex

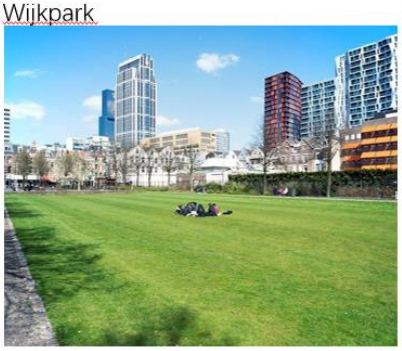
1. Places for primary data collection

Chinese older activity center

Erasmus University



Wijkpark



Chinese church

China town

Hoogstraat

2. Questionnaire for daily activity of Chinese immigrants

Dear Chinese Rotterdammer:

I am JINGYU LEI, a student from university of Twente, majoring in urban planning I am doing my research on daily activity patterns of Chinese immigrants in Rotterdam, and would like to hear from you. Your answers will be confidential and used only for research purposes. It will take about 3 minutes to answer the questionnaire. Thank you for your time and cooperation.

Part 1: Individual details

1. Your gender： A. Male B. Female
2. Your age： _____ year old (please write a number).
3. Which year did you come to the Netherlands? The year of _____
4. How many years have you been living in Rotterdam? _____year(s)(if less than half year, please write "0")
5. Where were you born?
   A. Canton province
   B. Zhejiang province 、
   C. Fujian province
   D. Other parts of China (Mainland)
   E. Hong-Kong
   F. Taiwan
   G. Netherlands
   H. Indonesia
   I. Other country: _____

6. Please select the language(s) you speak among the following languages, which are from the Chinese language family. (you can select more than one answers)
   A. Cantonese
   B. Mandarin
   C. Hokkien
   D. Wenzhou dialect
   E. Hakka language
   F. Other language or dialect_____

7. What is your nationality?
   A. I am a Dutch citizen
   B. I am a citizen of another member state of EU (not the Netherlands)
   C.I am a Chinese citizen
   D. I am a Hong-Kong citizen
   E. I am a Taiwanese citizen
   F. I am a Indonesian citizen
   I. I am a citizen from another country_____(write down the country)

8. Do you have permanent residency in the Netherlands?
   A. Yes
   B. No

9. What is the highest level of education you have completed ?
   A. Elementary school or below
   B. Secondary school or equivalent (HAVO/ WBO)
   C. Associate degree /higher professional education/ HBO

D. Bachelor degree/ WO
E. Master degree or above
F. Other_____

10. Do you have a diploma from a Dutch university?
A. Yes
B. No

11. What is your job category?
A. Student
B. Employed
C. Unemployed
D. Self-employed
E. Housewife
F. Pensioner
D. Other_____

(if you don't have a job, please skip question 12 , 13, continue to answer from question 14)
12. What is your profession?
A. Manager/executive/ director
B. Lawyer, politician
C. Engineer (e.g.: it, mechanics, civil engineer), specialist, technology consultant, doctor architect
D. Scientist, researcher, university teacher
E. Educator (not university teacher)
F. Civil servant、Clerk or workers in service industry
H. Agriculture，animal husbandry or fishermen
I. Skilled workers
K. Small business or individual management
L. Other _____

13. What kind of company do you work in?
A. Dutch government/public institute
B. Dutch private company
C. Chinese private company
D. International company
E. Self-run company
F. Self-employed
G. Not employed
H. Other_____

14. How many people are there in your household?
A. Only one
B. Two
C. Three
D. Four
E. Five or more than five

15. How many children do you have ?
A. I don't have any children
B. One child
C. Two children
D. Three children or more than three

Part 2: On your daily activity

16. What kind of transport mode do you use to go to work most often(to school if you are a student)?
   A. By car
   B. By train
   C. By metro
   D. By tram
   E. By bus
   F. By bike
   G. On foot
   H. Work at home
   I. Other_____

17. How much time does it take from your home to your work place /school? _____ minutes

18. Who do you go with when you do the following activities. (please use "√" to select it in the table)

	Shopping (e.g.: grocery, supermarket, open market, clothes or cosmetic shopping)	**Sport** (e.g.: ball sports, fitness, swimming, climbing, skating, boating, sailing)	**Socializing** (e.g.: Eating out, visiting friends)	**Entertainment** (e.g.: watching movie, watching football game, visiting exhibition, bars)	**Private affaires** (e.g.: visiting doctor, banking, praying and so on)
Hang out alone					
With family members					
With Chinese friends					
With Dutch friends					
With friends from other ethnicity					
With others					

3. Interview question

1. Where in Rotterdam do you live?(mapping)
2. What kinds of ethnic group are there in your neighbourhood? Dutch, Chinese or other ethnicity? Which group are dominant in your neighbourhood? (Zhang, 2013)
3. What makes you select this neighbourhood to live? (Zhang, 2013)
4. Where do you work? (mapping)
5. Please select several places in Rotterdam where you visit frequently in your leisure time(no more than four). (mapping)
6. What do you do over those places in your leisure time? (Wang et al., 2012)
7. What do you like about those places?
8. How frequently do you visit those places? (Wang et al., 2012)
9. How much time do you spend averagely in each place? (Wang et al., 2012)

Specific Objectives	Research questions	Data Collection Methods	Tools or Software Requires	Analysis Methods	Anticipated Results
To explore method to investigate the the spatial pattern of Chinese immigrants	• To what extent does ethnic distribution conceptualize residential spatial pattern of Chinese immigrants?	Library seaching,		Liturature review	Conceptualization of esidential spatial pattern, Methods to measure spatial pattern
	• What methods can be suitable to measure residential spatial pattern ?				
	• What methods can be applied to measure daily activity spatial pattern ?				
To anaylse the residential spatial pattern of Chinese immigrants in a major Dutch city.	• Where are Chinese immigrants residing in Dutch major city ?	Secondary data, questionaire	ArcGIS, SPSS, excel	Segregation dimension, module, GIS	map, Segregation index, Relationship of factor
	· How did the residential spatial patterns of Chinese immigrants in Rotterdam change in the period of 1990–2015?				
	• Which get more segregated among the Chinese immigrants for the residence?				
	• What is the heterogeneity of residential spatial pattern between the Chinese immigrants and other ethnic group?				
To analyse the daily activity spatial pattern of Chinese immigrants in a major Dutch city.	• Where do Chinese immigrants usually go for leisure/ work/ daily life activities in Dutch major city?	Participation map, Walking interview	ArcGIS, Auto recorder,	Qualitative-GIS	Transcription, Maps, Discussion
	• Who get more integrated or more fragmented among the Chinese immigrants for their daily activity?				