Retroflex and Non-retroflex Merger in Shanghai Accented Mandarin

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Abstract

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The Mandarin spoken in Shanghai differs in some aspects from the Mandarin spoken in Beijing. One of the most notable differences is a merging of the retroflex consonants with the non-retroflex ones (Zheng, Sproat, Gu, Shafran, Zhou, Su, Jurafsky, Starr, & Yoon, 2005). Based on quantitative analysis of three pairs of phonological variables [ʂ] vs. [s], [tʂ^{h}] vs. [ts^{h}], and [tʂ] vs. [ts], this thesis takes up the study of retroflex and non-retroflex merger in Shanghai-accented Mandarin, by using recorded interviews to explore whether such variation is correlated with social class, age, gender and task formality.

The statistical results indicate that social class, age and task formality all have a significant effect on retroflex and non-retroflex merger for Shanghainese. Gender, however, was shown not having a strong correlation with retroflex and non-retroflex merger.

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1. Introduction

Thesis Overview

As China's most developed city, Shanghai not only attracts millions of dreamers, its language use also attracts many scholars' attention. The common observation that Mandarin use is increasing in Shanghai (Wu & Gordon 1987, Chu 2001, Yan 2003) is supported by recent language attitude surveys indicating that Shanghainese people hold increasingly positive views of Mandarin (Bai 1994, Zhou 2001). If Mandarin is indeed popularizing in Shanghai, are the people there speaking it in a standard way? Before I go further, it might be necessary for me to provide a bit information on standardization and standard Mandarin. According to Milroy (2001), standardization consists of the imposition of uniformity upon a class of objects, which involves conscious human intervention in language maintenance and language change. An important ideological effect of "standardization" is the firm belief of correctness (Milroy, 2001). As for the standard Mandarin, Li (2004) gives detailed explanation based on the definition made by the State Council in 1956: standard Mandarin ''is modeled on the pronunciation of Beijing, draws on Northern Chinese as its base dialect [i.e., lexicon], and receives its syntactic norms from exemplary works of vernacular literature". The use of standard Mandarin as the medium of instruction in the educational system and in the media has contributed to the spread of the notion of standard Mandarin. As a result, Chinese people clearly understand which is

standard and correct Mandarin and which is non-standard and incorrect.

The current study uses recorded interviews to examine whether or not Shanghainese were using standard mandarin features or not in Shanghai, and how speakers' social class, as well as age and gender might correlate with the use of standard and nonstandard linguistic variables.

Putonghua, or "common speech", is the official name of standard Mandarin in mainland China (Dong, 2010). However, Chinese is a vast dialectal complex containing hundreds of mutually intelligible local varieties (Norman, 2007). Among the many Mandarin varieties, one that is much-studied is Southern-area Mandarin. It has been widely observed that the Mandarin spoken in areas where southern Chinese dialects dominate differs in some features from the Mandarin spoken in Beijing (Chen 1999, Yao 1989, Chen 1990). Such areas include Shanghai. A recent study by Zheng et al. (2005) investigated change in Mandarin in Shanghai by studying the merging of the retroflex series of the consonant initials [ʂ], [tʂ^{h}], [tʂ] into the alveolar series [s], [ts^{h}], [ts]. Their data indicate that standard use of retroflex (not merged) is associated with younger female more educated speakers, based on reading passages rather than spontaneous speech.

The following thesis takes up the study of retroflex and non-retroflex merger in Shanghai-accented Mandarin by using recorded interviews to explore whether such language variation is correlated with social class.

We can hardly consider the social distribution of language without encountering the pattern of social stratification which pervades the life of the city (Labov, 1966). A

number of sociolinguistic studies (Labov 1966; Wolfram 1969; Fasold 1972; Trudgill 1974) have convincingly demonstrated that linguistic variation may correlate extremely closely with social differences.

One of the most important contributions of Labov's quantitative paradigm has been to allow us to examine systematically the relationship between language variation and speaker variables such as sex, ethnicity, social network, and social class (Milroy & Milroy 1992). Although there are several classical sociolinguistic studies that focus on English language variation and social class, very few of such quantitative analyses have been carried out on Mandarin. One of the few studies was by Zhang (2005), which provides a rigorous variationist account of the Mandarin spoken in Beijing by employees of state-owned vs. foreign-owned businesses. My principal interest in the current research is to study the correlation between language variation and social classes in Shanghai, another large city in China.

The interviews conducted for this research included the collection of demographic information, an interview about the subjects' lifestyle, a modified map task and wordlist task. Three methods of measuring retroflex merger were used to carry out a quantitative acoustic analysis: Noise peak, skewness, and lowering F3.

The research examines the effect of social class, age, gender and task formality on the retroflex merger in Shanghai. The thesis seeks to contribute to sociophonetics studies on retroflex and non-retroflex merger of accented Mandarin. Results of this study will provide a better understanding of such linguistic phenomenon in Shanghai. The study will show how linguistic practice in the local site of Shanghai is influenced

by what is happening in the transnational Chinese community and the global market.

Organization

The thesis is organized as follows: Section 2 provides information on the Chinese language, Chinese social classes, and previous literature on retroflex merger in Mandarin. Section 3 describes methods used in the study. Section 4 discusses results. Section 5 draws conclusions and discusses further implications.

2. Background

Introduction

This chapter introduces background information for the current research, with a focus on the broad socio-cultural context of modern China. Section 2.2 gives brief overview of the modern Chinese language. Section 2.3 reviews previous work on retroflex/non-retroflex merger in local Mandarin. Section 2.4 provides some recent studies on the Chinese social classes. The last two sections, Section 2.5 and Section 2.6 describe the history of Shanghai, as well as its demographic distribution and sociolinguistic information of this city.

The Chinese Language

The term “Chinese” actually encompasses enough diversity to rival that of many language families. However, throughout history the different varieties contained under the umbrella of this term have traditionally been thought of as one language (Gilliland, 2006).

According to Norman (1988), the Chinese dialects are traditionally classified into seven groups. They are: Mandarin, Wu, Xiang, Gan, Hakka, Cantonese, and Min. Of these, the Mandarin dialect family is by far the largest, being spoken by around 70% of Han Chinese in China. For the purposes of this study, the most important thing to note concerning the different varieties of Chinese is that a great many of them are

mutually unintelligible.

While many varieties of Mandarin are spoken throughout China, only the official standard, *Putonghua* (‘common language,’ hereafter PTH), is promoted by the government, which is also known as standard Mandarin. As mentioned in Zhou (1999), conformity to government standards is portrayed by the Chinese communist leaders as a sign of modernization and progress, while emotional attachment to local dialects is identified with the feudalism of old society. Such prescriptivism causes people to have different attitudes towards “local Mandarin”, which has phonological, lexical, and syntactic features of the local dialects of different regional varieties of Mandarin which may sound different, but are still intelligible to the average Mandarin speaker (Lin, 2000). For example, as Lin (2000) mentioned, the retroflex initials [ʂ], [tʂ^{h}], and [tʂ] are perceived by many Chinese as the single most salient feature of Northern Chinese (more “standard” Mandarin), and as such have been an object of both pride and derision. Specifically, it is not uncommon in Northern China to encounter attitudes which see retroflex-less speech as substandard and uneducated. In parts of the South, however, the use of retroflex-less speech is viewed as local and friendly (Ding, 1998).

Before heading further, it may be necessary to briefly introduce the features of standard Mandarin, PTH. PTH is based mainly on the Mandarin dialects, and most closely resembles the variety spoken in the capital city, Beijing (Norman, 1988). According to its official definition, PTH ‘‘is modeled on the pronunciation of Beijing, draws on Northern Chinese as its base dialect [i.e., lexicon], and receives its syntactic

norms from exemplary works of vernacular literature'' (Yao, 1998). As Yao(1998) mentioned, the promotion of Beijing Mandarin based phonology as the standard, then, makes PTH contrast sharply with varieties of Southern Mandarin, which lack many features of PTH, including neutral tone, final rhoticization, and retroflex initials.

Recent researches in Mainland China and Taiwan suggests that linguistic scholarly interest in Mandarin varieties is increasing. For example, Chen (1999) discusses that owing to interference from the local dialects, the great majority of Chinese people inevitably speak PTH in a way which may vary greatly in terms of the degree of approximation to the prescribed standard as coded in *Xiàndài Hànyǔ Cídiǎn* [*Modern Chinese Dictionary*], or as represented by announcers on CCTV (China Central Television). Zhang (2005) also studied 'hybrid Chinese' as another new variety of Mandarin spoken by employees of state-owned vs. foreign-owned businesses, who make use of a variety of Mandarin with Southern features, which are thought to be more cosmopolitan, to present their modern, sophisticated and cosmopolitan yuppie identity. She attributes this phenomenon as result of China opening up to the global market and China becoming a participant in the transnational Chinese community Zhang (2005).

Previous Work on Mandarin Consonant Merger

As early as 1928, Chinese dialectologist Yuen Ren Chao was doing research in the Chinese Wu dialect and published descriptions of merger of retroflex and dental

sibilants in Shanghainese (Chao, 1928).

But it was only recently that retroflex consonants have come to attention of linguists. In an unpublished manuscript, Starr & Jurafsky (2004) report research on the retroflex variable in Shanghai. In standard Mandarin (PTH), there is a distinction between [s] and [ʂ], [ts^h] and [tʂ^h], [ts] and [tʂ]. But in most Mandarin varieties in Southern China, there is a merger of these two sets of sounds such that there is only /s/, /ts^h/ and /ts/ (Chung 2006, Star & Jurafsky 2004). This merger is more explicitly stigmatized as uneducated and incorrect than other Southern features (Li, 2004, Star & Jurafsky 2004). The focus of Starr & Jurafsky (2004)'s study is to look at the merger, i.e., the use of a dental sound where standard Mandarin expects a retroflex. In their study of a corpus of 100 speakers, they found that the social variables significantly correlated with the use of retroflex. Younger speakers, female speakers, and more educated speakers were all more likely to use the standard retroflex (Star & Jurafsky 2004). See Figure 1.

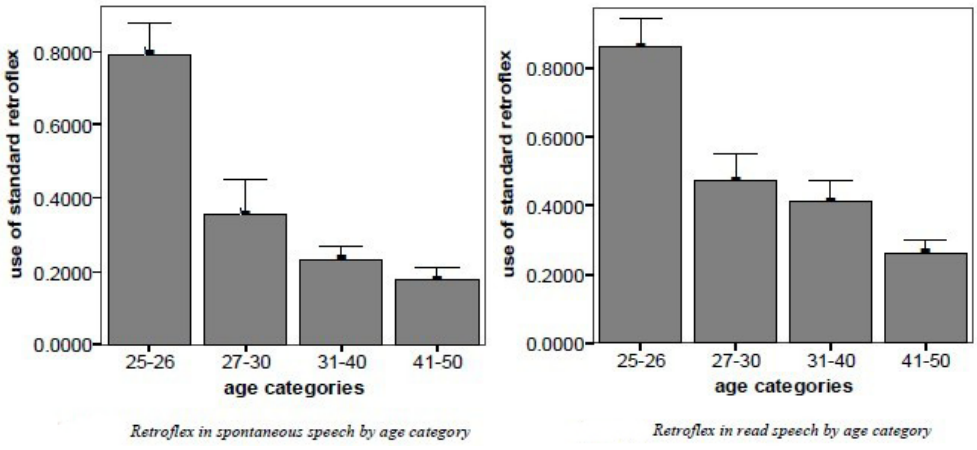


Figure 1: Retroflex in spontaneous speech and read speech by age category (data from Starr & Jurafsky 2004)

There are also some studies regarding the retroflex and non-retroflex initials in Taiwan. For example, Chung (2006) studied a parallel movement which is in seemingly the opposite direction of a widening acceptance of attenuated retroflexed initials ([tʂ-, tʂ^{h}-, ʂ-]): a growing use of the retroflexed initials in certain contexts. The conflict between the two trends often surfaces in the form of hypercorrection. As Chung (2006) puts it, a speaker may consciously adopt a different style from that of the listener, out of a desire to come across as more educated or authoritative than he or she actually is.

The Chinese Social Classes

Chinese sociologists define social class in the classic Marxian sense of ownership and control over the means of production and control over the labor power of others (Kohn, Li, Wang & Yue, 2007). According to Lu（2002), during rural land reform and the urban reorganizations of the early 1950s, individuals throughout China were classified into categories on the basis of these individuals' ideological status: working class, peasant class, and intellectual class. These are the "old class" labels (Lu, 2002).

Emerging Chinese Middle Class

Over the last two decades, China's social structure has undergone significant changes. While still largely an agricultural country with more than 70 percent of the

population being farmers, China has evolved into a mixture of a quasi-capitalist economy combined with an autocratic communist government (Qu, 2005). Qu (2005) mentioned that such development has brought about the reshuffling of the old structure and, at the same time, created new social classes.

The question that follows immediately after such a classification is: “Who are the middle class, and who are the working class?” It is a greatly controversial issue in China. Nobody can give a clear and satisfactory answer. There are many different and conflicting definitions (Li (2009). According to Li (2009), three criteria are mentioned to classify middle class in Mainland China. The first criterion is income. Middle class includes people with higher and stable income. The second criterion is occupation. Middle class includes people in a professional or managerial occupation. The third criterion is education. Middle class also includes people with higher levels of education. In addition, the public media and white-collar professions have created a typical image of middle class based on the consumptive behaviors and life-styles of richer people. Thus, consumption becomes the fourth criterion. Middle class means one can afford large houses, luxury cars and other expensive goods (Li, 2009).

The Restructuring of Chinese Working Class

The Chinese working class has been experiencing restructuring since marketized economic reform in late 1978. According to Lau (1997), in urban areas, in the past, the government undertook to assign jobs for new entrants into the urban

labor force under the central allocation system. The central allocation system is a unitary system, in which the central government had absolute control over production and distribution of goods and services (Lin & Liu, 2000). According to their study, this system was gradually dismantled when China abolished mandatory recruitment plans and state-owned enterprises enjoyed complete autonomy in recruitment without interference from government departments (Lin & Liu, 2000). As a result, massive numbers of workers were laid off. Some of them were transferred to undesirable or lesser-paying posts. *Daigang* workers (Laid-off workers awaiting new postings) were either put on re-training, long leave, or some other similar arrangements, earning only a certain percentage of basic wages (Lin & Liu, 2000)..

In rural areas, collective farming was completely dismantled and died out by 1983 (Lu 2001). As autonomous producers, peasant households had the rights to free themselves from working the land to work locally or elsewhere for higher income from a nonagricultural job (Nee 1989, Unger 1994). As a result, migrant peasant labor flooded towns and cities (Ma 2001). The once homogeneous “peasant class” (Parish 1975, Chan et al. 1992) became differentiated in many ways (Bian, 2002). For example, some of these people are businessmen, some are employees in collective industry, and some are peasant workers dwelling in big cities Lu (1989, 2002).

Brief History of Shanghai

Founded in the 10th century, the city was located in a swampy area in Southeast China. See figure 2. Until 1127, Shanghai was a small market town of 12,000 households. The Shanghai region became one of China's most prosperous in the 13th century, after becoming a cotton production and manufacturing center.

Figure 2: Map of Shanghai, China. (From Central Intelligence Agency, 2011)

Opened forcibly to foreign trade and residence at the conclusion of the Opium Wars in 1843, Shanghai became a modest domestic trading mart and low-level administrative center in China. At the end of that critical century, it became a world city, ranking in size and influence just behind London, Paris and New York (MacPherson, 2002).

Due to the Communist victory in 1949, most foreigners left Shanghai and the Chinese Communist state took control of the city and the formerly privately-held businesses (Gilliland, 2006). According to Gilliland (2006), industry was severed.

During the Cultural Revolution (1966-1976), hundreds of thousands of Shanghainese locals were sent to work in rural areas throughout China. The open door policy in 1976 allowed a political and economic revival to take place in Shanghai. Since then, Shanghai gradually became a darling city of new China, a city where infrastructure change and economic growth are taking place on a scale once thought impossible (Gilliland, 2006).

The Population and Shanghai Identity

Shanghai dialect is the primary native language of Shanghai residents. It belongs to the Wu language family, and is mutually unintelligible with Mandarin (Liu, 2004).

Since the Qing Dynasty (1644-1911 AD), Shanghai has witnessed two waves of migration. The first wave occurred on the heels of the Opium War in 1842 when Shanghai served as an open port to British colonialists. During this period, the Shanghai dialect was suddenly infused with lots of loanwords (Qian, 2000) as foreign words were largely popularized among locals and were employed in daily conversations. As Qian (2000) stated, several of these languages were later developed into what is now called Yángjìbāng (Pidgin English). In the years that ensued, however, the Shanghai dialect demonstrated its stability, and was “never overwhelmed or supplanted by any other languages” (Qian, 2000).

The second wave transpired after the reform and opening-up policy in late 1978, when China underwent a fundamental structural transformation from a highly

centralized planned economy to a robust socialist market economy (Qian, 2000). Economic reforms in rural areas, specifically the introduction of Jiātíng Liánchǎnchéngbāo Zérènzhì (the system of the rural household responsibility contract), significantly increased production efficiency and facilitated the turnover of rural workers. Meanwhile, the expanded income gap between urban and rural workers produced a direct economic motivation for the surplus workers in rural areas to move to cities. Since the 1990s, Shanghai has experienced a major influx of migrant workers from various regions across China (Qian, 2000). See Figure 3.

Another group of migrant settlers is comprised of Chinese college graduates. Favorable economic conditions and promising job opportunities encourage them to settle in Shanghai instead of returning to their hometowns after graduation. This group mainly constitutes the middle class families in this study.

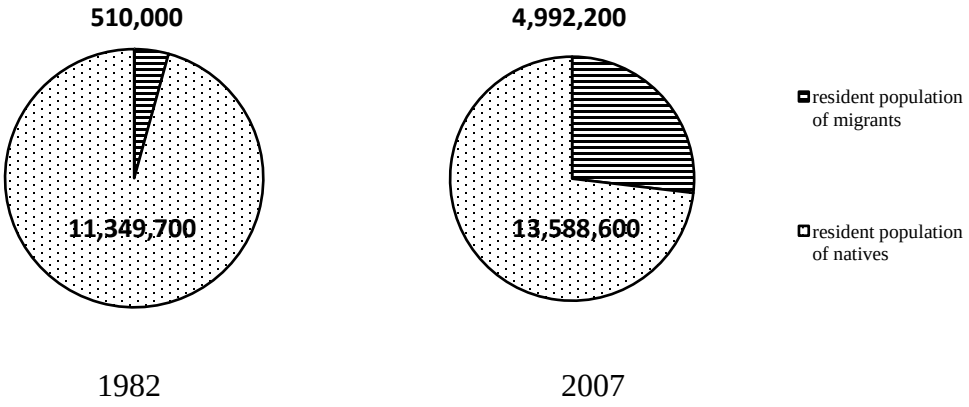


Figure 3: Chart of Migrants vs. Native residents in overall population in Shanghai (Shanghai Statistics Bureau, 2008)

From the late nineteenth century to the mid-twentieth century, immigrants consistently made up about 80 percent of the city's population (Lu, 1999). Because of the large percentage of immigrants, the notion of a distinct Shanghainese identity

became a strong one, both inside Shanghai and in the rest of China. Gamble (2002) asserts that many Shanghainese often use the Shanghai dialect as a test to determine if a person should be viewed as in-group or out-group. He further states that many Shanghainese say that speaking in the Shanghai dialect immediately gives one a feeling of being *qinqie*, which can be translated as "intimacy" or "closeness". As a result, the word "Shanghai person" is often associated with sophistication, astuteness, and a certain degree of Westernization (Lu, 1999).

The Sociolinguistics Situation in Shanghai

Chu (2001) posits a linguistic distinction in Shanghai between High, Middle, and Low varieties. Traditionally, Shanghai has been described as triglossic: The High variety is Standard Mandarin (PTH), the Middle is the Shanghai dialect, while the Low is actually a number of different Chinese dialects that are spoken by immigrant families or families whose ancestors immigrated to the city. This paper, however, only focuses on the High variety, PTH, as well as one variety of PTH, Shanghai-accented Mandarin.

Although there is a consensus among authors and Shanghai natives that the linguistic situation in Shanghai is undergoing a rapid shift toward Mandarin, and away from Shanghainese (Wu & Gordon 1987, Chu 2001, Kang 2003, Starr & Jurafsky 2004), there are no quantitative studies confirming this reported shift. As mentioned in Section 2.5.2, Shanghainese natives have traditionally been stereotyped as arrogant and

exclusionary; in other words, the perception is that they think Shanghai is the greatest city in China, and that Shanghainese people consider themselves as better than everyone else (Gilliland, 2006). According to Bai (1994) and Starr & Jurafsky (2004), while the rest of China dutifully adopted Mandarin, or at least admired it as a standard, Shanghainese people have been viewed as unnaturally proud of their own dialect and disdainful of anyone who does not speak authentic Shanghainese (Bai 1994, Starr & Jurafsky 2004).

It is widely observed that the Mandarin spoken in Shanghai differs in some respects from the Mandarin spoken in Beijing (Chen 1999, Yao 1989). One of the most notable differences is a merging of the retroflex consonants /ʂ, tʂ^{h}, tʂ/ and the dental/apical /s, ts^{h}, ts/, for example, *chuanyi* "to wear clothes" is pronounced as [ts^{h}uæn i:] in Shanghai-accented Mandarin, whereas it is [tʂ^{h} uæn i:] in standard Mandarin. This is usually attributed to the lack of retroflex onset in the dominant local dialects: Shanghainese doesn't have a retroflex/non-retroflex distinction; in other words, it doesn't have retroflex fricatives or affricates like Mandarin does. Most of the retroflex fricatives and affricates in Mandarin are replaced by their alveolar fricatives or affricate (non-retroflex) counterparts in the Shanghai dialect (Chen, 1999). Against the backdrop of the language standardization taking place throughout China, such a merger in Shanghai-accented Mandarin is quite stigmatized in places other than Shanghai (Li 2004, Starr & Jurafsky 2004).

This paper will examine the usage of retroflex and non-retroflex consonants, and whether such usage can be predicted by task formality as well as speaker variables.

3. Methods

Introduction

In this section I describe the methods used in this study. Section3.2 provides information on subject recruitment and sample demographics. Section3.3 illustrates methods for indexing social classes. Section3.4 describes the instrument used in data collection. Section3.5 explains the three tasks performed by each speaker, including an interview (Section3.5.1), a map task (Section3.5.2), and a word list (Section3.5.3). Section3.6 and Section3.7 describe the acoustic and statistical methods used in analyzing the data respectively.

Participants

The fieldwork for this study was conducted in March, 2011 in Shanghai, China. Altogether 24 subjects were recruited for this study. Recruitment was done through networking by using contacts that my family and I had made in Shanghai.

Subjects were native Shanghai dialect speakers 18 years or older. Of the 24 participants used in this study, all except one were born and raised in the city center of Shanghai (as opposed to the suburbs), and they all self-identified as speakers of mainstream *Shanghainese*, as opposed to subvarieties of *Shanghainese*. Prior to the investigation, they signed a consent form and completed a demographic questionnaire concerning their basic personal information. (See Appendices A & B). The

questionnaire gathered information on speaker sex, age, occupation, salary, education, mother tongue as well as their parents' mother tongue. The questionnaires show that all participants were born in Shanghai, with the exception of one participant who moved to Shanghai at the age of four (the admittedly arbitrary cutoff age decided upon for this study was five). Among these questions, occupation, income, and education are used to determine subjects' social classes. As Kohn & Slomczynski (1990) point out, social stratification is a single socioeconomic continuum inferred from the covariation of educational attainment, occupational status and job income.

Breakdowns by sex and age group are provided in Table 2.

Education levels ranged from a high school education to PhD degrees. Breakdowns by education levels are provided in Table 3.

All of the 24 subjects self-identified as both a standard Mandarin and Shanghai dialect speakers. Two out of 24 subjects reported that one or both of their parents speak either Mandarin or Shanghai dialect, but cannot speak both.

Table 1. Number of subjects by sex and age group. (n = 24)

	Age 18-30	Age 31-40	Age 41-50	Total
Male	4	4	4	12
Female	4	4	4	12
Total	8	8	8	24

Table 2. Number of subjects by education level. (n = 24)

	Senior high	Associate's degree	Bachelor's degree	Master's or above	Total
Male	2	3	3	4	12
Female	3	3	3	3	12
Total	5	6	6	7	24

Indexing Social Class

In order to discover the status groups the subjects belong to, a set of criteria for ranking individuals was devised based on Labov (1966) and Trudgill (1974). Labov (1966) used a three-component index for his New York subjects. Based on information about occupation, education, and family income, he placed individuals on a 10-point scale with each factor weighted equally. Trudgill (1974), on the other hand, used a six-component index in which each component had scores ranging from 0-5. The six components were occupation, father's occupation, income, education, locality and housing type. In the current study, I use occupation, salary, and education as a three-component index, because it better suited to the social contexts of shanghai. As shown in table 3. Each component ranges from 0-6. I also modified occupation categories, income and education level to better match the actual conditions of China. More specifically, for example, I added civil servant to the occupation category. Currently there are about 10 million civil servants in China (Kjeld &,Chen, 2011).

Because the job security and good welfare benefits, government jobs have become more and more attractive in China. As a result, the competition becomes fierce as thousands of college graduates take the annual civil servant exams. Not surprisingly, the final job-takers are comparatively well educated, smart and intelligent, which is why I put civil servant above company employees. Also, when assigning job category to the subjects, I encountered ambiguities. For example, a computer engineer could be considered “professional workers” as well as “company employees”. In this case, I put them in the former category, given that this group of people are well educated and have a relatively high salary. “Company employees”, refers more to those who are semi-skilled.

The criteria and their associated weights for each component are listed in Table 3.

Table 3. The three components of socioeconomic index for Shanghainese with their relative weights.

Ⅰ **Occupation**	**Score**
Professional workers	**6**
Employers, managers	**5**
Civil Servant	**4**
Company employee	**3**
Self-employed	**2**
Farmer	**1**
Unemployed	**0**

Table 3 continued

Ⅱ Salary (RMB/month)	
above 30000	**6**
20000-30000	**5**
8000-10000	**4**
6000-8000	**3**
4000-6000	**2**
2000-4000	**1**
1000-2000	**0**
Ⅲ Education	
PhD	**6**
Master's Degree	**5**
Bachelor's Degree	**4**
Associates' Degree	**3**
Senior High School	**2**
Junior High School	**1**
Elementary School	**0**

The range of possible scores from the 3 components with 7 values each is 0-18. The actual range for the current study's subjects was 2-12. I assigned my subjects to social classes as follows:

Score 9-12 Middle Class

Score 2-8 Working Class

At the first glance, this might seem inappropriate, since the score range 9-12 seems relatively narrow compared with score 2-8. However, Figure 4 shows that none of the subjects get the score 3, 4 or 7. In other words, each class of people is distributed to equal number of scores.

Altogether, there are 12 subjects who belong to the middle class, and 12 who belong to the working class. Below is the distribution of each score:

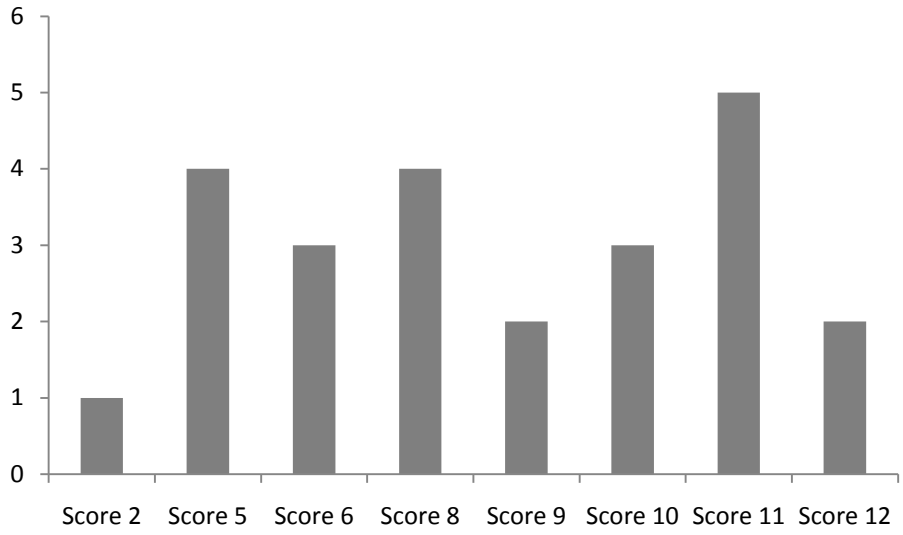


Figure 4: Number of subjects for score 2-12

Instrumentation

All the recordings were done in a quiet room either in the subjects' own house or in an insulated conference room in the subject's work place, using an M-Audio microtrack 24/96 flash recorder and an Audio Technica AT3031 tabletop microphone. The rooms chosen for recording had no computers or other electronic equipment such as refrigerators which might produce background noise on the recordings. Also, it must be bright enough even when all the lights were turned off, so as to avoid the

noise that fluorescent and other types of bulbs produce in recordings. Each task was recorded as a separate track at 44.1 kHz and 16-bit in WAV file format. The recordings were then transferred to a computer and resampled at 11.25 kHz before analysis in Praat (Boersma & Weenik 2010).

Materials and Data Collection

Interview Task

Subjects participated in a one-on-one interview at the participants' residence. Each interview lasted a minimum of 15 minutes. (See Appendix C). The interview task is designed to gather information which can be used to determine a subject's social class, while also eliciting a more spontaneous style of speaking. The interview focused on two general topics: background information and lifestyle.

The first section of the interview focused on basic personal information and was primarily intended to gather background information about the subjects and confirm their answers to the demographic questionnaire.

The second section of the interview was the subjects' self-report about their living style, pastimes, favorite food, etc. Some of these answers in the interview were useful in assisting my determination of classifying the subjects into different social classes, but they are more or less for my own reference, and don't have a direct effect on class classification. For example, the subjects were asked which kind of public transport they used. They also discussed whether they do the housework themselves

or hire a part-time cleaner. Some of the questions that were initially designed to elicit the subject's consumption habits, however, failed to help identify those habits. For example, the subjects were asked which supermarket they often went to, but most of the subjects' choices are based on proximity, rather than on brands or prices. Therefore aspects of consumption were excluded from social class designation

Map Task

Map tasks were originally developed in speech and hearing sciences to elicit connected speech in a semi-scripted way, allowing for the study of suprasegmental and segmental features (Anderson, Bader, Boyle, Doherty, Garrod, Isard, Kowtko, McAllister, Miller, Sotillo, Thompson, and Weiniert. 1991). The map task was expected to be intermediate between the interview and the word list with respect to formality (Oxley 2009). The variety of spoken language allows the participants to introduce, focus on, and keep track of entities (Anderson et al. 1991). In current phonetic research, map tasks are used to elicit words containing specific phonetic variables (Ladefoged 2003).

The map task in the current study is more like a picture description task, which lasts approximately 5 minutes per person on average. The basic format of the picture is adapted from the map task in Oxley (2009)'s study. The map shows a fictional route with various signs indicating the landmarks a fictional couple see when they start off from their home on their way to their cousin's home. See Appendix D. The

subjects are asked to make up a story by telling what the couple see on their way to their cousin's house by using all the landmarks appearing on the map. They are allowed to add words themselves, however, any other tokens produced in the course of giving directions won't be analysed in this study. The map contains 27 possible tokens, which are distributed equally among the three retroflex consonants /ʂ, tʂ^{h}, tʂ/. The percentages of retroflex tokens which are "de-retroflexed" in each subject's speech were calculated. The task was explained to the subjects before they started the recording and they were given an opportunity to ask questions if they were not clear about the task.

Word List Task

The last task that each subject was asked to perform is the word list task. (See Appendix E). The task lasts approximately 10 minutes per person on average. The word list includes 59 randomized phrases in total, 45 of which contain the target characters. All target characters are open syllables with a retroflex initial and one of four vowels: [a], [i], [u], [ə]. The four vowels are equally distributed among the 45 target characters. The target character was read twice in each carrier phrase. Tones are disregarded in this study. In each carrier phrase, the target character was first read in a word, then it was read again as an isolated character, for example, one phrase could be literally translated from Chinese as "read RED bean's RED". The list is padded with 6 dummy phrases (3 at the beginning, 3 at the end), with additional distracter phrases

scattered randomly throughout the list. All the subjects were asked to read three copies of the word list that had different phrase orders. Again, the task was explained to the subjects before they started the recording and they were given an opportunity to ask questions if they did not understand.

Acoustic Analysis

Acoustic Cues of Retroflex/Non-retroflex Consonants

According to Hamann (2004), [ʃ] and [ʂ] are very similar acoustically. Therefore, in the acoustic analysis, I assume [ʃ] and [ʂ] bear similar acoustic cues.

Based on Jongman, Wayland, & Wong (2000), the overall spectral shape of each fricative is determined by the size and shape of the oral cavity in front of the constriction. The longer this anterior cavity, the more defined the resulting spectrum (Jongman, Wayland, & Wong 2000; Stevens 1998). Since the alveopalatal sibilant (retroflex) has a longer anterior cavity than its alveolar counterpart (non-retroflex) does, I predict that [ʂ], [tʂ^{h}], [tʂ] have a more defined, distinct spectrum shape (more peaked kurtosis) than [s], [ts^{h}], [ts], whose kurtosis are relatively flat.

In addition, alveolar sibilants can be distinguished from alveopalatal sibilants on the basis of the spectral properties of the noise (Jongman et al. 2000; Evers, Reetz, Lahiri, 1998; Shadle 1990; Behrens and Blumstein 1988; Heinz & Stevens 1961; Strevens 1960; Hughes & Halle 1956). According to Ladefoged, the frication noise in [s] is centered at a high frequency, between 5000 and 6000 Hz. The noise in [ʂ] is

lower, extending down to about 2500Hz (Ladeforged, 2005).

Furthermore, skewness can also be used to distinguish retroflex and non-retroflex consonants. Skewness is an indicator of a distribution's asymmetry. Positive skewness suggests a negative tilt with a concentration of energy in the lower frequencies. Negative skewness is associated with a positive tilt and a predominance of energy in the higher frequencies (Jongman et al. 2000). Based on this, I predict for most non-retroflex production, the skewness will be negative, while for most retroflex production, the skewness will be positive.

Finally, according to (Ladefoged & Maddieson 1996), the typical acoustic correlate of retroflexion is a lowering of F3 in the preceding vowel.

To sum up, the acoustic cues that will be used in the analysis are: spectrum shape, spectrum noise, skewness and F3.

Spectrums in Praat

Analysis of the linguistic variables was performed using Praat signal analysis software (version 5.0.47 for Windows) with a narrow window length (0.005) and a view range of $0\text{-}10^4$ KHz.

Figures 4 and 5 show productions of an unmerged [ʂ] and a merged [ʂ] respectively. The merged [ʂ] is auditorily and acoustically [s]. We can see that Figure 4 has a more defined, distinct spectrum than Figure 5, which is more flat, since the production of a retroflex has a longer anterior cavity than non-retroflex does.

Meanwhile, in Figure 5, the frication noise is centered above 5000 Hz, which is high, compared to the frication noise in Figure 4, which is below 5000Hz. Moreover, there is a lowering of F3 in Figure 4 of the unmerged [ʂ], but no lowering of F3 is observed in Figure 5. Finally, the skewness for Figures 2 and 3 is 0.26 and -0.42 respectively (using the default setting "power 2"), which indicates the merging of [ʂ] and [s] into [s] occurs in Figure 5 but not in Figure 4.

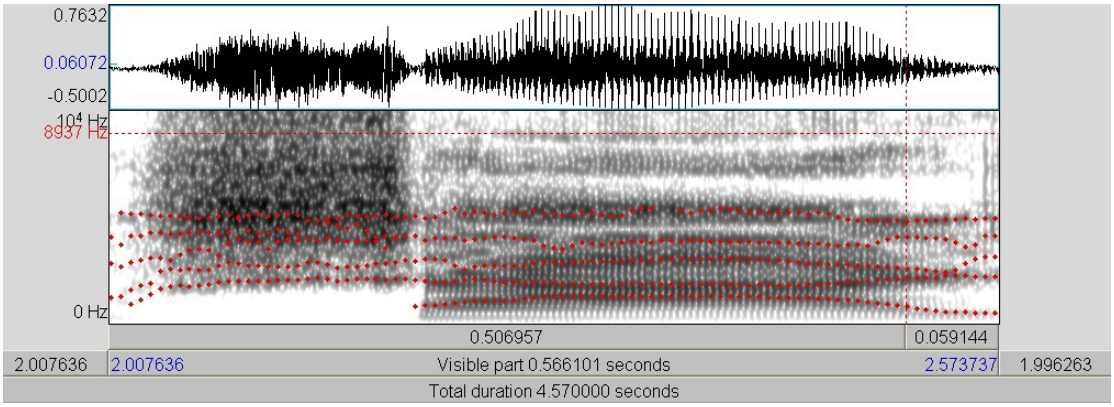


Figure 5: Waveform and spectrogram for a retroflex production of 沙 [ʂa:] from a female speaker (not merged).

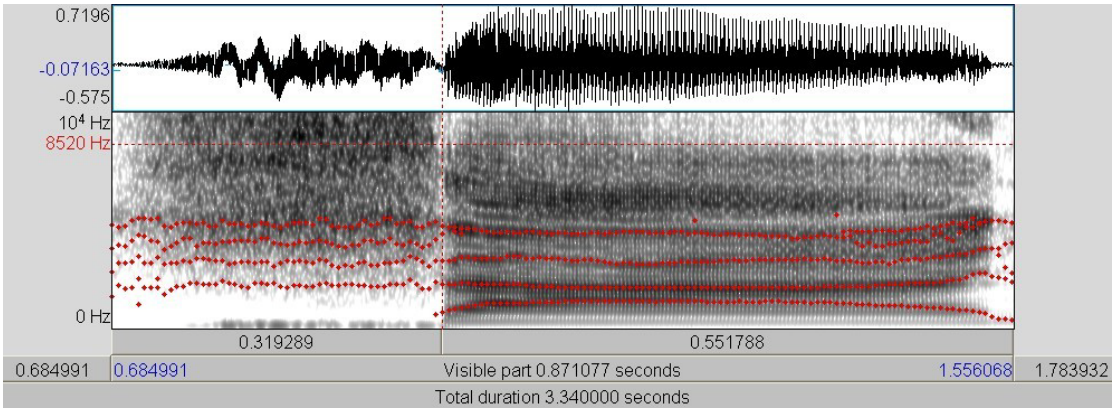


Figure 6: Waveform and spectrogram for a retroflex production of 沙 [sa:] from a female speaker (merged).

Statistical Analysis

Multiple linear regression was used to assess the relationship of retroflex merger with social class, sex and age. A multiple linear regression was chosen because it allows more than one explanatory independent variables. The independent variables (IVs) include social class, sex and age, and the task formality. The dependent variables (DVs) refer to retroflex merger.

SPSS statistical software (Version 20.0 for Windows 7) was used to test if the associations are statistically significant.

4. Results

In this section, I present the results of the analysis. The results are organized by independent variable. Table 4 indicates the distribution of total retroflex initials produced as alveolar within the 7,128 tokens found in the corpus:

Table 4: Number and percentage of merged retroflex consonants

Retroflex	Total	Number merged	Merger percentage
ʂ	2,376	626	26.35%
$tʂ^h$	2,376	524	22.05%
tʂ	2,376	547	23.02%

Generally speaking, the [ʂ] merger occurred most frequently when compared with the other two retroflex consonants, while the [tʂ] merger occurs slightly more frequently than the [$tʂ^h$] merger. However, the multiple linear regression tests show that such differences are not statistically significant ($p > .05$). Therefore, I won't elaborate on the interactions of these three retroflex consonants further.

Social class

The hypotheses for use of the retroflex merger by different social classes are as follows:

H1: The retroflex merger occurs less frequently in the middle class group.

H0: There is no significant difference in the use of the retroflex merger across social

classes.

Hypothesis 1 is confirmed by the data, as illustrated in Figure 6. This figure shows that the middle class group merged 20.53% of the overall 2,376 retroflex [ʂ], whereas the working class group merged 30.47% of the same amount of tokens. That means that 488 out of 2,376 retroflex initial [ʂ] were actually pronounced as [s] by the middle class, and 771 by the working class. Meanwhile, for the overall 2,376 tokens of retroflex [tʂ^{h}], the middle class group merged 18.05% of time, while the working class group merged 26.08%. Finally, the middle class group merged 17.75% of 2,376 retroflex [tʂ], while the working class group merged 28.30%. To sum up, middle class speakers tend to merge retroflex consonants less frequently. This finding is statistically significant (p =.047).

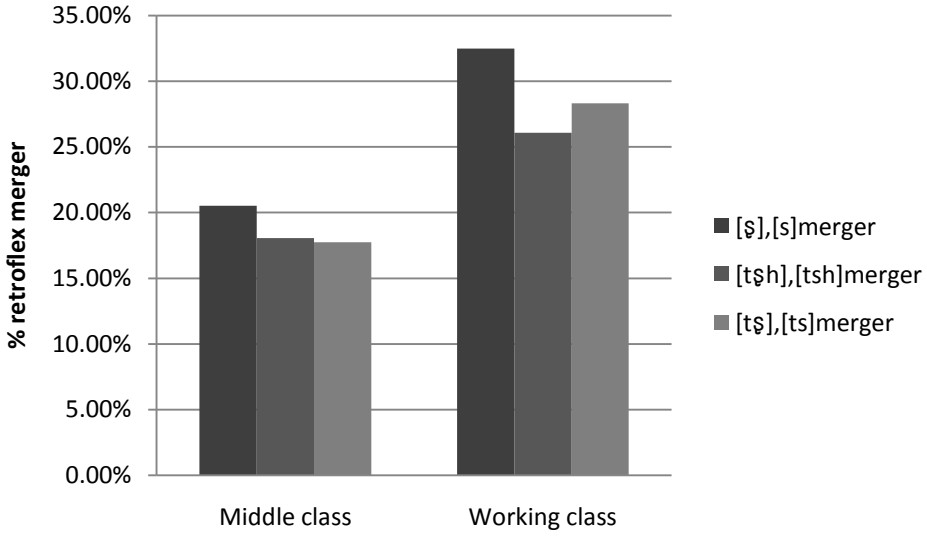


Figure7: Use of the retroflex merger by social classes

Age

The hypotheses for use of retroflex merger by different age groups are as follows:

H1: The retroflex merger occurs most often in the oldest age group, and least often in the youngest age group.

H0: There will be no significant difference in the use of the retroflex merger across the three age groups.

Hypothesis 1 is confirmed by the data, as illustrated by Figure 7. The figure shows that the youngest group (18-30) merged 4.17% of the total 2,376 retroflex [ʂ], the middle group merged 19.91%, and the oldest group merged 55.42%. That is, 99 out of 2,376 retroflex initial [ʂ] were actually pronounced as [s] by the youngest group, 473 by the middle group, and 1317 by the oldest group. Meanwhile, out of the 2,376 retroflex [tʂ^{h}] tokens and 2,376 [tʂ] tokens, the youngest group merged 3.70% and 3.47% respectively, the middle group merged 17.36% and 14.82% respectively, and the oldest group merged 45.14% and 50.79% respectively. To sum up, younger people tend to merge retroflex consonants less. This finding is statistically significant ($p = .031$).

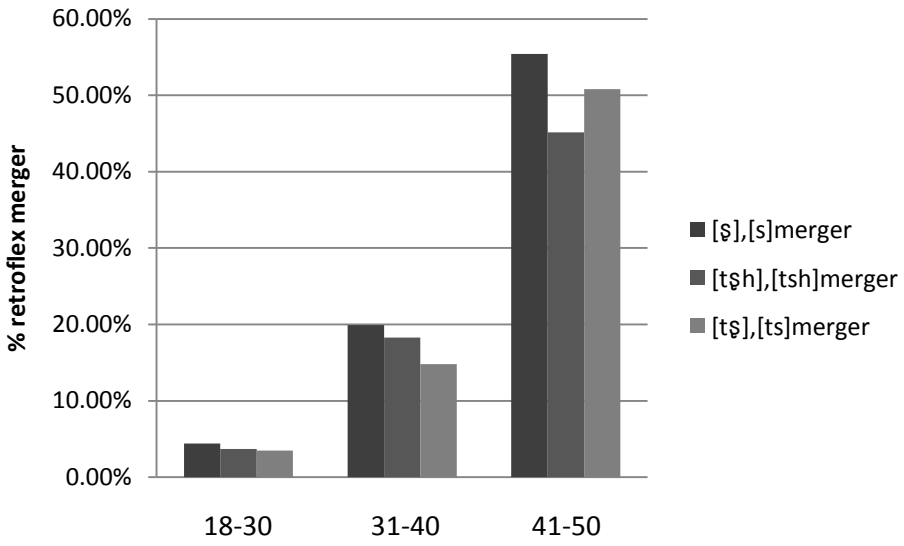


Figure 8: Use of the retroflex merger by age

Gender

The hypotheses for use of retroflex merger by gender are as follows:

H1: The retroflex merger occurs more in the speech of males.

H0: There will be no significant difference in the use of the retroflex merger across gender.

Figure 8 below shows that males have a higher percentage of merged retroflex tokens than females do. Males merged 29.32% of the total 2,376 tokens of retroflex [ʂ], while females merged 23.67%. In other words, 697 out of 2,376 tokens of retroflex initial [ʂ] were actually pronounced as [s] by males, while 562 were pronounced as [s] by females. Meanwhile, for the 2,376 retroflex [tʂ^{h}] tokens and 2,376 [tʂ] tokens, males merged 23.61% and 23.92% respectively, while females merged 20.52% and 22.13% respectively. This difference is not statistically significant. ($p = .066$). Therefore, gender is not a statistically significant predictor of retroflex merger.

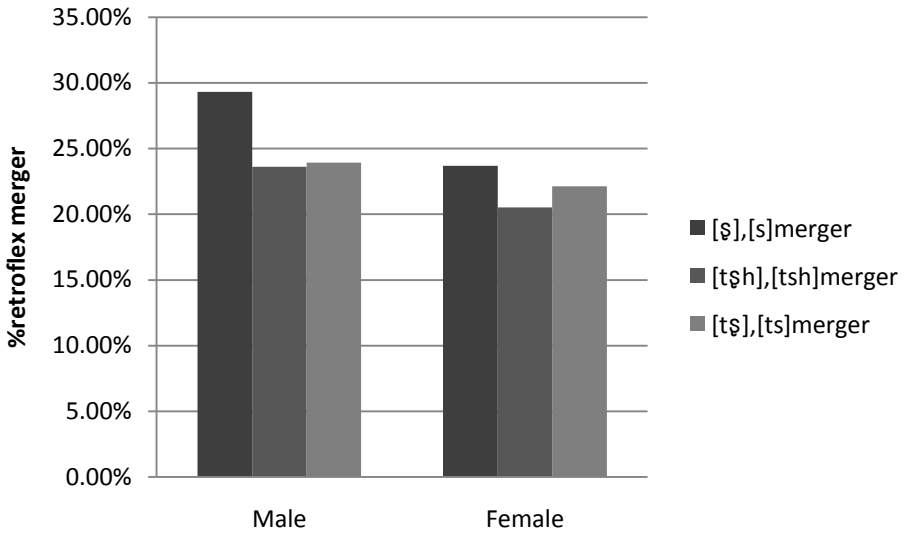


Figure 9: Use of the retroflex merger by gender

Task formality

The hypotheses for the use of the retroflex merger by task formality are as follows:

H1: The retroflex merger occurs more often in the map task.

H0: There will be no significant difference in the use of the retroflex merger in task formalities.

Hypothesis 1 is confirmed by the data, as illustrated in Figure 9. This figure shows that the subjects merged 55.42% of the overall 216 retroflex [ʂ] in the map task, and 20.20% in the 2160 retroflex [ʂ] in the wordlist task. Meanwhile, for the overall 216 retroflex [tʂ^{h}] in the map task, and 2160 in the wordlist task, the percentage of merged tokens is 50.59% and 16.96% respectively. Finally, for the 216 retroflex [tʂ] tokens in the map task, and the 2160 tokens in the wordlist task, 46.30% and 14.52% were

merged, respectively. To sum up, the retroflex merger is less frequent in formal tasks. This result is statistically significant (p = .038).

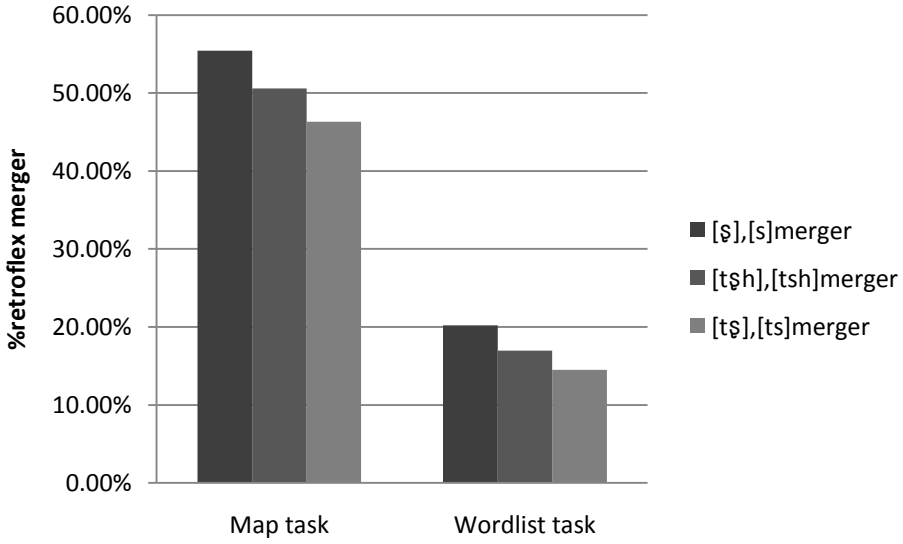


Figure 10: Use of the retroflex merger by task formality

Outliers

The data in the previous section show that younger, middle class people tend to merge retroflex consonants less. However, two subjects broke from this pattern and displayed different tendencies.

The first case is a 26-year-old working class female, Xiaolan[1]. She has almost no retroflex consonants merged in both the map task and wordlist tasks. Her use of the retroflex merger is listed in table 6 as below, compared with two other peers, Meiru and Jiaojiao, who are representative in the same cohort.

[1] All names mentioned in this study are pseudonyms.

Table 5: Frequency of retroflex merger by comparison

	Xiaolan	**Meiru**	**Jiaojiao**
	female, 18-30, working class	**female, 18-30, working class**	**female, 18-30, middle class**
ʂ	1.85%	37.04%	3.70%
$tʂ^h$	1.85%	37.04%	3.70%
tʂ	0%	16.67%	1.85%

In the table, Xiaolan has 0 retroflex [tʂ] merged in both map task and wordlist task and a very small percentage for [ʂ] and [$tʂ^h$]. Meiru and Jiaojiao are the only two persons who share exactly the same speaker variables. Meiru's data fit in the overall pattern, but Xiaolan seems to behave differently. As a working class person, Xiaolan is expected to have certain amount of retroflex merger, as Meiru. However, Xiaolan merger percentages are so small, that they are even smaller than the middle class female (Jiaojiao) in the same age cohort. It turns out that the Xiaolan's job is customer service in a local bank. Xiaolan's situation is further discussed in Chapter 5.

The second case is a 35-year-old middle class male, Zhenqiang. This person has a very high percentage of retroflex merger, compared with two other peers, Jinsong and Qigang:

Table 6: Frequency of retroflex merger by comparison

	Zhenqiang	**Jinsong**	**Qigang**
	male, 31-45, middle class	**male, 31-45, middle class**	**male, 31-45, working class**
ʂ	42.59%	15.93%	18.52%
$tʂ^h$	33.33%	11.11%	24.07%
tʂ	24.07%	16.67%	16.67%

In the table, Zhenqiang has a much higher percentage of retroflex merger, compared with Jinsong, who shares exactly the same speaker variables with Zhenqiang. While Jinsong's data fit in the overall pattern, Zhenqiang's data seem unexpected. In fact, Zhenqiang's merger percentages are so high that they are even higher than the working class male of the same age. A casual chat with the subject after the experiment reveals that this person strongly identifies as Shanghainese. More detailed discussion of this respondent is provided in Chapter 5.

Summary

This chapter presents the descriptive and inferential results for each independent variable. It shows that social class, age and task formality are statistically significant predictors of the retroflex merger. To be specific, higher class score, younger age and more formal task predict a lower merger score. There are also two subjects whose linguistic behavior deviates from the normal pattern. The next chapter will present a more detailed interpretation of these results, as well as limitations of the currents study,

and directions for future research.

5. Discussion

Interpretation of Results

For the statistical comparison of the working class group to the middle class group, it was found that the middle class tends to merge retroflex consonants less frequently. This supports the hypothesis that the retroflex merger occurs less frequently in the middle class group than the working class group. As mentioned in Chapter 2, there are three criteria for determining social classes in China. They are income, occupation, and education (Li 2009). As a matter of fact, these three factors are closely interrelated. People with higher occupation scores (See table 4) usually have higher income and education scores, and people who got higher education scores (See table 4) usually had higher income and occupation scores. However, higher income scores do not necessarily predict higher education and occupation scores. For example, one subject, Huangwei, in the working class group, is self-employed and has her own online business. She has an e-store in Taobao (a Chinese language web site for online shopping, similar to eBay), in which she sells down jackets. “I sell hundreds of down jackets every day, even in the summer. I am content with my current life, even though this job is very different from the career aspirations I had as a kid. I now have enough money to hire four customer service agents to support my 24-hour e-store and of course, buy houses and cars.” According to Huangwei’s self-reported salary, she ticked the box “over 30,000 RMB”, which is the highest level in the questionnaire. Since the information is self-reported, there is no absolute

guarantee of the reliability. In order to verify it, I found Huangwei's e-store in Taobao. (She gave me her e-store address for advertising purpose). There are over 50 different styles of down jacket on show in the e-store. Each style of jacket has its own sale record. Roughly speaking, there are 50 down jackets sold every day, which shows that Huangwei exaggerated the number of jackets being sold.in the interview. However, if I take 500 RMB as the average price, and the net income to be half of the price, Huangwei's monthly salary is about 375, 000RMB, which greatly exceeds the highest salary category. In this sense, Huangwei's salary report was reliable. Huangwei's education level is high school. This example illustrates that people with high income scores do not necessarily have higher education and occupation scores.

On the other hand, occupation turns out to be crucial in determining social classes. In other words, people belonging to the top three occupational categories (professional workers, employers & managers, and civil servants, see table 4) are usually middle class, even without considering their education and income scores. In this study, all the 12 middle class subjects have occupation scores above 4 (See table 4). This is unsurprising because in China, the top three "middle-class" occupation categories normally require their applicants to have at least a bachelor's degree. Some of the positions, like senior software developers, and some province-level or skilled civil servants, even require master's degrees. These positions usually earn considerable salaries. This explains the fact that people who have high occupation scores usually have higher education and income scores. This finding also echoes that of Macaulay (1976)'s study, which relied on occupation alone as a class indicator.

His Glaswegian subjects fell into four occupational groups based on the Registrar General's classification. The results of his study showed a fine and regular correlation for all the phonological variables with class distinctions based solely on occupation.

In the current study, the retroflex merger is considered nonstandard. That the retroflex merger occurs less frequently in the middle class group than the working class group is expected. People in certain occupations tend to use more standard varieties of language than other people at the same level of status, income or education (Guy 1988). Guy (1988) mentions that occupations involve projecting a public image. This has been clear in sociolinguistic studies since Labov's department store survey, which showed that speakers use of prestige variants correlated with the prestige of the store they worked in, even among employees doing the same kind of job and earning about the same income (Labov, 1972a).

This also explains the behavior of the first outlier mentioned in the previous chapter. Xiaolan, a 26-year-old working class female, has a very low retroflex merger percentage, 1.85% for [ʂ], 1.85% for [tʂ^{h}], and 0% for [tʂ]. These percentages are even lower than those of a typical middle class subject. She was categorized as working class because her education and salary score were low (an associate's degree, 2000 – 4000 RMB per month). Her job was customer service at a local bank. Her work involves answering daily calls from bank customers. According to the interview, when she was hired by the bank, she received a one-month training. They corrected her Mandarin and trained her how to speak in a nice and friendly way. Xiaolan said her bank had the right to fire her if they received any complaint about her service from

customers. “People think I’ve got a decent job, because I work in such a gorgeous work environment, wearing a uniform every day. But actually I am on a contract, and the salary they pay me is far less than people expect. I work 6 days per week, and even on holidays. So I have little time for relaxation and entertainment.”

This result could be interpreted under the concept of *marché linguistique* or “linguistic marketplace”. Some people have a greater stake than others in speaking the “legitimized” dialect, that is, in using standard or prestigious variants. These people are not always identified by their social class or other major social attributes. Bourdieu and Boltanski (1975) argue that market pressures toward standardizing one’s speech cut across class categories. In the current case, Xiaolan’s language behavior crosses her working class category to behave like middle class. This is because her work involves speaking much more than other working class, and even more than middle-class jobs, such as computer programmers. Her occupation requires the use of language communication, and she is paid according to her performance.

In the previous chapter, I mentioned that there is another outlier, Zhenqiang, who is middle class, but behaves linguistically like the working-class. Zhenqiang is a middle aged civil servant working in the city transportation bureau. Zhenqiang is a typical middle class person since he got relatively high scores in occupation (civil servant), education (master’s degree) and income (12000 – 20000). Therefore he is expected to speak in a more standard way – we would predict less retroflex merger in his speech. However, the data show that there are many instances of the retroflex merger in Zhenqiang’s speech, at even higher frequencies than the working class (See

table 7). As stated earlier, the casual chat with Zhenqiang after the experiment revealed his preference for remaining in his home area: "I don't want to go anywhere." The repetition of this comment, along with "I love this city" demonstrate his attachment to local life. His orientation to the local culture and xenophobia towards migrant workers from other cities could be illustrated by the following statement: "I've never imagined that someday like today there would be so many people on the street, most of whom are *Waidiren* (negative term for people from other places). I even don't want to go outside during weekends and holidays. It's just so crowded." When asked how he judged if a person was *Waidiren* or Shanghainese, he said:"Their clothes, their way of talking." Zhenqiang's sentiment echoes how Gamble (2002) said that Shanghainese define themselves in opposition to the world of non-Shanghainese, including other Chinese people. Milroy (1980), on the other hand, recognizes that "speakers use the resources of variability in their languages to express a great complex of different identities." In the current case, Zhenqiang used the retroflex merger, a typical linguistic feature of Shanghainese, viewed as nonstandard in Mandarin, to project his own Shanghai identity.

There are a few landmark quantitative studies of linguistic features that are good clues to identity marking. The most famous one is Labov (1963), in which the centralization of the onset of /aw/ and /ay/ diphthongs is correlated with "islander loyalty" on Martha's Vineyard. In Wolfram (1974)' study, he stated that ethnic varieties of English available to Puerto Rican immigrants to New York City allow them to choose between building a "Puerto Rican" or "African American" identity.

Additionally, Eckert (1989) found that mid-lax vowel backing correlated with "burnout" adolescent identity in a Detroit suburb.

For the statistical comparison of different age groups, it was found that the younger group tends to merge retroflex consonants less. This confirms the hypothesis that the retroflex merger occurs most often in the oldest age group, and least often in the youngest age group. Sankoff (2005a, 2005b) suggested that there are two separate patterns involving speaker variation that correlates with speaker age. The two patterns are "age grading" and "change over time". Sankoff & Blondeau (2007) explain age-grading as the steady increase in the use of one variant of the variable as speakers age. In other words, age-graded changes are regular and predictable changes in the use of a variant that recur at a particular age in successive generations. Such a pattern would be cyclic in character (Sankoff & Blondeau, 2007). Because of the small sample for the current study and the lack of developmental studies documenting the stages in which young adults use the unmerged retroflex, the more standard variable, it is difficult to conclude that this is the case. However, the age-grading analysis will probably be ruled out if we look more closely at the reasons for the occurrence of age-graded change. One major reason for age-graded change is the *marché linguistique*, first promoted by Bourdieu and Boltanski (1975), as mentioned earlier. But when people get older and retire, language is no longer used as an indicator, so they often return to speaking in a more casual, or nonstandard way. However, since all of my subjects, even the oldest, were all working during the time of the research, I don't have enough information to call this variation age-graded. Therefore, I reject the

possibility of age-graded change for the retroflex merger in the current study.

Another possibility is “change over time”, in which “individual speakers change over their lifespans in the direction of a change in progress in the rest of the community” (Sankoff 2005a). Such a pattern would be historical in character (Sankoff & Blondeau, 2007). When applying the “change over time” pattern to the current analysis, we find that the retroflex merger, or more generally, standard versus nonstandard Mandarin forms, is closely related to social changes that have been ongoing in China over the last half century.

On the mainland, the shape of the modern standard language has a relatively short history. On February 6, 1956, the Chinese government arrived at the definition for Standard Mandarin which is still used in textbooks today (Li, 2004). From then on, the use of Mandarin as the medium of instruction in the educational system and in the media has contributed to the spread of standard Mandarin. However, in 1955, one year before the standardization of Mandarin, about 18 million youth dropped out of school and went to the countryside in response to Chairman Mao’s slogan “Intellectual youth go to the countryside”, which is known as the Down to the Country Movement. The movement lasted twenty years until the end of the Cultural Revolution in 1976. During this chaotic period, millions of students lost the opportunity for education, which lead to the loss of opportunities for learning the newly established standard Mandarin. Among the 24 subjects in the current study, about half of them were born during the 1960s and 1970s, decades of turmoil in Chinese modern history. From this aspect, the retroflex merger/un-merger probably

has nothing to do with social class, gender or other social attributes, but with age, since older people, born in those very decades, may not have learnt the standard way of speaking Mandarin at all. Even though later on some of these people regained the opportunity to further their studies, join the workforce, and join the middle class, they probably still retained these linguistic features, as they already passed the critical period.

For the statistical comparison of different task formalities, it was found that in the wordlist task, which is more formal, people tend to merge retroflex consonants less. This supports the hypothesis that the retroflex merger occurs more often in less formal tasks. Such types of context-sensitive linguistic variation could be described as style shifting. Labov (1972b, 2000) treat stylistic choices as responsive, determined by components of the communicative context. He promoted the axiom that style can be arranged along dimension, measured by the amount of attention paid to speech (Labov 1972b). Therefore, the casual style, or in the current study, the map task, has the least amount of conscious self-monitoring, while the formal style, or in the current study, the word list task, has the maximum degree of self-monitoring. This explanation accounts for the result that when people paid the most attention to formal tasks, they spoke in a more formal, standard way, and when people paid the least attention to less formal tasks, they spoke in a more casual and nonstandard way.

Limitations of Current Study and Directions for Further Research

There are several factors that limited the current study. One was small number of subjects. It's possible that the small sample size might lead to unrepresentative data, and we must be cautious about conclusions from such small sample. Therefore, the study only constitutes the beginnings of a full study of this ongoing phenomenon. Also, because of time constraints, some of the recordings were done in the conference rooms at the subject's workplace. It's possible that the subjects have rushed to finish the recording in order to go back to work as soon as possible. Or, they might have felt uncomfortable doing the recording during their work. It's also possible that such an environment encouraged people to be more formal when doing the recording. All of these could create unrepresentative data. Finally, because of time constraints, with each recording lasting approximately 45 minutes on average, the amount of possible data to analyze was enormous, and I had to make the decision to give up some reading materials, and trim my interview questions. This caused the loss of otherwise valuable data.

Another limitation is that the social class indexing model is still imperfect. As I mentioned earlier in Chapter 5, occupation turns out to be key in determining social class. In other words, occupation could be the sole determiner for one's social class, even without taking education and income into account. If the social class indexing model is sophisticated enough, it should be able to predict the importance of occupation and therefore put more weight on it. In future studies, instead of putting equal weightings on each category, we should rely on our own intuition to judge

which factor might have a more weighing. In this study, for example, after we have designated the three factors determining one's social class, namely education, salary and occupation, we should think first which one seems more important. Based on observation of the community being studied, it's possible to for us to make the conclusion that occupation might be the most important factor among the three, since good paying jobs usually require higher levels of education and they always have relatively high salary.

Finally, we should use socio-historical background information to help us make our judgments. In this study, we found that the high percentage of retroflex merger is largely related to age. Historical events such as the Down to the Country Movement and Cultural Revolution that may have impeded people's language acquisition had to be taken into consideration. Social upheaval paralyzes education, which in turn affects people's language acquisition. These extra-linguistic factors are hard to assess in a population and operationalize.

References

Anderson, A. H, Bader.M, EG. ,Boyle.E, Doherty.G, Garrod.S, Isard.S, Kowtko.J,McAllister.J, Miller.J, Sotillo.C, Thompson.H.S, and Weiniert.R. The Hcrc Map Task Corpus. (1991). *Language & Speech*. 34(4), 351-366.

Bai, J. (1994). Language attitude and the spread of Chinese in China. Language Problems and Language Planning 18. 128-138.

Behrens, S. J. & Blumstein, S. E. (1988) Acoustic characteristics of English voiceless fricatives: A descriptive analysis. J. Phonetics 16: 295–298.

Bian, Y. (2002). Chinese Social Stratification and Social Mobility. *Annual Review of Sociology, 28,* 91-116.

Boersma, Paul, & David Weenik, (2010). Praat: doing phonetics by computer (Version 5.1.30) [Computer program: http://ww.praat.org].

Bourdieu, P. & Boltanski, L. (1975). Le fétichisme de la langue. *Actes de la Recherche en Sciences Sociales*. 4: 2-32.

CASS (Chinese Academy of Social Sciences). (2002). (In Chinese) A Framework of Ten Social Classes in China. *She Hui Xue*. 3: 54-59.

Chinese general social survey report (CGSS). (2006). Beijing: Zhongguo she hui chu ban she.

Central Intelligence Agency. 2011. Retrieved April 20, 2011, from https://www.cia.gov/library/publications/the-world-factbook/maps/maptemplate_ch.html

Chan A, Madsen R, & Unger J. (1992). *Chen Village under Mao and Deng*. Berkeley: Univ. Calif. Press

Chao, Y. R. (1968). *Xian dai Wu yu di yan jiu: Studies in the modern Wu-dialects*. Taibei Yonghe zhen: Da hua yin shu guan.

Chen, P. (1999). *Modern Chinese: History and Sociolinguistics*. Cambridge: Cambridge University Press.

Chen. S. (1990). Shaoxingshi Chengqu Putonghua de Shehuifenbu ji qi Fazhan Qushi. *[Putonghua in Shaoxing city: the social distributiong and its development trend]*. *Yuwen Jianshe*,1: 41-47.

Chu, X. (2001). Linguistic diversity in Shanghai. *Journal of Asian Pacific Communication* 11: 17-24.

Chung, K.S. (2006). Hypercorrection in Taiwan Mandarin. *Journal of Asian Pacific Communication*, 16, 197-214.

Ding, Yi. (1998). Guanyu ‘guifan putonghua’ he ‘dazhong putonghua’ de taolun (Discussion on Standard Mandarin and Popular Mandarin). Yuwen Jianshe Tongxun.57: 14.

Dong, J. (2010). The enregisterment of Putonghua in practice. *Language & Communication, 30,* 4.

Eckert, P. (1989). *Jocks and burnouts: Social categories and identity in the high school*. New York: Teachers College Press.

Evers, V., Reetz, H., & Lahiri, A. (1998). Crosslinguistic acoustic categorization of sibilants independent of phonological status J. Phonetics 26, 345–370.

Fasold, R. W. (1972). Tense marking in Black English. Arlington, Va:. Center for Applied Linguistics.

Gamble, J. (2002). *Shanghai in transition*. New York, NY: Routledge Curzon.

Gilliland, J. (2006). Language attitudes and ideologies in Shanghai, China. (Master Thesis, Ohio State University, 2006).

Guy, Gregory R. (1988). Language and social class. In Frederick J. Newmeyer (ed.), Linguistics: The Cambridge survey, vol. 4: Language: The socio-cultural context, 37– 63. Cambridge & New York: Cambridge University Press. 37-63.

Hamann, S. (2004). Retroflex fricatives in Slavic languages. *Journal of the International Phonetic Association, 34,* 1, 53-67.

Heinz, J. M., & Stevens, K. N. (1961). ‘‘On the properties of voiceless fricative consonants,’’ J. Acoust. Soc. Am. 33, 589–596.

Hughes, G. W.& Halle, M.(1956). Spectral properties of fricative consonants. J.Acoust. Soc. Am. 28: 303–310.

Jing, Y. (2010). Stumbling on the Rocky Road: Understanding China’s Middle Class. *International Journal of China Studies.* 1: 435-458.

Jongman, A., Wayland, R., & Wong, S. (2000). SPEECH PRODUCTION (70) – Acoustic characteristics of English fricatives. *The Journal of the Acoustical Society of America, 108,* 3, 1252.

Kjeld, E & Chen, G. (2011). China's Civil Service Reform: An Update. East Asian Institute Home Page at National University of Singapore. Retrieved January 20, 2012, from http://www.eai.nus.edu.sg/BB493.pdf

Kohn, M. L., Li, L., Wang, W., & Yue, Y. (2007). Social Structure and Personality during the Transformation of Urban China: A Preliminary Report of an Ongoing Research Project. *Comparative Sociology, 6,* 4, 389-429.

Labov, William (1962). The social history of a sound change on the island of Martha’s Vineyard, Massachusetts. Master’s essay, Columbia University.

Labov, W. (1966). The Social Stratification of English in New York City. Cambridge, U.K.: Cambridge University Press.

Labov, W. (1972a). The social strati fication of (r) in New York City department stores. In *Sociolinguistic patterns* (pp. 43–69). Philadelphia: University of Pennsylvania Press.

Labov, W. (1972b). *Language in the inner city: Studies in the Black English vernacular*. Philadelphia: University of Pennsylvania Press.

Labov, W. (1973). Hypercorrection by the Lower Middle Class as a Factor in Linguistic Change. In *Sociolinguistic patterns* (pp. 122–142). Philadelphia: University of Pennsylvania Press.

Labov, W. (2000). The anatomy of style shifting. Stylistic variation in language. In P. Eckert & J. R. Rickford (Eds.), Style and sociolinguistic variation. (pp. 85-108). Cambridge: Cambridge University Press.

Ladefoged, P. (2003). *Phonetic data analysis: An introduction to fieldwork and instrumental techniques*. Malden, MA: Blackwell.

Ladefoged, P. (2005). *A course in phonetics*. Boston: Wadsworth Publishing.
Ladefoged, P & Maddieson, I (1996). *The sounds of the world's languages. Oxford: Blackwell.*
Lau, R. W. K. (1997). China: Labour reform and the challenge facing the working class. *Capital & Class, 97*, 61.
Li, C. (2002). The Class Structure of China's Urban Society During the Transitional Period. *Social Sciences in China*. 1: 91-99.
Li, C. (2009). Profile of Middle Class in Mainland China. Working Paper of Chinese Academy of Social Sciences.
Li, P. (2002). Introduction: Changes in Social Stratification in China Since the Reform. *Social Sciences in China*. 1: 42-47.
Li, C.W. (2004). Conflicting notions of language purity: the interplay of archaising, ethnographic, reformist, elitist and xenophobic purism in the perception of Standard Chinese. *Language & Communication*, 24. 97-133.
Lin, J. Y., & Liu, Z. (2000). Fiscal decentralization and economic growth in China. *Economic Development and Cultural Change, 49*, 1, 1-21.
Lin, Y. (2000). Guifanhua, biaozhunhua, dazhongputonghua (Unification, standardization, and Popular Mandarin). *Yuwen Jianshe Tongxun*. 62: 9–12.
Liu, B. (2006). Social structure and personality in transitional urban China. *Dissertation Abstracts International, A: the Humanities and Social Sciences, 67*, 4, 1555.
Liu, M. (2004). (In Chinese) Brief History of the Phonology of Shanghainese. *Shanghaihua yuyin jianshi*. Shanghai: Xuelin Chubanshe.
Lu, H.C. (1999). *Beyond the neon lights: Everyday Shanghai in the early twentieth century*. Berkeley: University of California Press.
Lu, X.Y. (1989). Rethinking the peasant problem (chongxin renshi nongmin wenti). *Socioogical Research. (shehuixue yanjiu)*, 6:1–14.
Lu, X.Y. (2002). (In Chinese) A Research Report of Social Class in Contemporary China. *Dangdai Zhongguo Shehui Jieceng Yanjiu Baogao*. Beijing: Chinese Academy of Social Sciences.
Luo, Z. J. (2004). (In Chinese) Dialect and Culture. *Da hai wang luo wen zhai* 8.
Ma, Z. (2001). Urban labor-force experience as a determinant of rural occupation change: evidence from recent urban-rural return migration in China. *Environ. Planning* A 33:237–55.
Macaulay, R, K, S. (1976). Social class and language in Glasgow. *Language in Society*. 5: 173-88.
MacPherson, K. L. (2002). Shanghai's History, Back to the Future. *Harvard Asia Pacific review*, 7, 37-40.
Milroy, L. (1980). *Language and social networks*. Oxford: B. Blackwell.
Milroy, L., & Milroy, J. (1992). Social network and social class: Toward an integrated sociolinguistic model. *Language in Society, 21*, 1, 1-26.
Milroy, James. "Language Ideologies and the Consequences of Standardization." *Journal of Sociolinguistics*. 5.4 (2001): 530-555. Print.
Nee ,V. (1989). A theory of market transition: from redistribution to markets in state

socialism. *Am. Sociol. Rev.* 54:663–81.
Norman, J. (1988). *Chinese*. Cambridge: Cambridge University Press.
Norman, J. (2007). The Chinese Dialects: Phonology. In Thurgood, G., & LaPolla, R. J. *The Sino-Tibetan languages* (72-83) London: Routledge.
Parish, W.L. (1975). Socialism and the Chinese peasant family. *J. Asian Stud.* 34(3):613–30.
Peter, H. (foreword). 2008. *All about Shanghai and environs, a 1934 guide*. London: China Economic Review Publishing Ltd.
Qu, L. (2005). Understandings about the Social Structure in Modern China. *Chinascope*
Sankoff, G. (2005a). Cross-sectional and longitudinal studies in sociolinguistics. *An International Handbook of the Science of Language and Society*, Volume 2, 2, ed. by Ulrich Ammon, Norbert Dittmar, Klaus J. Mattheier, and Peter Trudgill, 1003-1013. Berlin: deGruyter.
Sankoff, G. (2005b). Age: Apparent time and real time. *Elsevier Encyclopedia of Language and Linguistics.* ed. by Keith Brown, 2ndedition, Vol. 9. Oxford: Elsevier.
Sankoff, G., & Blondeau, H. (2007). Language change across the lifespan: /r/ in Montreal French. *Language, 83*, 3, 560-588.
Shadle, C. H. (1990) Articulatory-acoustic relationships in fricative consonants,'' in *Speech Production and Speech Modeling*, edited by W. Hardrastle & A. Marchal Kluwer, Dordrecht: 187–209.
Shanghai Statistics Bureau. (2011). Retrieved April 28, 2011, from http://www.stats-sh.gov.cn/tjnj/nj08.htm?d1=2008tjnj/C0301.htm
Starr & R. & Jurafsky, D. (2004). Phonological variation in Shanghai Mandarin. Paper presented at NWAV 33, Ann Arbor, Michigan.
Stevens, K. N. (1998). *Acoustic Phonetic*. The MIT Press, Cambridge, MA.
Strevens, P. (1960). Spectra of fricative noise in human speech. Lang. Speech 3: 32–49
Spolsky, B. (1998). *Sociolinguistics*. Oxford: Oxford University Press.
Oxley, M. (2009). *(ay) Monophthongization in Deer Park, Texas.* MA thesis, University of Washington at Seattle.
Qian N.R. (2000). Shanghai yuyan de bianqian [The Vicissitude of Shanghai Dialect]. *Shehui Kexue* [*Social Science*]. 2.65-66.
Tse, J. K. (1998). (In Chinese) Do young people in Taiwan really not distinguish between zhi chi shi and zi ci si? Huawen shijie[*Chinese world*] 90. 1-7.
Trudgill, P. (1974). *The Social Differentiation of English in Norwich*. Cambridge, UK: Cambridge University Press.
Unger, J. (1994). 'Rich man, poor man': the making of new classes in the Chinese countryside. In *China's Quiet Revolution*, ed. by D Goodman, B. Hooper, pp. 43–63. Melbourne, New York: St. Martin's Press.
Whyte, M. K., Vogel, E. F., & Parish, W. L. (1977). Social Structure of World Regions: Mainland China. *Annual Review of Sociology, 3*, 179-207.
Wolfram, W. (1969). A sociolinguistic description of Detroit Negro English.

Washington, D.C.: Center for Applied Linguistics.
Wolfram, W. (1974). *Sociolinguistic aspects of assimilation: Puerto Rican English in New York City*. Arlington, Va.: Center for Applied Linguistics.
Wu, Z. Q. & Gordon, E. (1987). Language variation in Shanghai. *Working Papers in Language and Linguistics* 21. 54-65.
Xiàndài Hànyǔ Cídiǎn [*Modern Chinese Dictionary*] (1983). Beijing: Commercial Press.
Kang, Y., & Smitheram, R. H. (2002). *Deciphering Shanghai: 1990-2000*. Eveleigh, N.S.W: Australian-Chinese Press.
Kohn, M. L., & Słomczyński, K. M. (1990). *Social structure and self direction: A comparative analysis of the United States and Poland*. Cambridge, Mass. [u.a.: Blackwell.
Yao, Y. (1989). Ying Kaizhan Dui Difang Putonghua de Yanjiu *[Investigation should be conducted on local Putonghua]*. *Yuwen Shijie*, 3: 18-21.
Yao, H. (1998). Guifan putonghua yu dazhong putonghua (Standard Mandarin and Popular Mandarin).*Yuwen Jianshe Tongxun*. 57:1–12.
Zhang, W. (2002). Twenty Years of Research on Stratified Social Structure in Contemporary China. *Social Sciences in China*. 1: 48-58.
Zhang, Q. (2005). A Chinese yuppie in Beijing: Phonological Variation and the Construction of a New Professional Identity. *Language in Society*, 34, 431-466.
Zheng, Y., Sproat, R., Gu,L., Shafran, I., Zhou,H., Su, Y., Jurafsky, D., Starr, R., & Yoon, Y. (2005). Accent Detection and Speech Recognition for Shanghai-Accented Mandarin. In Proceedings of *EUROSPEECH-05, Lisbon, Portugal.*
Zhou, Y. (1999). Guanyu ‘dazhong putonghua’ wenti (On the issue of ‘Popular Mandarin’).*Yuwen Jianshe Tongxun*. 59:1–5.

Appendix A: Consent Form

UNIVERSITY OF WASHINGTON CONSENT FORM
A Study of Shanghai Mandarin

Contact information:
Liyi Zhu
Email: zliyi@u.washington.edu Cell phone: +1 (206) 601-6156
Please note that we cannot guarantee the confidentiality of email communications.

Advisor: Betsy Evans
Email: evansbe@u.washington.edu
Please note that we cannot guarantee the confidentiality of email communications.

Investigator:
Liyi Zhu, Graduate Student, Dept. of Linguistics, Univ. of Washington

Investigators' statement:
I am asking you to be in a research study. The purpose of this consent form is to give you the information you will need to help you decide whether or not to be in the study. Please read the form carefully. You may ask questions about the purpose of the research, what I would ask you to do, the possible risks and benefits, your rights as a volunteer, and anything else about the research or this form that is not clear. When all your questions have been answered, you can decide if you want to be in the study or not. This process is called “informed consent.”

PURPOSE OF THE STUDY

The purpose of this study is to understand linguistics features of languages spoken in Shanghai by interviewing native Shanghainese who do not have any known speech or hearing difficulties.

PROCEDURES

If you choose to be in this study, I will ask you to do four things:

Demographic Questionnaire: I will ask you fill out a demographic questionnaire about your basic personal information, not including your name. Such questions are like “what is your age range?’, “what is your occupation?” The questionnaire session lasts about 5 minutes. You may decline to answer any question you do not wish to answer.

Interview: First, would like to interview you about your leisure activity. The entire int erview will last about 30 minutes and will focus on how you usually spend your leisure time in Shanghai . For example, I will ask you, “What do you do for fun?”

"Which kind of food do you like?" and "Which shopping mall do you often go to?" You do not have to answer every question.
Map Task: I will give you a map of a fictional location and asked to describe how to get from one point on the map to another, making reference to landmarks. The map task will last about 10 minutes.
Reading: I will ask you to read a list of sentences aloud. The reading task will last about 10 minutes.

I will record the entire session. I will store the recordings in a locked file cabinet.

RISKS, STRESS, OR DISCOMFORT

Some people feel that providing information for research is an invasion of privacy. I have addressed concerns for your privacy in the OTHER INFORMATION section. Some people feel self-conscious when they are audiorecorded.

BENEFITS OF THE STUDY

You may not directly benefit from taking part in this study. However, I hope the results of the study will allow me to learn more about Shanghai and how languages spoken in this region compares to those spoken in other regions.

OTHER INFORMATION

Taking part in this study is voluntary. You can stop at any time.

Information about you is confidential. I will code the study information. I will keep the link between your name and the code in a separate, secured location until June 2011. Then I will destroy the link. I would like to keep your recordings indefinitely for my research and to share with other researchers.
I would also like to be able to use your recordings in presentations and for educational purposes. Even though your name will not be associated with the data, it is possible that someone who knows you might recognize your voice. If the results of this study are published or presented, I will not use your name.

Although I will make every effort to keep your information confidential, no system for protecting your confidentiality can be completely secure. It is possible that unauthorized persons might discover that you are in this study, or might obtain information about you. The confidentiality of email communications also cannot be completely guaranteed. Government or university staff sometimes review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records may be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

Signature of investigator Printed Name Date

Subject's statement:

This study has been explained to me. I volunteer to take part in this research. I have had a chance to ask questions. If I have questions later on about the research I can ask the investigator listed above. If I have questions about my rights as a research subject, I can call the University of Washington Human Subjects Division at 01-(206) 543-0098. I will receive a copy of this consent form.

□ I give my permission for the researcher to re-contact me to clarify information. Giving your permission to re-contact you does not obligate you in any way.
□ I do NOT give my permission for the researcher to re-contact me to clarify information

The researcher may use my recordings and data in the following ways:
□ The researcher may use my data in any way that she feels is appropriate.
-Or- to limit the use of your data, check as many as apply :

□ My data may be made available to researchers **within** the University of Washington.
□ My data may be made available to the **larger** academic research community.
□ My data may be used as part of **teaching** materials.
□ My data may be published in **online** research databases.

Signature of subject Printed name Date

Copies to: Investigator's file, Subject

Appendix B: Demographic Questionnaire

Speaker Survey

Please answer the following questions by using a tick mark in the box which applies to you. All information will be treated in strict confidence. Thank you.

1. Age Range:
   ☐ 18-30 ☐ 31-40 ☐ 41-50 ☐ 51-60

2. Sex:
   ☐ Male ☐ Female

3. Occupation:
   ☐ Civil Servant ☐ Employers, managers ☐ Farmer
   ☐ Company employee ☐ Self-employed
   ☐ Professional workers ☐ Unemployed ☐ Others (Please specify)

4. Salary (RMB/per month):
   ☐ 1000-3000 ☐ 3000-5000 ☐ 5000-8000
   ☐ 8000-12000 ☐ 12000-20000 ☐ 20000-30000 ☐ above 30000

5. Your Present Education Level:
   ☐ Elementary School ☐ Junior High School ☐ Senior High School
   ☐ Associate's degree ☐ Bachelor's degree ☐ Master's degree
   ☐ PhD ☐ Others (Please specify)

6. Mother tongue:
   ☐ Mandarin ☐ Shanghai dialect ☐ English ☐ Others (Please specify)

7. Your parents' mother tongue:

   Father: ☐ Mandarin ☐ Shanghai dialect ☐ English

   ☐ Others (Please specify)

   Mother: ☐ Mandarin ☐ Shanghai dialect ☐ English

   ☐ Others (Please specify)

Appendix C: Interview Questions

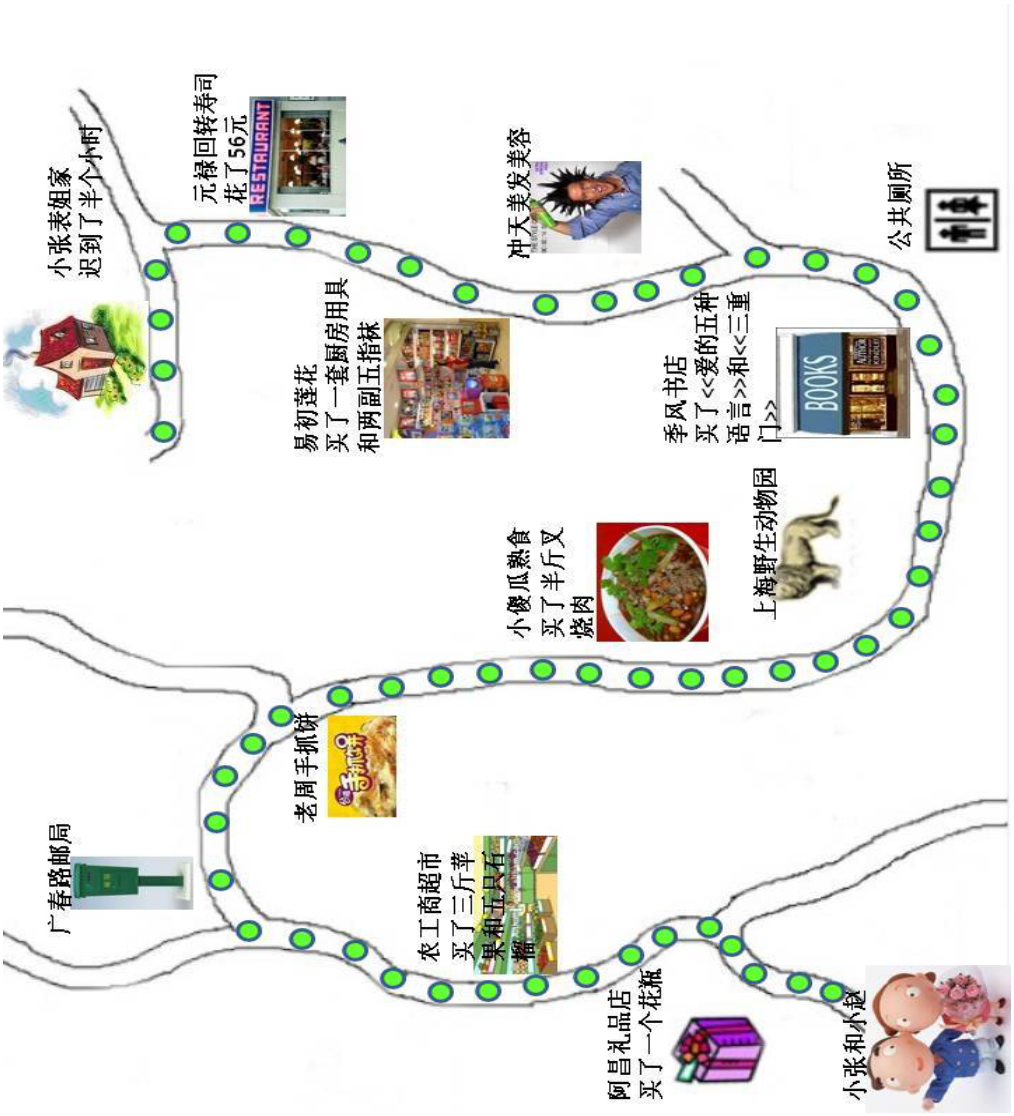
I. Background

1. Where were you born?
2. How long have you lived in Shanghai?
3. What do you do?
4. What about your parents? Where were they born? What languages do they speak?
5. Have you learned any other languages in school?

II. Entertainment

6. What do you do for fun during your leisure time?
7. What kind of food do you like most?
8. Which restaurant do you often go to?
9. Which supermarket do you often go to?
10. Do you travel much?
11. Where have you travelled?
12. Do you have any hobby, such as stamp collecting, and how much money do you spend on that every month?
13. Which transportation tools do you use?
14. Do you do the housework all by yourself or share with your spouse? Or, do you have hourly employees work for you?
15. Which shopping mall in Shanghai do you often go to?
16. What do you think of living in Shanghai? Do you like this city?
17. Any plans for the future?

Appendix D: Map Task



Appendix E: Wordlist

请以正常速度朗读以下文字（先从上往下，再从左到右）
Please read the following words with normal speed (top to bottom, left to right)

念大海的海	念出来的出	念煮饭的煮	念猪肉的猪	念舍得的舍
念医院的医	念舌头的舌	念邻居的居	念步行的行	念色彩的彩
念牛肉的肉	念吃饭的吃	念遮挡的遮	念眨眼的眨	念彻底的彻
念插头的插	念可是的是	念棉袄的棉	念相差的差	念说啥的啥
念沙漠的沙	念数学的数	念折纸的折	念油炸的炸	念书本的书
念实心的实	念竹笋的竹	念开始的始	念学者的者	念咸蛋的蛋
念成熟的熟	念清楚的楚	念除法的除	念赤豆的赤	念牙齿的齿
念处理的处	念水池的池	念属于的属	念检查的查	念大厦的厦
念这里的这	念土地的土	念祝贺的祝	念拉扯的扯	念过年的年
念报社的社	念值得的值	念扎实的扎	念大米的米	念电灯的电
念制造的制	念奢侈的奢	念开车的车	念老师的师	念夏天的天
念足球的球	念只是的只	念傻瓜的傻	念织布的织	

请以正常速度朗读以下文字（先从上往下，再从左到右）
Please read the following words with normal speed (top to bottom, left to right)

念夏天的天	念出来的出	念舍得的舍	念舌头的舌	念猪肉的猪
念医院的医	念煮饭的煮	念邻居的居	念步行的行	念遮挡的遮
念过年的年	念吃饭的吃	念色彩的彩	念眨眼的眨	念彻底的彻
念学者的者	念可是的是	念棉袄的棉	念足球的球	念说啥的啥
念相差的差	念数学的数	念折纸的折	念油炸的炸	念书本的书
念实心的实	念开车的车	念开始的始	念插头的插	念咸蛋的蛋
念成熟的熟	念大米的米	念除法的除	念赤豆的赤	念这里的这
念检查的查	念水池的池	念属于的属	念处理的处	念只是的只
念牙齿的齿	念土地的土	念祝贺的祝	念扎实的扎	念大厦的厦
念报社的社	念值得的值	念拉扯的扯	念清楚的楚	念电灯的电
念制造的制	念奢侈的奢	念竹笋的竹	念老师的师	念大海的海
念织布的织	念牛肉的肉	念傻瓜的傻	念沙漠的沙	

请以正常速度朗读以下文字（先从上往下，再从左到右）
Please read the following words with normal speed (top to bottom, left to right)

念棉袄的棉	念属于的属	念沙漠的沙	念只是的只	念傻瓜的傻
念大海的海	念煮饭的煮	念赤豆的赤	念步行的行	念拉扯的扯
念过年的年	念吃饭的吃	念色彩的彩	念眨眼的眨	念实心的实
念扎实的扎	念可是的是	念这里的这	念足球的球	念说啥的啥
念相差的差	念数学的数	念折纸的折	念油炸的炸	念书本的书
念彻底的彻	念遮挡的遮	念开始的始	念检查的查	念咸蛋的蛋
念成熟的熟	念牛肉的肉	念除法的除	念出来的出	念开车的车
念插头的插	念清楚的楚	念邻居的居	念报社的社	念舌头的舌
念水池的池	念祝贺的祝	念大厦的厦	念学者的者	念土地的土
念处理的处	念值得的值	念电灯的电	念牙齿的齿	念夏天的天
念制造的制	念奢侈的奢	念竹笋的竹	念舍得的舍	念医院的医
念织布的织	念大米的米	念猪肉的猪	念老师的师	

Appendix F: Descriptive Statistics

[s] production

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Middle class.	1188	.02	.57	.20	.20
Working class	1188	.04	.66	.33	.26
18-30	792	.02	.07	.04	.01
31-45	792	.06	.43	.20	.13
46-60	792	.41	.76	.56	.11
female	1188	.02	.66	.24	.23
male	1188	.04	.76	.30	.25
Map task	216	.03	.54	.20	.18
Wordlist task	2160	.00	.40	.12	.11

[ts^h] production

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Middle class.	1188	.01	.51	.17	.21
Working class	1188	.03	.60	.28	.22
18-30	792	.01	.07	.04	.03
31-45	792	.05	.34	.17	.12
46-60	792	.39	.57	.55	.09
female	1188	.02	.57	.24	.16
male	1188	.04	.76	.28	.21
Map task	216	.02	.57	.19	.26
Wordlist task	2160	.00	.37	.09	.17

[ts] production

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Middle class.	1188	.01	.51	.15	.28
Working class	1188	.02	.67	.31	.28
18-30	792	.01	.07	.06	.03
31-45	792	.06	.44	.17	.14
46-60	792	.42	.58	.59	.07
female	1188	.01	.60	.21	.18
male	1188	.04	.66	.29	.17
Map task	216	.01	.53	.19	.26
Wordlist task	2160	.00	.48	.11	.20